CURRICULUM VITAE

Luis A. San Andrés

https://scholar.google.com/citations?user=W1S_CWwAAAAJ&hl=en&oi=ao

J. Mike Walker '66 Department of Mechanical Engineering
Texas A&M University (TAMU)
College Station, TX 77843-3123.
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U.S. naturalized citizen (1995). **Ethnic origin:** Hispanic

Registered Professional Engineer, Texas, No. 73079, September 1992-Jun 2024.

URL address http://rotorlab.tamu.edu details information on Dr. San Andrés teaching portfolio, research projects and funding sources, research progress, list of publications by subject, short and long resumes, undergraduate and graduate class syllabi and notes, etc.

EDUCATION

Degree	Field	Institution	Date
Ph.D.	Mechanical Engineering	Texas A&M University	December 1985
MS	Mechanical Engineering	University of Pittsburgh	December 1982
BS.	Mechanical Engineering Summa Cum Laude	Escuela Politécnica, Ecuador	June 1981

ACADEMIC EXPERIENCE

Professor Emeritus		June 2023-
Mast-Childs Chair & Professor	Mechanical Engineering Texas A&M University	October 2019-September 2024 October 2014-September 2019
Faculty Fellow	Army Research Laboratory – Propulsion Division	February 2019-September 2019
Associate Director	Turbomachinery Laboratory	December 16, 2015 – April 11, 2017
Mast-Childs Professor	Mechanical Engineering Texas A&M University	2011-2014 2008-2011, 2005-2008,
Visiting Scientist	KIST, Korea Institute of Science and Technology	October 8-November 16, 2019 January 4-March 30, 2010
Visiting Faculty (Sabbatical leave)	National University of Singapore	August 2009- December 2009
Systems and Controls, Division Leader	Mechanical Engineering Department	September 2002 – July 2004
Professor	Texas A&M University	September 2000
Guest Docent (Sabbatical leave)	Universiteit Twente, The Netherlands	September 1999-June 2000
Associate Professor	Texas A&M University	September 1993 – March 2000

Assistant Professor	Texas A&M University	September 1991 – August 1993
Visiting Assistant Professor	Texas A&M University	September 1990 – August 1991
Research Associate	Texas A&M University	August 1988 – August 1990
Principal Professor	Escuela Politécnica Nacional, Quito, Ecuador	October 1986 – July 1988
Research-Associate	Texas A&M University	December 1985 – July 1988

HONORS AND RESEARCH AWARDS

Google scholar	
L San Andres	**12/10/2024**
Citations All	**10921**
h-index	**56**
i10-index	**227**
Citations since 2019	**3990**
h-index	**30**
i10-index	**141**

2025, ASME Henry R. Worthington Medal – ASME Fluids Engineering Division
2023, ASME Mayo D. Hersey Award – ASME Tribology Division
2022, ASME Aircraft Engine Technology Award (AETA) – ASME International Gas Turbine Institute (IGTI)
2014-2024, Mast-Childs Chair Professor, Texas A&M University (2x5 years)
2020, Fellow GPPS, Global Power and Propulsion Society, November
2005, Fellow ASME, American Society of Mechanical Engineers, November
2005, Fellow STLE, Society of Tribologists and Lubrication Engineers, May

2024 Best Paper Award, Structures & Dynamics Committee, ASME IGTI (June 2024)
San Andrés, L., Duran-Castillo, A., Jauregui, J., de Santiago, O. and Lubell, D., 2023, Measurement of Temperature and Load Versus Bearing Displacement in a Thrust Foil Bearing: Differences Between Light Load and High Load Operation, ASME Paper GT2023-103154.

2023 Best Paper Award, Structures & Dynamics Committee, ASME IGTI (June 2023)
San Andrés, L., and Alcantar, A., 2022, "Effect of Reduced Oil Flow Rate on the Static and Dynamic Performance of a Tilting Pad Journal Bearing Running in Both Flooded and Evacuated Conditions," ASME GT2022-81839.

2022 Best Paper Award, Structures & Dynamics Committee, ASME IGTI (June 2022)
San Andrés, L., Toner, J., and Alcantar, A., 2021, "Measurements to Quantify the Effect of a Reduced Flow Rate on the Performance of a Tilting Pad Journal Bearing with Flooded Ends," ASME GT2021-58771.

2019 Best Paper Award, Structures & Dynamics Committee, ASME IGTI (June 2019)
Experimental Force Coefficients for Two Sealed Ends Squeeze Film Dampers (Piston Rings and O-rings): An Assessment of Their Similarities and Differences, ASME GT2018-76224.

2018 Best Paper Award, Structures & Dynamics Committee, ASME IGTI (June 2018)
San Andrés, L., and Lu, X., 2017, "Leakage. Drag Power and Rotordynamics Force Coefficients of an Air in Oil (Wet) Annular Seal, ASME GT2017-63254

2017 Best Paper Award, Structures & Dynamics Committee, ASME IGTI (June 2017)
San Andrés, L., Childs, D., and Phillips, S., 2016, "A Water Lubricated Hybrid Thrust Bearing: Measurements and Predictions of Static Load Performance," ASME GT2016-56349

2014 Outstanding Paper 9th IFToMM International Conference on Rotordynamics, Milan, Italy (1/198 papers**)**
San Andrés, L., **Jeung, S.-H, and Bradley,** G., 2014, "Dynamic Forced Performance of Short Length Open-Ends Squeeze Film Damper with End Grooves."

2012 Best Paper Award, Structures & Dynamics Committee, ASME IGTI (June 2013)
Ryu, K., and San Andrés, L., 2012, "Effect of Cooling Flow on The Operation of a Hot Rotor-Gas Foil Bearing System," ASME J. Eng. Gas Turbines Power, vol. **134** (October), 102511 [ASME paper GT2012-68074]

2012 Best Paper Award, Microturbines, Turbochargers, & Small Turbomachines Committee, ASME IGTI (June 2013)
San Andrés, L.., Barbarie, V., Bhattacharya, A., and Gjika, K., 2012, "On the Effect of Thermal Energy Transport to the Performance of (Semi) Floating Ring Bearing Systems for Automotive Turbochargers," ASME J. Eng. Gas Turbines Power, vol. **134** (October), 102507 [ASME paper GT2012-68074]

2011 Best Paper Award Rotordynamics, Dynamics & Structures Division, ASME IGTI (June 2012)
San Andrés, L.., and Delgado, A., 2012, "A Novel Bulk-Flow Model for Improved Predictions of Force Coefficients in Grooved Oil Seals Operating Eccentrically," ASME J. Eng. Gas Turbines Power, vol. 134 (May), 022509

2010 Best Paper Award for ASME Journal of Tribology (2011 IJTC Conference, LA)
Kim, T. H., and San Andrés, L., 2010, "Thermohydrodynamic Model Predictions and Performance Measurements of Bump-Type Foil Bearing for Oil-Free Turboshaft Engines in Rotorcraft Propulsion Systems," ASME Journal of Tribology, Vol. 132(January), p. **011701**

2008 BEST Rotordynamics Paper Award (ASME-IGTI, Structures & Dynamics Committee)
Kim, T. H., and San Andrés, L., 2009, "Effect of Side End Pressurization on the Dynamic Performance of Gas Foil Bearings – A Model Anchored to Test Data," ASME Journal of Engineering for Gas Turbines and Power, 131(1), pp. 012501. (ASME Paper GT2008-50571)

2007 Editor's Choice – Tribology & Lubrication Technology, June 2007, pp. 40-50.
De Santiago, O., and L., San Andrés, 2007, "Experimental Identification of Bearing Dynamic Force Coefficients in a Flexible Rotor – Further Developments," *Tribology Transactions,* v. 50(1), p. 114-126.

2004 Best Rotordynamics Paper Award (ASME-IGTI, Structures & Dynamics Committee)
Rubio, D., and L., San Andrés, 2004, "Bump-Type Foil Bearing Structural Stiffness: Experiments and Predictions", ASME Paper GT 2004-53611

2003 Best Rotordynamics Paper Award (ASME-IGTI, Structures & Dynamics Committee)
Wilde, D.A., and San Andrés, L., "Experimental Response of Simple Gas Hybrid Bearings for Oil-Free Turbomachinery," 2006, ASME Journal of Engineering for Gas Turbines and Power, 128, pp. 626-633. (ASME Paper No. GT 2003-38833).

2019-2024 (Re)Appointed Mast-Childs Chair Professor, Texas A&M University (5 years)
2014-2019 Appointed Mast-Childs Chair Professor, Texas A&M University (5 years)
2011-2014 (Re)Appointed Mast-Childs Professorship, Texas A&M University (3 years)
2008-2011 (Re)Appointed Mast-Childs Professorship in Tribology, Texas A&M University
2005-2008 Inaugural Holder of Mast-Childs Professorship in Tribology, Texas A&M University

2005, Ruth and William Neele'52 Faculty Fellow, Dwight Look College of Engineering, Texas A&M University, April
2004, E.D. Brocket Professorship, Dwight Look College of Engineering, Texas A&M University, October
1999, Dresser Industries Professorship, Dwight Look College of Engineering, Texas A&M University
1998, Outstanding Graduate Teaching Award, Mechanical Engineering Dept., Texas A&M University
1997, The Plank Co. Faculty Fellow, Dwight Look College of Engineering, Texas A&M University
1996, TEES Senior Research Fellow Award, Texas A&M University, Texas Engineering Experiment Station.
1995, Ralph R. Teetor Educational Award from SAE (Engineering Society for Advancing Mobility Land Sea Air and Space).
1995, TEES Research Fellow Award, Texas A&M University, Texas Engineering Experiment Station
1993, TEES Research Fellow Award, Texas A&M University, Texas Engineering Experiment Station

1989, Latin-American Applied Science Award, (OAS) Organization of American States.

PROFESSIONAL SOCIETIES

Registered Professional Engineer, Texas, No. 73079, September 1992-Jun 2024.
Life Fellow ASME, American Society of Mechanical Engineers (1987-date)
Life Fellow STLE, Society of Tribologists and Lubrication Engineers (1991-date)
Fellow GPPS, Global Power and Propulsion Society, November (2017-2024)
Member ASEE, American Society for Engineering Education (2002-2023)

COLLABORATORS AT TAMU

Adolfo Delgado, John Vance, Dara Childs

TEACHING

COURSES TAUGHT AT TEXAS A&M UNIVERSITY

Graduate

MEEN 626 – Modern Lubrication Theory
MEEN 613 Advanced Dynamics
MEEN 617 – Mechanical Vibrations
MEEN 659 - Sound & Vibration Measurements

Also at Universiteit Twente, The Netherlands, 2000
National University of Singapore, Singapore, 2009
Korea Institute of Science and Technology (KIST), South Korea, 2010
Seminar – Practices of Modern Engineering (KIST, Spring 2010)

Undergraduate

MEEN 363 - Dynamics and Vibrations (2000-2020 – 20 times)
MEEN 459 - Sound & Vibration Measurements
MEEN 357 - Engineering Analysis for MEs (2015 – 1 time)
MEEN 401 - Design Studio (2013)
FSE1203 Freshman Seminar – Practices of Modern Engineering (NUS, Fall 2009)
MEEN 489 – Practices of Modern Engineering (2011) – 3 hour/week elective
MEEN 334 – Mechanical Systems I (1990-1999)
ENGR 203 – Modeling of Engineering Systems (1995)

STUDENT RESEARCH ADVISING

Bold face: Minority Hispanic, female

A. Doctorate (Ph.D.) (18 students)

Student Name (employment)	**Thesis title**	**Graduation date**
Wonbae Jung US Army RL, KeyYang Prec	Modeling of Floating Bearings for Turbochargers	August 2021
Rasool Koosha Apple, Western Digital	Thrust Bearings – Self Equalizing	December 2020
Xueliang Lu Hunan Sund, Atlas Copco	Two-Phase Flow Seals for ESPS	Spring 2020
Travis Cable Honeywell Aerospace	Metal Mesh Thrust Foil Bearings	Spring 2020
Pedram Tazrei	LES CFD – co-Chair with Prof Girimaji (Aero)	Spring 2020
Tingcheng Wu Air Products, Siemens, Dresser Rand	Labyrinth Seals Improved Flow Solution	Fall 2019
Bonjin Koo Daikin Applied	SFD – Air Ingestion	Spring 2020
Sung-Hwa Jeung ResMEd, Ingersoll-Rand	SFD – with groove – large clearance	May 2017

Thomas Chirathadam SpaceX, Bearings+, SwRI	Metal Mesh Foil Bearings for Microturbomachinery	December 2012
Keun Ryu Hanyang University, SK	Gas Bearings for Oil Free Turbomachinery	December 2011
Tae Ho Kim Kookmin University, SK	Computational Analysis of Gas Foil Bearings	December 2007
Adolfo Delgado Texas A&M Univ., GERC	Identification of force coefficients in a sealed SFD	December 2008
Oscar de Santiago ETU, Mx	Imbalance Response of Rotor Supported on Integral Squeeze Film Dampers and Tilting Pad Bearings	May 2002
Marco Faria U Campinas, Brazil	Finite Element Analysis of High Speed Grooved Gas Bearings	June 1999
Sergio Diaz U S.Bolivar, Venezuela	Effect of Air Entrapment on the Performance of Squeeze Film Dampers	May 1999
Jiming Li, Siemens Energy Sector	Bulk-Flow Analysis of Multiple Pocket Gas Damper Seals	December 1998
Grigory Arauz, Schlumberger, Reta Pumps	Analysis of Two-Phase Flow in Damper Seals for Cryogenic Turbomachinery	December 1996
Zhao Yang Cummins Engines, IN	Thermohydrodynamic Analysis of Product Lubricated Hydrostatic Bearings in Turbulent Flow Regime	December 1993

B. Masters (46 students)

Student Name (Employment)	**Thesis title**	**Graduation date**
Jose Torres Boeing	Wet Pocket Damper Seals - Experiments	Spring 2022
Andy Alcantar MEBA	Influence of Orifice Flow in TPJBS	Unknown
Bryan Rodriguez LA Turbines	SFDS – Effect of frequency on o-ring sealed dampers	Spring 2022
Jon Toner Exxon-Mobil	Flow Rate in Tilting Pad Bearings	Spring 2021
Rachel Bolen	Air Bearings for TCs in UAVS	Summer 2020
Hussain Kaizar Waukesha Bearings	Tilting Pad Bearings – Effect of pad material	May 2019
Hardik Jani Honeywell	Tilting Pad Bearings – Effect of flow rate	May 2018
Wonbae Jung PhD TAMU	Effect of Coating on Gas Foil Bearing Performance	December 2017
Behzad Abdollahi R&D Pumps	Flow Model for Tilting Pad Journal Bearings	December 2017
Sean Den Formosa Plastics Co.	Short-Length SFDs – Start up Response	December 2015
Michael Rohmer Exxonmobil	Thrust Hybrid Bearings – Identification of Parameters	December 2015
Yingkun Li	Tilting Pad Bearings – Pad Flexibility	May 2015

Travis Cable PhD TAMU	Thrust Collars for Integrally Geared Compressors	May 2015
Joshua Norsworthy Borg-Warner	Shimmed Foil Bearings	December 2014
Sung-Hwa Jeung PhD TAMU	SFD – with groove – large clearance	December 2013
Alain Anderson Halliburton Eng Services	All-Metal Seal Leakage	August 2013
Gary Bradley Texas A&M, Eng Tech	SFD – open ends	August 2013
Yujiao Tao Waukesha Bearings	Tilting Pad Bearing Analysis with Pivot Effects	December 2012
Feng Yu Honghua America LLC	THD Model for Floating Ring Bearings in TCs	May 2013
Paola Mahecha	Experimental Verification of performance in a Sealed Ends Damper	August 2011
Sanjeev Seshagiri Calnetix	Experimental Verification of performance in an Open Ends Damper	May 2011
Thomas Chirathadam TAMU PhD	Identification of Dynamic Force Coefficients in Metal Mesh Foil Bearings	August 2009
Arian Vistamehr	Nonlinear Hysteresis in Turbocharger Rotordynamics	August 2009
Yaying Niu Dresser-Rand	Performance of Flexure Pivot Gas Bearings – Base Induced Motions	August 2009
Zach Ashton Borg-Warner	Performance of High Temperature Seals	August 2009
Jose Baker O&G	Performance of Hybrid Brush Seals	December 2007
Ash Maruyama SulzerTurbo	Nonlinear rotordynamics of turbochargers	September 2007
Keun Ryu PhD TAMU	Gas Bearings for Oil Free Turbomachinery	May 2007
Anthony Breedlove Schlumberger	Effects of Temperature on Structural Parameters of Foil Bearings	May 2007
Dario Rubio Bechtel Corp	Rotordynamics of Gas Foil Bearings	December 2005
Juan Rivadeneira Bechtel Corp	Rotordynamics of Automotive Turbochargers	December 2005
Adolfo Delgado PhD TAMU	Identification of force coefficients in a sealed SFD	December 2005
Suzan Xhu	Gas Tilting Pad Bearings for Turbochargers	May 2004
K Balantrapu Capgemini Consulting	Identification of Parameters in Flexible Rotor-Bearing Systems	May 2004
Jason Kerth Dresser-Rand	Turbocharger Rotordynamics	August 2003

Deborah Wilde Zodiac	Measurement of the Dynamic Forced Performance of Air Bearing Supported Rotors	May 2002
Thomas Soulas Dresser Rand	Bulk-Flow Analysis of Lomakin Bearings for Cryogenic Turbopumps	October 2001
Thomas de Boer, U Twente	Dynamics of turbocharger rotors supported on floating ring bearings	August 2000 U. Twente
Julio Naranjo Wood Group	Dynamic Response of a Rotor Supported on Floating Ring Journal Bearings	June 1999
Oscar de Santiago PhD TAMU	Imbalance Response of Rotor Supported on Integral Squeeze Film Dampers	December 1998
Nicole Zirkelback Martin Marietta	Computational Analysis of Spiral Groove Trust Bearings and Face Seals	December 1997
David Ransom SwRI	Test Rotordynamic Force Coefficients in Gas Damper Seals	August 1997
Daniel Lubell Oil Free TM	Imbalance Response of a Rotor Supported on Off-Centered Squeeze Film Dampers	May 2000
Nick Walton Bell Helicopters	Measurements of Static Load Characteristics of a Flexure Pivot Tilt Pad Hydrodynamic Bearing	August 1995
Miller Robison Solar Turbines	A Test Rig for the Identification of Rotordynamic Coefficients of Fluid Film Bearings	August 1995
Hector Laos General Electric	Measurements of Unbalance Response in a Squeeze Film Damper Test Rotor Kit	May 1993
Grigory Arauz	Experimental Study of a Grooved Squeeze Film Damper	May 1993
Julio Semanate	Analysis of Floating Multi-Ring Oil Seals	December 1992

C. Sr. Honors Thesis

Student Name	Thesis title	Grad date
Joshua Brooks	Metal Mesh Foil Bearings	May 2013
Christy Petter	Parametric Study of Gas Foil Bearing performance	May 2006
Julene Aguirre(*)	Effect of Coatings on Gas Bearing Lift Off Speed	May 2002
Adolfo Delgado	Stiffness of Reverse Rotation Brush Seals	"
(*)**Dario Rubio** (*)	Structural Stiffness of Foil Bearings	
Albert Atkins	Stability and Vibration response of oil-lubricated TC	December 2001
Enrique Garcia	Measurements of the Vibration Response in a Garrett T2 Automotive Turbocharger	May 1999
Timothy Shaw		
Israel Silva	Identification of Damping Force Coefficients in Sealed Integral Dampers	August 1998
C.W. Karstens	Effects of Air Entrainment on the Damping Coefficients of a Squeeze Film Damper	December 1998
Nicole Zirkelback	Finite Element Analysis of a Fixed Pad Thrust Bearing - Determination of Force Coefficients	December 1995
Aquiles Lopez	Test Results for an Open End Squeeze Film Damper with a High Viscosity Oil	May 1995
Donald Plumlee	Analysis of a Mechanical System with Structural Hysteresis	December 1993

(*) exchange program with Universidad Simon Bolivar, Venezuela

D. Other student advising

Dr. San Andrés is a student advisor for the TEES Undergraduate Summer Research Program since 1992. He also volunteers work since 1996 for the Science, Technology & Youth Symposium (high school students) and the Science and Engineering Workshop for High School Teachers.

The responsibilities as a mentor to a minority student include academic guidance, addressing cultural issues, helping with administrative paperwork, and offering moral encouragement.

Dr. San Andrés also sponsors the work and training of undergraduate students in his laboratory. Four to six students per year assist to graduate students in their research work.

E. Post-Docs, Visiting Scholars, Research Associates

Oscar de Santiago, ETU, Mexico, Summer 2022(two months)

Azael Duran, U. Queretaro, Mexico, July-Oct 2022 (four months)

Jing Yang, TEES Senior Research Engineer, Nov 2016—March 2022

Tae-Ho Kim, Associate Professor, Kookmin University, S Korea, August 2018-August 2019.

Yanxia Fu, Assistant Professor, Jiangsu University, China, March 1, 2019-December 31, 2019

Rimpei Kawashita, Visiting Scholar, Mitsubishi Heavy Industries, Aug 2017-Aug 2018 (one year)

Arihara Hirotoshi, Visiting Scholar, Kobe Co., Set 2016-Aug 2017 (one year)

M. Loftry, Fulbright Scholar, American University Cairo, Summer 2017

Yi-Ching Michelle Wang, Research Associate, Sept-Dec 2016

Lili Gu, Tsinghua University, Visiting Assistant Professor, Sept 2015-2016 (one year)

Wei Zhang, Tianjin University, PRC, Sept. 2015 (one year)

Oscar de Santiago, ETU, Mexico, Summer 2015 (three months)

Masayuki Ochiai, Tokai University, Japan, 2015 (6 months)

Giovanni Pallini, University of Florence, 2015 (6 months)

Tanjia Baumann, ETH Zurich, 2015 (4 months)

Nam Dae Ho, Hyundai Heavy Industries, Aug 2014 – 2015 (one year)

Jonathan Baptista, Safran - SNECMA SEP, January 2014 (one year)

Takuya Kinoshita, Mitsubishi Heavy Industries, Jan-June 2013

Andriy Zahorulko, Summy State University, Jan-March 2013.

Sang-shin Park, Yeungnam University, South Korea, August 2012- July 2013

Tae Ho Kim, Texas A&M University, September 2007- December 2008.

Cyril Defaye, Universite de Poitiers, France, July 2005

Mihai Arghir, Universite de Poitiers, France, July-August 2004

Sergio Diaz, Universidad Simon Bolívar. Venezuela, June 1999 – April 2000, Summer 2001.

Fernando Baquero, CIATEQ, Mexico, June-August 1995.

Juan Oliveras, Univesidad Simon Bolívar, Venezuela, July 1996 - January 1997.

Son Yoon, KIST, Korea, 1990 (1 year)

Meng Guang, Shanghai Jiatong University, China, 1991 (1 year)

RESEARCH

December 10, 2024

Publications	2020	2021	2022	2023	2024	2020-24	Career
Journal (peer reviewed)	7	10	6	**7**	**4**	**42**	**213**
Conference (peer reviewed)	8	10	6	**8**	**3**	**49**	**160**
Conference (NOT peer reviewed)	1		3			**4**	**44**
					total	**95**	**417**

Bold face denotes student co-author

1. REFEREED JOURNAL PUBLICATIONS

Bold face denotes student co-author

213 San Andrés, L., **Ouyang, Z., and Qin, Y.,** 2024, "Effect of Reduced Oil Flow on the Performance of a Load on Pad, Tilting Pad Journal Bearing: Flooded vs. Evacuated Conditions," ASME J. Eng. Gas Turbines Power, Vol. **146**(4): 041004, https://doi.org/10.1115/1.4063686 ASME Paper GT2023-103242.

212 San Andrés, L., **Duran, A.,** de Santiago, O., Jauregui, J.C., and Lubell, D., 2024, "Measurement of Temperature and Load vs. Bearing Displacement in a Thrust Foil Bearing: Differences Between Light Load and High Load Operation," ASME J. Eng. Gas Turbines Power, Vol. **146**(3): 031004, https://doi.org/10.1115/1.4063545 ASME Paper GT2023-103154

211 **Torres, J.,** and San Andrés, L., 2024, "Leakage and Rotordynamic Force Coefficients of Two Seal Types Operating with Wet Gas," ASME J. Eng. Gas Turbines Power, Vol. **146**(3): 031016, https://doi.org/10.1115/1.4063551 ASME Paper GT2023-100555.

210 **Rodriguez, B.,** and San Andrés, L., 2024, "Dynamic Forced Response of an O-Rings Sealed Squeeze Film Damper Lubricated with a Low Supply Pressure and a Simple Method to Quantify Air Ingestion**,**" ASME J. Eng. Gas Turbines Power, Vol. **146**(2): 021004, ASME Paper GT2023-100495

209 Yang, J., Tran, D., and San Andrés, L., 2023, "Computational Fluid Dynamics Analysis and Experimental Results for the Dynamic Performance of Two Long Smooth Surface Annular Seals Operating With a Liquid in Air Mixture," ASME J. Eng. Gas Turbines Power, Vol. **145**(11): 111012, https://doi.org/10.1115/1.4063309 ASME Paper GT2023-103202

208 San Andrés, L., and **Alcantar, A.J.,** 2023, "Effect of Reduced Oil Flow Rate on the Static and Dynamic Performance of a Tilting Pad Journal Bearing Running in Both Flooded and Evacuated Conditions," ASME J. Eng. Gas Turbines Power, Vol. **145**(6): 061012. https://doi.org/10.1115/1.4056535 ASME GT2022-81839. **2023 Best Bearings & Seals Paper Award –ASME (IGTI)**

207 Delgado, A., San Andrés, L., **Thiele, J.,** and Yang, J., 2023, "Experimental Force Coefficients for a Fully-Partitioned Pocket Damper Seal and Comparison to Other Two Seal Types," ASME J. Eng. Gas Turbines Power, Vol. **145**(5): 051019. https://doi.org/10.1115/1.4056347 ASME GT2022-83164.

206 San Andrés, L., 2023, "A Review of Turbine and Compressor Aerodynamic Forces in Turbomachinery", Lubricants **2023**, 11*(*1), 26; https://doi.org/10.3390/lubricants11010026 (Special Issue **Fluid–Structure Interaction in Bearings and Seals**)

205 **Koo, B.,** and San Andrés, L., 2023, "A Model and Experimental Validation for a Piston Rings-Squeeze Film Damper: a Step toward Quantifying Air Ingestion," ASME J. Eng. Gas Turbines Power, Vol. **145**(4): 041012. https://doi.org/10.1115/1.4055712 ASME GT2022-81990.

204 Childs, D., Yang, J., San Andrés, L., **Torres, R**., and **Moreland, A**., 2023, "Measured Leakage and Rotordynamic Force Coefficients for Two Liquid Annular Seal Configurations: Smooth-Rotor/Grooved-Stator versus Grooved-Rotor/Smooth-Stator," ASME J. Eng. Gas Turbines Power, Vol. **145**(3): 031005. https://doi.org/10.1115/1.4055638

203 **Torres, J.,** San Andrés, L., and Yang, J., 2023, "A Stepped Shaft Labyrinth Seal vs. a Pocket Damper Seal: Leakage and Dynamic Force Coefficients under Wet Gas Operation," ASME J. Eng. Gas Turbines Power, Vol. **145**(1): 011006. https://doi.org/10.1115/1.4055665 (ASME 2022-82280).

201 **Jung, W.,** San Andrés, L., and Kim, J., 2022, "A Nonlinear Rotordynamics Model for Automotive Turbochargers Coupled to a Physical Model for a (Semi) Floating Ring Bearing System," ASME J. Eng. Gas Turbines

Power, Vol. **144**(11): 111002. https://doi.org/10.1115/1.4055365

200 Wu, T., San Andrés, L., and Lu, X., 2022,"Computational Fluid Dynamics Analysis of the Influence of Gas Content on the Rotordynamic Force Coefficients for a Circumferentially Grooved Annular Seal for Multiple Phase Pumps," ASME J. Trib, Vol. **144**(11): 111803. https://doi.org/10.1115/1.4054757

199 Yang, J., and San Andrés, L., 2022, "Making Better Swirl Brakes Using Computational Fluid Dynamics: Performance Enhancement From Geometry Variation," ASME J. Eng. Gas Turbines Power, Vol. **144**(2): 021027, https://doi.org/10.1115/1.4051962 (ASME GT2021-58956).

198 **Lu, X.,** San Andrés, L., and Yang, J., 2022, "A Nonhonogeneous Bulk Flow Model for Gas in Liquid Flow Annular Seals: An Effort to Produce Engineering Results," ASME J. Tribology Vol. **144**(6): 062302, https://doi.org/10.1115/1.4052678

197 **Koosha, R.,** and San Andrés, L., 2022 "A Model for Tilting Pad Thrust Bearings Operating With Reduced Flow Rate – Do Benefits Outweigh Risks?," ASME J. Eng. Gas Turbines Power, Vol. **144**(2): 021026, https://doi.org/10.1115/1.4052200 (ASME GT2021-60396)

196 San Andrés, L., **Kaizar, H., Hardik, J.,** and Thorat, M., 2022, "Effect of Pad Material, Copper vs. Steel, on the Performance of a Tilting Pad Journal Bearing: Measurements and Predictions," ASME J. Eng. Gas Turbines Power, Vol. **144**(3): 031001, https://doi.org/10.1115/1.4052430 (ASME GT2021-59401).

195 San Andrés, L., and Yang, J., 2021,"An Analytical Two-Phase Flow Model for Prediction of Leakage in Wet Gas Labyrinth Seals and Pocket Damper Seals. Is Simplicity Still Desired?" ASME J. Eng. Gas Turbines Power, Vol. **143**(12): 121016, https://doi.org/10.1115/1.4051916 (ASME GT2021-58958).

194 San Andrés, L., **Toner, J.,** and **Alcantar, A.,** 2021, "Measurements to Quantify the Effect of a Reduced Flow Rate on the Performance of a Tilting Pad Journal Bearing with Flooded Ends," ASME J. Eng. Gas Turbines Power, Vol. **143**(11): 111012, https://doi.org/10.1115/1.4052268 (ASME GT2021-58771)

2022 Best Bearings & Seals Paper Award –ASME (IGTI)

193 San Andrés, L., and **Rodriguez, B.,** 2021, "On the Experimental Dynamic Force Performance of a Squeeze Film Damper Supplied Through a Check Valve and Sealed With O-Rings," ASME J. Eng. Gas Turbines Power, Vol. **143**(11): 111011, https://doi.org/10.1115/1.4051964 (ASME GT2021-58627).

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URL site **http://rotorlab.tamu.edu** contains complete graduate class notes in Modern Lubrication and Mechanical Vibrations.

The Modern Lubrication Course notes and computational worksheets are used at several universities such as Georgia Tech, Carnegie Mellon, University Missouri-Rolla, Univerity of Poitiers (France), Chalmers University (Sweden), and schools in Korea, India and Latin America (Mexico and Venezuela). Other users are from industrial research: SNECMA-SEP (France), Barber-Nichols, Dresser Rand, Southwest Research Institute, Concepts-NREC, Praxair, Honeywell Turbocharging Technologies.

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Ryu, K., and L. San Andrés, 2006, "Measurements of of Rotordynamic Response of a Rotor Supported on Hybrid Flexure Pivot Tilting Pad Gas Bearings" Paper IJTC 2006-12371, ASME/STLE International Joint Tribology Conference, San Antonio, TX, October 2006

2005 San Andrés, L., **J.C. Rivadeneira,** K. Gjika, M. Chinta, and G. LaRue, 2005, "Advances in Nonlinear Rotordynamics of Passenger Vehicle Turbochargers: a Virtual Laboratory Anchored to Test data," Paper WTC 2005-64155, III World Tribology Conference, Washington D.C., September.

Kim, T.H., and L. San Andrés, 2005, "Analysis of Gas Foil Bearings with Piecewise Linear Elastic Supports," Paper WTC 2005-63397, III World Tribology Conference, Washington D.C., September.

De Santiago, O., and L. San Andrés, 2005, "Identification of Bearing Force Coefficients in Flexible Rotors: Extensions to Method," Paper WTC 2005-63276, III World Tribology Conference, Washington D.C., September.

San Andrés, L., and **T.H**. **Kim,** 2005 "Gas Foil Bearings: Limits for High Speed Operation," Paper WTC 2005-63398. III World Tribology Conference, Washington D.C., September.

Pan, C., and L. San Andrés, 2005, "The Narrow Groove Bearing Analysis Revisited," Paper WTC 2005-63803, III WorldTribology Conference, Washington D.C., September

Student Poster presentations Available at http://reumicro.tamu.edu

Two student posters prepared for NSF—Microturbomachinery REU Summer 2009 Program
Students: Jose Camero (UTSA), Shane Muller (Calvin College).

Four student posters prepared for NSF—Microturbomachinery REU Summer 2008 Program
Students: Alex Martinez (TAMU), Kathleen Hagen (TAMU), Brian Rice (UVA), Nick Niedbalski, (Gonzaga University)

Three student posters prepared for NSF—Microturbomachinery REU Summer 2007 Program
Students: Alex Martinez (TAMU), Hing Suh (TAMU),

Ryu, K., and San Andrés, L., 2007, "Experimental Response of Hybrid Gas Bearings: Control of Supply Pressure to Eliminate Critical Speeds," **First Place**, Online Student Poster Competition, Society of Tribologists and Lubrication Engineers, October.

ASME/STLE International Joint Tribology Conference, San Diego, CA, October 2007

San Andrés, L., and **Kim, T-H,** 2007, "Effect of Side Feed Pressurization on the Dynamic Performance of Gas Foil Bearings," Paper IJTC2007-44047.

ASME/STLE International Joint Tribology Conference, San Antonio, TX, October 2006

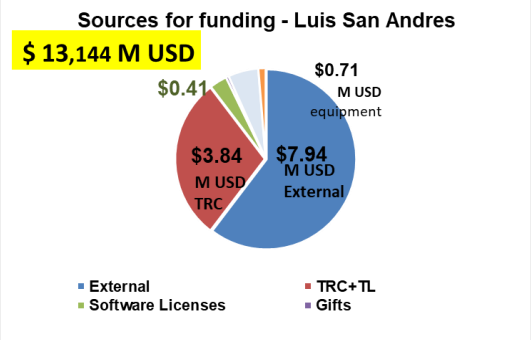
Baker, J., A. Delgado, and L. San Andrés, 2006, "Measurements of Leakage and Identification of Structural Parameters in a Hybrid Brush Seal," Paper IJTC 2006-12375

Ryu, K., and L. San Andrés, 2006, "Measurements of of Rotordynamic Response of a Rotor Supported on Hybrid Flexure Pivot Tilting Pad Gas Bearings" Paper IJTC 2006-12371

Petter, C., 2006, "Analysis of Gas Foil Bearings and Test Data Predictions," ASME Regional Student Conference, District E – Eastern Area (2006 Spring Student Conference, April 6-8, University of Arkansas – Fayetteville, AR

FUNDING FOR RESEARCH

TOTAL (EXTERNAL + INTERNAL – ALL COMPETITIVE)



1990-2023	career
External	$7,937,614
Internal TRC+TL	$3,842,561
Software Licenses	$414,113
Gifts	$64,000
Equipment	$713,775
Student support	$172,700
total	**$13,144,763**

External Research Funds, total $7'937,614

Principal Investigator(s)	Sponsor Project #	Amount	Project	Dates (GS support)
A Delgado, L. (PI), L. San Andrés 415880-00001	Baker-Hughes	$221,091	Aerodynamic Forces of Axial (Unshrouded) Turbine Stage	01/01/22-05/31/24
A Delgado (PI), L. San Andrés 415880-00001	Schlumbeger	$122,714	NL Rotordynamics of ESPs	04/11/22-12/31/23

A Delgado (PI), L. San Andrés 415440-00001	John Crane	$249,723	Advanced Analysis of Dry Gas Seals	01/01/22-05/31/24
L. San Andrés 414270-0001	Elliott Group	$186,713	Tilting Pad Bearing – Flow Injection Test program	01/02/21-12/31/21 (2)
A Delgado (PI), L. San Andrés (co-PI)	US Army RL Cooperative Agreement	$341,252	Developments Towards Oil-Free Turbochargers for UAVs	09/01/19-08/31/24 (1)
L. San Andrés/ J Yang 412170-00001	Ingersoll-Rand	$114,867	Gas Bearings for HVAC Oil free Compressors	07/10/19-10/30/20
L. San Andrés	Danfoss	$16,223	Design of Seal Test Rig	12/01/18-02/21/19
L. San Andrés	Mitsubishi Heavy Industries	$135,000	Testing of Interlocking Labyrinth Seals	9/01/17-12/31/18 (1)
L. San Andrés 40867000001	KeyYang Precision	$255,934	Semi Floating Ring Bearings for Turbochargers	9/01/17-12/31/20 (1)
L. San Andrés 50648000001	IBC Materials	$36,540	Evaluation of Coatings for Foil Bearings	9/01/16-12/31/16 (1)
L. San Andrés 40435000001	Elliott Group	$313,411	Tilting pad Bearing Test program	9/01/16-05/31/2018 (2)
L. San Andrés 40187100004/5/6/7	Pratt & Whitney	$446,566	Squeeze Film Damper – Assessment of Performance	01/01/13 – 08/31/18 (1)
L. San Andrés 40435000001	Torishima Pumps	$ 79,887	Hybrid CFD-Bulk Flow Model for Pump Seals	09/01/15-08/31/16 (1)
L. San Andrés 40243400001	Hyundai HI	$40,000	Integrated Model for Gas Seal Cartridges	08/01/14 – 07/31/15
L. San Andrés 40397300001	Hitachi R&D	$152,541	Model for Prediction of SSV in Tilting Pad Bearings	01/01/13 – 12/31/15 (1)
L. San Andrés 32525/B4770ME	Samsung Techwin	$158,639	Thrust Collar Analytical Development	09/01/12-08/31/14 (1)
L. San Andrés 32525/B4770ME	Borg-Warner TC	$ 90,441	Gas Thrust Bearings for Oil-free TCs	09/01/11-08/31/12 (1)
L. San Andrés 32525/39600/ME	Honeywell Turbocharging Technologies	$208,340	Turbocharger Bearing Code Development	09/01/10 – 08/31/13 (1)
L. San Andrés 32513/A2850/ME	Pratt & Whitney	$436,264	Squeeze Film Damper – design of test rig for high frequency & high load operation	07/01/08 – 12/31/12 (1)
L. San Andrés 32525/39600/ME	NASA - Glenn RC	$284,588	Prediction of Foil Bearing Performance: A Computational Model Anchored to Test Data	09/01/07-08/26/09 (2)
L. San Andrés 32525/37550//ME	Capstone Turbine Corp.	$ 64,762	Capabilities with Foil Bearings	12/31/06-01/15/08 (1)
L. San Andrés	Honeywell International 32525/6865A/ME	$438,160	Computational Analysis of Floating Ring Journal Bearings and Experimental Validation in a Turbocharger Test Rig – Phase I-IV	01/01/03-12/31/09(1)
W. Hung (ENT), L. San Andrés	National Science Foundation 32525/3543/ME	$259,249	Research Experiences for Undergraduates: Development of Microturbomachinery $114,154 (pro-rated MEEN)	06/01/06 – 06/30/10 10UG/year
L. San Andrés	Siemens 32525/3465AA	$106,950	High temperature Hybrid Brush Seal	10/01/07 6/30/09 (1)
L. San Andrés	Siemens 32525/34650	$ 75,993	Brush Seals with Reverse Rotation	01/01/06-09/30/07 (1)

L. San Andrés	Northrop Grumman 32525/2433B/ME	$787,277	Thrust Bearing Rig for validation of liquid hydrogen TP bearings	09/01/05 – 09/30/08 (3)
L. San Andrés D. Childs	Northrop Grumman 32525/24330/ME	$224,529	CLIN 0004 of the AFRL – Support for USET	02/01/05 – 06/30/06 (1)
L. San Andrés	Universal Technology Corporation 32525/21960/ME	$20,016	Identification of stiffness and damping coefficients in foil bearings	09/01/04-05/31/05 (1)
Dara Childs L. San Andrés	Northrop Grumman 32525/20580/ME	$49,972	CLIN 0001 of the AFRL – Support for USET	04/01/03-07/31/04
L. San Andrés	**NSF** 32525/53900//ME	$255,475	Gas Foil Bearings for Oil-Free Rotating Machinery – Analysis anchored to Experiments	06/15/03-05/31/06 (2)
L. San Andrés	NASA MSFC 32525/66500/ME	$ 37,282	Software Upgrade for Cryogenic Fluid Film Bearings	12/01/01-07/31/03
L. San Andrés	Dynatech 32525/60770//ME	$16,984	Computational Fluid Film Bearing Model Development in Support of Integral Rotor-Bearing Dynamics Software	10/01/03-12/31/03
L. San Andrés	ATS 32525/66260/ME	$ 79,580	Computational Analysis of Reverse Rotation Brush Seals	10/15/01-03/31/03 (1)
L. San Andrés	Garrett Boosting Systems 32525/64750//ME	$ 42,000	Feasibility Study of Bearing Technologies for Oil-Free Turbochargers	05/01/01-08/31/02
L. San Andrés	Honeywell International 32525/61570//ME	$129,000	Computational Analysis of Floating Ring Journal Bearings and Experimental Validation in a Turbocharger Test Rig	05/01/00-08/30/02(1)
L. San Andrés	DynaTech Engineering,Inc.	$ 4,367	Testing of Hypad™ air bearings for oil free applications	10/16/00 (1)
J. M. Vance, L. San Andrés	GE Transportation Systems 32525/62780/ME	$189,265	Turbocharger Rotordynamics	11/01/00-08/31/01 (2)
L. San Andrés	NSF 32525/58130/ME	$172,079	Dynamic Forced Performance of Fluid Film Bearings Operating with Air Entrainment	05/01/99-05/30/02 (2)
L. San Andrés	Boeing - Rocketdyne 32525/58350/ME	$ 33,000	Bulk-Flow Model of Cryogenic Liquid Labyrinth Seals	06/01/99-12/31/00
L. San Andrés	Allied Signal, Inc. 32525/54350/ME	$ 20,220	Tests on the Dynamic Response and Stability of Fluid Film Bearings for Automotive Turbochargers	01/01/98 - 06/30/99 (1)
L. San Andrés	NASA MSFC 32525/52330/ME	$ 73,200	Bulk-Flow Analysis of Hybrid Thrust Bearings for Process Fluid Applications	09/01/97 - 12/31/90
J.Vance (50%), L. San Andrés	TEXAS ATP 32190/71700/ME	$131,914	Damper Seals for Jet Engines	01/01/96 - 08/31/98 (3)
L. San Andrés	NSF 32525/45240/ME	$153,067	Dynamic Forced Response of Rotor Bearing Systems Supported on Squeeze Film Dampers	08/01/94-12/31/97 (2)
L. San Andrés	NASA LeRC 32525/42490/ME	$361,338	Thermohydrodynamic Analysis of Hydrostatic Journal Bearings for Cryogenic Applications	01/01/93 - 12/31/96 (2)
D. Childs, 50%	Entergy	$ 40,165	Evaluation of Grand Gulf Nuclear Station Reactor	04/01/96 -

L. San Andrés	Operations, Inc. 32525/49000/ME		Recirculation Pump At Parameters Oscillations	07/01/96
L. San Andrés	Pratt & Whitney 32525/41430/ME	$106,000	Hydrostatic Bearing Development	10/01/92 - 09/30/93 (1)
L. San Andrés	Rockwell RF 6288A01	$82,986	Advanced Analysis of Hydrostatic Journal Bearings for Cryogenic Applications, Phase II	10/01/91 - 09/30/92 (1)
L. San Andrés	Rockwell RF 6288002	$76,000	Advanced Analysis of Hydrostatic Journal Bearings for Cryogenic Applications, Phase I	10/01/90 - 09/30/91 (1)

INTERNAL RESEARCH FUNDS, TOTAL $ 3'842,561

The TEES Turbomachinery Research Consortium (TRC) integrated by about 20 industrial members provides funds for advanced research in topics of current interest in industry. The TRC members review and vote on proposals presented at the TRC Annual Meeting (May). TRC funds allow only equipment purchases and support for ONE graduate student (no faculty support).

Principal Investigator(s)	Sponsor	Amount	Project	Dates
L. San Andrés	TAMU-Conacyt	$30,000	Gas Bearings for Oil Free machinery	01/01/21- 12/31/21
L. San Andrés	MEEN Seed Grant 207730-00025	$30,000	eTurbos for UAVs	09/01/20- 08/31/21
L. San Andrés, J. Yang	TRC 258124-00027	$150,885	Needs for Software in Turbomachinery	09/01/15- 08/31/21
L. San Andrés, J. Yang	TRC 258124-00144	$50,000	Better Thermal Mixing for TPJBs via CFD	09/01/19- 08/31/21
L. San Andrés, J. Yang	TRC 258124-00141	$50,000	Optimization of Swirl Brakes for Seals using CFD	09/01/19- 08/31/20
L. San Andrés, J. Yang	TRC 258124-00135	$100,000	Experiments Two-Phase Flow Seals	09/01/19- 08/31/20
L. San Andrés	TRC 258124-00142	$50,000	Sealed SFDs with Orings for Aircrafts	09/01/19- 08/31/20
L. San Andrés	TurboLab 25365000000	$100,000	CFD Wet Gas Seals (Post-Doc x 2 year)	10/01/17- 9/30/18
L. San Andrés	TRC 258124-00136	$50,000	Integral Squeeze Film Damper	09/01/18- 08/31/19
L. San Andrés	TRC 258124-00022	$47,540	Tilting Pad Gas Bearing	09/01/18- 08/31/19
L. San Andrés	TRC 258124-00135	$150,000	Effect of Flow rate on TPJB Performance	09/01/18- 08/31/21
L. San Andrés	TRC	$45,000	CFD of Pocket damper Seals	09/01/17- 08/31/18
L. San Andrés	TurboLab 25365000000 TRC 258124-00022	$50,000 $184,420	Thrust Bearing Code Development (Y I-Y IV)	09/01/15- 08/31/20
L. San Andrés	TRC 40012400028	$44,923	Morton Effect in Turbomachinery	09/01/15- 08/31/16
L. San Andrés	TRC 40012400046	$89,905 $45,000	Carbon-Graphite Bearings for Oil Free Turbomachinery	09/01/15- 08/31/18
L. San Andrés	TRC 40012400078	$104,360	Large Size Metal Mesh Bearings – Manufacture	10/01/14 08/31/17
L. San Andrés	TRC 40012400056	$172,819	Thrust Bearings: Experimental Verification	09/01/13 08/31/17

L. San Andrés	TRC 40012400022	$228,650	Modeling of Tilting Pad Bearings	08/01/10 08/31/17
L. San Andrés	TRC 40012400099	$204,389	Linear-Nonlinear Force Coefficients for Squeeze Film Dampers	11/01/11 08/31/16
L. San Andrés	TRC 40012400079	$154,704 $45,000	Making Wet Seals for Compressors	09/01/12 08/31/19
L. San Andrés	TRC 40012400081	$114,232	Pocket Damper-Brush Seal Analysis	09/01/12 08/31/15
L. San Andrés	TRC 32514/1519 F3	$37,996	Effect of Shimming on the Rotordynamic Force Coefficients of a bump-type foil bearing	09/01/13 08/31/14
L. San Andrés	TRC 32514/1519FB	$38,608	Metal Mesh Foil Bearings: Operation at High Temperature	11/01/11 08/31/11
L. San Andrés	TRC 32514/1519 X5	$76,347	Automated Modeling XLTRC2 RBS Transient Response	12/01/10 08/31/13
L. San Andrés	TRC 32514/1519 3S	$74,863	High Temperature Low Leakage Seals	08/01/10 08/31/12
L. San Andrés	TRC 32514/1519V2/ME	$75,000	Metal Mesh-Top Foil Gas Bearings for Oil-Free Turbomachinery	09/01/07 08/31/10
L. San Andrés	TRC 32514/1519B4/ME	$103,000	Gas Bearings for Oil-Free Turbomachinery –	09/30/05- 08/31/10
L. San Andrés	TRC 32514/1519C4/ME	$134,000	Identification of Structural Stiffness and Damping in Foil Gas Bearings	02/01/04- 08/31/10
L. San Andrés	TRC 32514/1519T3/ME	$35,000	Upgrade of XLTRC2 – Tilting Pad Bearing Code – Include Pivot Stiffness	08/01/07- 08/31/08
L. San Andrés	TRC 32514/1519T4/ME	$35,000	Upgrade of XLTRC2 – Journal Bearing Code – Include Thermal Effects	08/01/07- 08/31/08
L. San Andrés	TRC 32514/1519T7ME	$35,000	Upgrade XLTRC^2 Computational Model for Grooved Oil Seal Rings to predict Added Mass Coefficients	12/10/07 11/30/08
L. San Andrés	TRC 32514/1519S7/ME	$192,000	Experimental Force Coefficients for a Sealed Squeeze Film Damper, III	06/30/00- 05/31/08
H. Liang, L. San Andrés	TTI #405450	$65,000	SELF-REPAIRING RAILROAD TRACK	02/01/05- 01/31/06
L. San Andrés	TRC, Turbo Lab 32514/1519B1/ME	$122,000	High Speed Gas Bearings for Oil Free Rotating Machinery	07/01/98 - 06/30/99 09/01/01- 08/31/05
L. San Andrés	TRC 32514/1519/S4	$22,000	Stiffness and Damping Coefficients of Brush Seals with Reverse Rotation Ability	07/15/04- 06/30/05
L. San Andrés	TRC 32514/1519H3/ME	$82,000	Identification of Force Coefficients in Flexible Rotor-Bearing Systems	06/30/00- 05/31/04
L. San Andrés	Energy Resources Program, # 155290	$25,000	Gas Bearings for Oil Free Gas Turbines	06/01/00 12/31/01
L. San Andrés	TRC	$40,000	Flow Visualization Experiments on SFDs Operating with Entrained Air	06/01/98 - 05/31/00
L. San Andrés (70%), K.R. Rajagopal	TRC	$20,000	Theory of Mixtures Applied to Bubbly Flows in Squeeze Film Dampers	09/01/97 - 09/31/98
L. San Andrés	TRC	$40,000	Identification of Dynamic Force Coefficients in Gas Damper Seals Using Impact Load Excitations	06/01/97 - 05/31/99
L. San Andrés	TRC	$60,000	Imbalance Response of a Rotor Supported on Series Tilting Pad Bearings and Integral Squeeze Film Dampers	06/01/97 - 05/31/00
L. San Andrés	TRC	$20,000	Bulk-Flow Analysis of Hybrid Brush-Gas Damper Seals Rotordynamic Coefficients	06/01/97 - 05/31/98
L. San Andrés	TRC	$14,700	Effects of an Air/Bubbly Mixture on the Performance of Squeeze Film Dampers	06/01/96 - 05/31/97
L. San Andrés	TRC	$15,000	Measurements of the Dynamic Response and Stability of Fully Floating and Semi-Floating San Ring Journal Bearings	06/01/96 - 05/31/97

L. San Andrés	TRC	$15,000	Analysis of High Performance Tilting-Pad Bearings Including Pivot Radial Flexibility	06/01/96 - 05/31/99
L. San Andrés	TRC	$60,000	Test Rig for Measurement of Rotordynamic Force Coefficients of Generic Air and Oil Fluid Film Bearings	06/01/92 - 05/31/96
L. San Andrés	TRC	$15,000	Analysis of Dynamic Force Coefficients in Spiral Groove Bearings	06/01/95 - 08/31/97
L. San Andrés	TRC	$30,000	Measurements of the Dynamic Response of a Rotor Supported on Squeeze Film Dampers	06/01/94 - 05/31/96
L. San Andrés	TRC	$58,220	Analysis of Static and Dynamic Force Performance of Laminar Flow Hybrid Bearings of Exotic Geometry	06/01/91 - 05/31/95
L. San Andrés	TRC	$15,000	A Flow Model for Annular Seals Operating in the Transition Regime to Turbulence	06/01/93 - 05/31/94
L. San Andrés (60%),S. Noah	TRC	$15,000	Experimental and Analytical Study of the Non-Linear Response of Squeeze Film Damper Supported Rotors	06/01/93 - 05/31/94
L. San Andrés	TRC	$30,000	Effects of Feed Grooves on the Dynamic Force Performance of Squeeze Film Dampers	06/01/91 - 05/31/93
L. San Andrés	TRC	$26,440	Analysis of High Pressure Oil Seals	06/01/89 - 05/31/91
L. San Andrés	TRC	$15,000	Effect of Fluid Compressibility on Laminar Flow Hydrostatic Bearings	06/1/90 - 05/31/91
L. San Andrés	TRC	$13,220	Experimental Forces in a Variable-Speed Squeeze Film Damper Test-Rig	06/1/89 – 05/31/90
Not included Sungyon Lee, L. San Andrés	TRC	$44,362	Prediction of swirl in ESP impellers	12/01/14 to 2016

GIFTS

Honeywell Foundation TAMU 510319	$25,000	Oil-Free Turbocharger Development	08/01/02
Honeywell AeroSpace, Phoenix	$35,000	Squeeze Film Damper Research	10/01/2007
Dan Lubell (former student)	$ 4,000	Donation for student travel	2014, 2016

SUPPORT FOR EQUIPMENT: TOTAL $ 713,775

Source	Amount	Purpose	Date
Turbomachinery Laboratory	$410,035	Heaters, PC cluster & software licensing, sCo2 Loop	07/17
Turbomachinery	$27,500	ADRE BN system for rotordynamics	03/15
Laboratory	$ 5,000	MakerBot 3D printer	01/15
	$13,000	LV IOTECH 8-ch analyzer & software	05/13
TAMU	$ 1,500	Faculty Workstation Program	12/10
KIST	$ 15,000	Donation of high temperature rotor and two sets of foil bearings for NASA funded research program	01/09
Active Power	$ 60,000	Donation of high speed bearing test rig for NSF project	04/03
Turbomachinery	$ 3,000	Cost sharing for acquisition of four foil bearings	11/01
Laboratory	$ 3,000	Cost sharing for acquisition of HP 35670A Analyzer	10/00
COE Funds	$ 3,700	Two-channel analyzer for vibration demonstrations	07/99
Turbomachinery Laboratory	$ 9,000	Data acquisition software upgrade for Rotordynamics Laboratory	01/98
TAMU	$ 1,500	Portable computer for class demonstrations	04/98
Solar Turbines	$ 2,540	Donation of used equipment for laboratory	03/98
TAMU PUBF	$106,000	Equipment for Rotordynamics Laboratory	06/95
TAMU PUBF	$ 29,000	Equipment for Rotordynamics Laboratory	01/94
MEEN Dept.	$ 3,500	Equipment Support for TRC Rotordynamic Test Rig	12/92
	$ 3,000		12/93

SUPPORT FOR MINORITY UNDERGRADUATE STUDENTS: TOTAL $ 72,700

See above NSF-REU research program in Microturbomachinery (2006-2010)

Source	Amount	Student name	Date
TEES Undergraduate Summer Research Program	$ 3,500	Nicholas Rouge	06-08/03
TEES Undergraduate Summer Research Program	$ 3,500	Albert Atkins	06-08/01
TEES Undergraduate Summer Research Program	$ 3,500	Tim Beets	06-08/99
	$ 3,500	Greg Dunn	
TEES Undergraduate Summer Research Program	$ 2,500	Israel Silva	06-08/98
Turbomachinery Laboratory	$ 8,000	Janna Mouw	06-12/97
Turbomachinery Laboratory	$ 27,000	Nicole Zirkelback (M.S.)	01/96-08/97
TEES-NSF Minority Research Undergraduate Scholarship	$ 1,200	Nicole Zirkelback	09/95-12/95
Society of Tribologists and Lubrication Engineers	$ 5,000	Chrisma Jackson	05/95
TEES Undergraduate Summer Research Program	$ 2,500	Nicole Zirkelback	06-08/96
TEES Undergraduate Summer Research Program	$ 2,500	Nicole Zirkelback	06-08/95
	$ 2,500	Chrisma Jackson	
TEES Undergraduate Summer Research Program	$ 2,500	Aquiles López	06-08/94
TEES Undergraduate Summer Research Program	$ 2,500	Donald Plumlee	06-08/93
TEES Undergraduate Summer Research Program	$ 2,500	Miller Robison	06-08/92

NEW DESIGN METHODS, TECHNIQUES OR CONCEPTS DEVELOPED

A. PATENTS

6 Lu, X., Yang, J., and San Andrés, L., “Rotary Seal Assembly,” 2018 Nov. 21, U.S. Patent Application, 62/770,477, Texas A&M University System

5 Mohamed, Z., and San Andrés, L, "Foil Bearing,” May 21, 1996, U.S. Patent # 5,518,320, Texas A&M University System

4 San Andrés, L., "Two-Pad Axially Grooved Hydrostatic Bearing," July 18, 1995, U.S. Patent # 5,433,528, Texas A&M University System.

3 Vance J., and San Andrés, L., "Aircraft Engine Rotor Squeeze Film Damper", July 1986, U.S. Patent # 5067825.

2 San Andrés, L., "Hydrostatic Bearing with Improved Stability Characteristics", January 1991, disclosed to Rockwell International

1 Vance J., and San Andrés, L., "Gas Operated Bearing for Turbomachinery", April 1992, disclosed to TAMU Texas Experiment Engineering Station.

SERVICE

1. PROFESSIONAL SERVICE

2016 Asia Turbomachinery Symposium Advisory Board, Chair, 2014-16, member 2017-date

Turbomachinery Symposium Advisory Board, Member, 2013-date

International Pump Symposium Advisory Board, Member 2016-date

Chinese International Turbomachinery Conference (CITC), Scientific Committee Member, 2017-date

Middle Eastern Turbomachinery Symposium Advisory Board, Member, 2013-2015

Global Propulsion & Power Forum Society, Session organizer 2016, Technical Review Chair 2017, Member Awards Committee

IFToMM Rotordynamics (International Federation of Mechanics and Mechanisms)

US Member, Appointed, Sept 2010

International Journal of Rotating Machinery, Editorial Board, Member, April 2010-2016

ASME Tribology Division

ASME Research Council on Tribology, Chair (2007), Vice-Chair (2006), Member, Appointed, 2000-2004
Awards Committee, Member, Elected, 1999-2004. Chairman (2003-2004)
ASME Journal of Tribology, Associate Editor, 1999-2005.
ASME Journal of Tribology, Associate Editor, 2012-2015 (new appointment).

Society of Tribologists and Lubrication Engineers (STLE)

Tribology Transactions, Associate Editor, Appointed, 1999-to date.
Board of Directors, Elected 2000-2003.
Organizations and Operations Committee, Member, Appointed, October 1997.
Mechanical Seals Committee, Member, May 1995 – date.

ASME/STLE Tribology Service

STLE/ASME International Joint Tribology Conference, Session Track Organizer, San Antonio, TX, October 2006.
ASME/STLE International Tribology Conference (World Tribology Conference), Chairman, London, U.K., September 1997.
STLE/ASME International Tribology Conference, Technical Program Chairman, San Francisco, October 1996. Responsible for organization of Conference (109 technical papers + 80 poster presentations).
ASME/STLE International Tribology Conference Organizing Committee, Member, Appointed, 1992-1997. Paper solicitation and organization of technical sessions.

Lubricants Editorial Board Member, 2020-date.

International Gas Turbine Institute

Council of Chairs, Chair (2006), Vice-Chair (2005)
Structures and Dynamics Committee, Member, January 1995, Chair (2004-2006), Vice-Chair (2001-2003).
ASME Turbo-Expo 2003 Earth, Land and Sea Conference, Vice Chair: Structures and Dynamics Committee, Appointment based on exceptional service, May 2002-May 2004.
ASME Turbo-Expo 2000 Earth, Land and Sea Conference, Vanguard Chair: Rotordynamics, Appointment based on exceptional service, February 99 – May 2000.
ASME Turbo-Expo Earth, Land and Sea Conference, Rotordynamics & Bearings, Session Organizer, Appointed in 1995, 1997, 1998 and 1999, 2006, 2013

OTHER

Congreso Latinoamericano de Turbomaquinaria, Conference Planning Committee, Member, Honorary Appointment, 1995 – 2010.
Congreso Bolivariano de Ingenieria Mecanica, Member Scientific and Organizing Committee, 2001-2012

Dr. San Andrés chaired and co-chaired technical sessions at the following:

ASME Turbo-Expo Earth, Land and Sea Conference, (1993/95/97/98/00/01/02/03/04/05/06/07/13)
STLE/ASME International Tribology Conference, (1990/91/92/93/94/95/96/98/00/02/03/04/06)
STLE Annual Meeting (1990/92/95/99/00/01/04/13)
ASME Vibrations and Noise Biennial Conference (2003)
World Tribology Conference (1997, 2005)
Congreso Latinoamericano de Turbomaquinaria, (1995,96,97,98,03,06)

Congreso Bolivariano de Ingenieria Mecanica (2001, 2003, 2007)
Workshop on Rotordynamic Instability Problems in High Performance Turbomachinery, Texas A&M University, (1990/93/96)

UNIVERSITY AND COMMUNITY SERVICE

ME Tenure & Promotion Committee	Chair Member	appointed	01/21 01/22	12/21 12/22
ME Ad-Hoc Committee on APT faculty enhancement	Member	appointed	12/21	09/22
ME Advisory Committee	Chair Member	appointed	03/13 09/19	08/13 01/21
ME Honors and Awards Committee	Member	appointed	09/18	2019
ME Post-Tenure Review Committee	Member	appointed	2012	2014
ME Tenure & Promotion Committee	Chair Chair Member	appointed	2015 2014 2013 2020	2016 2015 2014 2022
ME Distance Learning Committee	Member	appointed	2013	2014
ME Climate (Ad-Hoc) Committee	Chair	appointed	2012	2013

Dwight Look College of Engineering, Awards Committee, Member, Appointed 2008, 2012, 2013, 2015

TAMU Faculty Senate (elected), September 2011 (3 y term)
TAMU University Scholars Program – Selection Process
National Fellowships, Honors and Undergraduate Research (SP 13, FA 13, SP14).

MEEN Department Head Search Committee, appointed, February 2011, December 2011

MEEN Dietz Professorship I & II Selection Committee, Chair, appointed October 2010

MEEN Department, Systems and Controls, Division Leader, September 2002, Appointed, August 2003 elected (15 Faculty), end date July 2004.

Dwight Look College of Engineering, ME Dept Head Search Committee, Member, Appointed 2010, December

MEEN Faculty Search Committee, Chair. Systems & Controls Division, Spring & Fall 2008

MEEN Graduate Studies Committee, member, appointed 2006
MEEN Post-Tenure Review Committee, member, appointed 2006, 2013
MEEN Department, Honors and Awards Committee, appointed 2005.
MEEN ABET Preparation Committee, member, appointed 2006

MEEN Department, Tenure and Promotion Committee, elected 2003-2005, 2013-2014
MEEN Department, Honors and Awards Committee, appointed 2003.
MEEN Faculty search for Thermal and Fluid Sciences and Materials Divisions, member

MALRC Academic Advisory Board, Member, 2006 (Mexican-American US Latino Research Center)
MALFA (Mexican-American US Latino Faculty Association), Member since 2003

Professional Hispanic Network (PHN), Vice-President, elected, December 2003
Professional Hispanic Network (PHN), Communications Secretary, elected, November 2002.

Undergraduate Curriculum Development Committee, Department Committee, Member, Appointed, September 2000 – 2002.
Texas BEST (Boosting Engineering Science and Technology Program), State Robotics Championship, Judge, Appointed, October 30-31, 1998.

Laboratory Development Committee, Department Committee, Member, Appointed, September 1998-2001.

Undergraduate Curriculum Development Committee, Department Committee, Member, Appointed, March 1997 - June 1998.

Ph.D. Qualifying Exam Committee, Department Committee, Member, Appointed, January 1991 – present.

Graduate Affairs Committee, Department Committee, Member, Appointed, September 1994 – August 1997.

Research Sub-Committee, Development and Advisory Council of the Department of Mechanical Engineering, Member, Appointed, October 1997 – present.

Industry Liaison Committee for Jerza, TAMUS Engineering Program, Member, Appointed, July 1997.

Faculty Progress Report, Mechanical Engineering Department, Reviewer, Appointed, January 1997.

"Science, Technology & Youth Symposium", Texas Alliance for Science, Technology & Mathematics Education, Volunteer, March 1995, 1996, 1997. Advise 7th and 8th grade high school students and provide comprehensive tours of Rotordynamics Laboratory.

TEES Undergraduate Summer Research Program, Student Advisor, 1992, 1993, 1994, 1995, 1996, 1997, 1998 and 1999.

Research Experience for Undergraduates Program, Mentor, Volunteer, 1994 – 1998. Academic guidance and mentor of under represented minority students.

MEEN Graduate Student (MS and Ph.D.) Examination Committee, Chair or Member, Appointed by student, 1990 - present. Advice in research and provide recommendations for thesis and dissertations. Approximately two to three MS and one Ph.D. students/year.

TAMU Ph.D. Student Examination Committee, Graduate College Representative, Appointed by Office of Graduate Studies, (Biochemistry: 03/94, Chemistry: 07/96, Wildlife and Fishery Science: 01/99).

Texas A&M Hispanic Professional Network, Member, May 1992 - present.

TAMU Ecuadorean Student Association, Faculty Advisor, Appointed, 1992 - 1996.

VIRU, Member, Latin folk music band, 1993-1997. Performances at Bryan Festifall, TAMU Faculty Follies and International Week, Rotary's Fund Raisings, city geriatric centers, church fairs and the Brazos County jail.

SERVICE TAMU-LATINOAMERICA

Congreso Bolivariano de Ingeniería Mecánica (Quito/01, Lima/03, Cusco/07), Conference Planning Committee, Member, Honorary Appointment, 2000-date.

Congreso Latinoamericano de Turbomaquinaria (Mexico), Conference Planning Committee, Member, Honorary Appointment, 1994 – to date.

Presented several technical lectures and seminars in Mexico as listed in PROFESSIONAL OUTREACH.

Encuentro de Matemáticas, Física y sus Aplicaciones (Ecuador), Conference Planning Committee, Member, Honorary Appointment, 1991, 1994, 1996, 1998, 2004.

Active collaboration with Mexican and Venezuelan research laboratories and search for qualified latinamerican graduate students.

Responsible for signing Memorandum of Agreements with IIE (Instituto de Investigaciones Eléctricas), Mexico, March 1993, and CIATEQ (Centro de Investigaciones y Asistencia Técnica del Estado de Queretaro), Mexico, September 1994, CENIDET (Centro Nacional de Investigación y Desarrollo Científico), Mexico, April, 1997, and Universidad Simon Bolivar, Caracas, Venezuela, March, 1997.

Examination Committee for professorship, Universidad Simon Bolivar, Mechanical Engineering Department, Member, Appointed, Caracas, Venezuela, November 1995.

PROFESSIONAL OUTREACH

1. Continuing Education/Professional Development

"Oil-Free Turbomachinery for the Cryogenic Industry," 12 hour short course to Chart Industries – The Woodlands, TX (Aug 31-Sep 1 2021), 9 participants. (with Daniel Lubell) Virtual and F2F delivery.

"Oil-Free Turbomachinery," 12 hour short course to Bosch – The Netherlands (Feb-Mar 2021), 11 participants. (with Daniel Lubell) Virtual delivery.

"Gas Bearings and Oil-Free Turbomachinery," & "Squeeze Film Dampers, Design and Operation," Machinery Vibration and Rotordynamics Short-Course, January 6-10, 2020, 12 participants (4 hours). Taught thirteen other times.

"Oil-Free Turbomachinery," Short course at Turbomachinery Symposium (September 17, 2018), 14 participants (8 hours). Taught two other times.

"Oil-Free Turbomachinery," 12 hour short course at GE Aircraft Engines (Aug 22-23, 2016), 9 participants. Taught one other time (with Daniel Lubell)

"Oil-Free Turbomachinery," Short course at Turbomachinery Symposium (September 19, 2016), 13 participants (8 hours). Taught one other time.

"Gas Foil Bearings for Rotating Machinery," September 2014, Turbomachinery Symposium, Short Course, Houston, TX. 19 students (8 hours). Co-taught with Mr. Daniel Lubell (Calnetix).

"Gas Foil Bearings for Rotating Machinery," April, 2013, Turbomachinery Laboratory Continuing Education Series, Houston, TX. 6 students (16 hours). Co-taught with Mr. Daniel Lubell (Calnetix)

Gas Foil Bearings for Rotating Machinery," July 2-4, 2012, Theory of Lubrication and Bearing Institute, Xi'an Jiaotong University, Xi'an, China, 20 students (6x3=18 hours).

"Gas Foil Bearings for Rotating Machinery," March 6-7, 2012, Turbomachinery Laboratory Continuing Education Series, Houston, TX. 11 students (12 hours). Co-taught with Mr. Daniel Lubell (Capstone Turbines)

"Gas Bearings and Oil-Free Turbomachinery," & "Squeeze Film Dampers, Design and Operation," Machinery Vibration and Rotordynamics Short-Course, January 8, 2014, 21 participants (8 hours). Taught nine other times

"Gas Bearings and Oil-Free Turbomachinery," & "Squeeze Film Dampers, Design and Operation," Machinery Vibration and Rotordynamics Short-Course, January 12, 2012, 28 participants (8 hours). Taught eight other times

"Gas Bearings and Oil-Free Turbomachinery," & "Squeeze Film Dampers, Design and Operation," Machinery Vibration and Rotordynamics Short-Course, January 10, 2011, 29 participants (8 hours). Taught seven other times

"Gas Bearings and Oil-Free Turbomachinery," Machinery Vibration and Rotordynamics Short-Course, January 15, 2009, 35 participants (4 hours). Taught six other times

"Gas Bearings and Oil-Free Turbomachinery," Machinery Vibration and Rotordynamics Short-Course, January 12, 2008, 39 participants (4 hours). Taught five other times

"Gas Bearings and Oil-Free Turbomachinery," Machinery Vibration and Rotordynamics Short-Course, January 2007, 32 participants (4 hours). Taught four other times

"Gas Bearings and Oil-Free Turbomachinery," Machinery Vibration and Rotordynamics Short-Course, January 2006, 27 participants (4 hours). Taught three other times

"Gas Bearings and Oil-Free Turbomachinery," Machinery Vibration and Rotordynamics Short-Course, January 2005, 25 participants (4 hours). Taught two other times

"Gas Bearings and Oil-Free Turbomachinery," Machinery Vibration and Rotordynamics Short-Course, January 2004, 20 participants (4 hours). Taught one other time in 2002.

"VIII Curso, Seminario Internacional de Turbomaquinaria", Queretaro, Mexico, November 21-23, 2001. Lectures in Fluid Film Bearings, Rotordynamics and Advances in Gas Bearing Technology. 16 hours (29 participants). (Taught in Spanish).

"Seminario enVibraciones," CIATEQ Extension Program, Queretaro, Mexico, June 29-July 1, 1999, 16 hours (24 participants). (Taught in Spanish).

"Fluid Film Bearings and Effects on Rotordynamics of Turbomachinery," TEEX Machinery Vibration and Rotordynamics Seminar, Texas A&M University, January 12-16, 1999, 40 participants (6 hours). Taught three other times (1996, 1997, 1998).

"Seminario en Rotodinamica," CIATEQ Extension Program, PEMEX Coatzacoalcos Refinery, Mexico, October 9-10, 1997, 16 hours (27 participants). (Taught in Spanish)

"Fluid Film Bearings and Effects on Rotordynamics of Turbomachinery," TEEX Machinery Vibration and Rotordynamics Seminar, Texas A&M University, May 13-17, 1997, 29 participants (6 hours). Taught one other times (1996).

"Design and Application of Squeeze Film Dampers in Rotating Machinery," Tutorial, TAMU 25th Turbomachinery Symposium, Houston, TX, September 11 & 12, 1996, 2 hours (80 attendees).

"Fluid Film Bearings and Effects on Rotordynamics of Turbomachinery," TEEX Machinery Vibration and Rotordynamics Seminar, Texas A&M University, June 3-7, 1996, 28 participants (6 hours). Taught one other time.

"An Introduction to Fluid Film Bearings and Squeeze Film Dampers," TEEX Machinery Vibration and Rotordynamics Seminar, Texas A&M University, June 3-7, 1995, 18 participants (3 hours).

"Tilting Pad Bearings, A Primer to the Analysis," II Taller de Tecnologia de Cojinetes y Chumaceras Hydrodinamicas, CIATEQ, Queretaro, Mexico, December 8-10, 1994 36 participants (4 hours). (Taught in Spanish)

"An Introduction to High Speed Fluid Film Bearings," Rotordynamics Seminar, NASA Marshall Space Flight Center, University of Alabama at Huntsville, July 27, 1993, 15 participants (8 hours).

"An Introduction to the Analysis of Fluid Film Bearings," Seminario en Rotordinamica, Instituto de Investigaciones Electricas, Cuernavaca, Mexico, February 1994, 42 participants (8 hours). (Taught in Spanish).

INVITED SIGNIFICANT SEMINARS OR LECTURES

	Title	Place	Group Addressed	Location	Date
2022	On Multiphase Pump Seals: Leakage and Gas Injection to Control Seal Centering Stiffness	2022 Chinese International Turbomachinery Conference	Invited (Virtual) Presentation	Kin Ming, China	October 22, 2022
	Annular gas seals in the 21st century: Leakage, force coefficients and rotor dynamic stability	21st Pprime Workshop: Sealing Challenges in High Speed Applications	Keynote invited	Angouleme, France	October 6. 2022
	On Pump Seals Operating with Multiple Phase Conditions: Measurements and Gas Injection to Increase Seal Centering Stiffness	7th World Tribology Congress	Keynote invited	Lyon, France	July 15, 2022
	Measurements and Models of Squeeze Film Dampers' Forced Response and a Bird's View to Air Ingestion and Entrapment	ASME Turbo-Expo Conference Aircraft Engine Technology Award	Special Lecture	Rotterdam, The Netherlands	June 14, 2022
	Design and Application of Squeeze Film Dampers in Rotating Machinery	Kookmin University	Tutorial	Seoul, SK	January 2022
2019	How to Get the Work Done, Intro to TurboLab	Korea Institute of Science and Technology (KIST)	graduate students	Seoul, South Korea (SK)	10/14/2019
2	Rotordynamics, More or less, more and less	Kookmin University	graduate students	Seoul	10/15/2019
3	How to Get the Work Done	Kookmin University	graduate students	Seoul	10/15/2019
4	How to Write & Review Tech Papers	Kookmin University - Hanyang University	graduate students	Seoul	10/17/2019
	How to Write & Review Tech Papers	KIST	graduate students	Seoul	10/18/2019
5	Rotordynamics, More or less, more and less	Seoul National University (SNU)	graduate students	Seoul	10/21/2019
6	Advances on the Thermal Energy Transport for Turbocharger Bearings	KeyYang Precision	graduate students	Gimcheon, SK	10/22/2019

7	Model and Experimental Verification of the Dynamic Forced Performance of a Tightly Sealed Squeeze Film Damper Supplied with a Bubbly Mixture	Hanhwa Aerospace	engineers	Seoul	10/23/2019
8	Effect of oil flow Rate on the Experimental Performance of a Flooded Tilting Pad Bearing	Conference Korea Tribology Society (KTS) -	graduate students	Pusan, SK	10/24/2019
9	Copper vs Steel Pad Tilting Pad Bearings. How to select?	Turbolink	engineers	Ulsan, SK	10/29/2019
10	Advances in the Modeling of Thrust Collars for Integrally Geared Compressors	Hanhwa Power Systems	engineers	Ulsan, SK	10/30/2019
11	Rotordynamics, More or less, more and less	KIST	graduate students	Seoul	11/1/2019
12	SFDs: an experimental appraisal of their dynamic performance	KIST	graduate students	Seoul	11/4/2019
13	Multiple Phase Flow Seals for SubSea Factories	KIST	graduate students	Seoul	11/7/2019
14	MEASUREMENT AND PREDICTION OF LEAKAGE AND CAVITY PRESSURES IN A 0.3 MM CLEARANCE INTERLOCKING LABYRINTH SEAL	Korea Rotating Machinery Eng Association (KRMEA)	engineers	Seoul	11/14/2019
15	Leakage and Dynamic Forces in Pump Annular Seals Operating with Air/Oil Mixtures	Asia Pacific University, University of Nottingham	Graduate students	Kuala Lumpur, Malaysia	April 2019

2018	**Institution/Group Addressed**	**Event Name**	**Location**	**Date(s)**
A Few Practices of Modern Engineering	Army Research Laboratory	Propulsion Directorate	Aberdeen, MD	July
Labyrinth Seals	Mitsubishi Heavy Industries	Invited lecture	Takasago	May
Tilting Pad Bearings – Effect of flow starvation	KOBE Industries	Invited lecture	Takasago	May
Metal Mesh Gas Bearings	300+ attendees	Chinese Int, Gas Lubrication Conference	Tianjin, China	May
Tilting Pad Bearings for Compressors	500 attendees	Chinese International Turbomachinery Conference	Chong Ching, China	April
Wet Seals for two Phase Flow Pumps		Asia Turbomachinery & Pump Symposium	Singapore	March
The current state in Graduate Education	Global Propulsion & Power Society	Global Propulsion & Power Forum	Zurich	January
2016	**Institution/Group Addressed**	**Event Name**	Location	Date(s)
SFDs for geared turbofan aircraft engines	GE Aviation	Invited seminar	Cincinnati, OH	March 18
Overview of Gas Bearings	ASME-Turbo Expo	Invited (1 h) tutorial	Seoul, Korea	June 13-17

	ASME GT2016-58306	with Keun Ryu (Hanyang U.)		
SFDs: an appraisal of the state of art	Pratt & Whitney UTC	Invited Seminar	East Hartford, Co	Aug 19
Metal Mesh Foil Bearings	Kookmin University	Invited seminar	Seoul, Korea	June 17
Tilting Pad Bearings – Effect of Pivot Flexibility	Hyundai Research Center	Invited seminar	Pusan, Korea	June 20
Squeeze Film Dampers: Fundaments and Experimental Force Coefficient	Beijing Univ. Of Chemical Technology	Invited Lecture	Beijing, China	July 29
Rotordynamics - Introduction	Harbin Institute of Technology	Invited Seminar (4 h each)	Harbin, China	Aug 1
Oil-Free Bearings for Turbomachinery	""	"	""	Aug 2
Damper Seals and Hydrostatic Bearings for Pumps	""	"		Aug 3
Squeeze Film Dampers: Operation, Models and Issues	""	"		Aug 4
Rotordynamics…RD .. Rd.	14th Biannual Chinese Rotordynamics Conference – ROTDYN 2016	Invited Plenary Lecture Speaker	Zhuzhou, China	Aug 6

KIST, "Squeeze Film Dampers", 2015, Invited Lecture (~ 20 graduate students). Seoul, South Korea

CHINA

November (2013)

Practices of Modern Engineering, Hunan University (~100 students),
Practices of Modern Engineering, Xiantang University (~200 students),

SFDs: Design and Operation, Hunan Sund Inds. (~15 engineers)
Turbocharger NL Rotordynamics, Hunan Tyen Machinery Co. (~20 engineers)

Industries (2012)

"Squeeze Film Dampers: Operation, Models and Issues," July 9, 2012, AVIAC Co, Shanghai, P.R. China (3 hour)
"Comparison of Leakage for Various Gas Seals at High Temperature Operation," July 5, 2012 Hunan Sund Ind. Tech., Chang-Sha, P.R. China (1 hour)
"Damper Seals for Pumps and Compressors," July 5, 2012, Hunan Sund Ind. Tech., Chang-Sha, P.R. China (3 hour)

Shanghai Jiaotong University (2012)

"Practices of Modern Engineering," July 8, 2012, School of Mechanical and Power Engineering, Shanghai Jiaotong University, Shanghai, P.R. China (4 hour)

Xi'an Jiaotong University (2012)

Gas Foil Bearings for Rotating Machinery," July 2-4, 2012, Theory of Lubrication and Bearing Institute, Xi'an Jiaotong University, Xi'an, China, 20 students (6x3=18 hours).

"Writing and Reviewing Technical Papers," July 4, 2012, Theory of Lubrication and Bearing Institute, Xi'an Jiaotong University, Xi'an, Shaanxi, China (3 hour)

Tsinghua University (2010)

"Gas Bearings for Microturbomachinery – an Overview," March 15, 2010. Tsinghua University, Beijing, China,

Xi'an Jiaotong University (2009)

"MTM: Applications and Beyond. Gas Bearings for MTM – Overview," September 21, 2009, Theory of Lubrication

and Bearing Institute, Xi'an Jiaotong University, Xi'an, Shaanxi, China (4 hour)
"Flexure Pivot Hybrid Bearings for MTM," September 22, 2009, Theory of Lubrication and Bearing Institute, Xi'an Jiaotong University, Xi'an, Shaanxi, China (4 hour)
"Bump Type Gas Foil Bearings: A Model Anchored to Test Data & Nonlinearity Issues with Foil Bearings," September 22, 2009, Theory of Lubrication and Bearing Institute, Xi'an Jiaotong University, Xi'an, Shaanxi, China (4 hour)
"Metal Mesh Foil Bearings for MTM." September 24, 2009, Theory of Lubrication and Bearing Institute, Xi'an Jiaotong University, Xi'an, Shaanxi, China (4 hour)
"Performance of Metal (non Contacting) Seals for Gas Turbines," September 25, 2009, Theory of Lubrication and Bearing Institute, Xi'an Jiaotong University, Xi'an, Shaanxi, China (4 hour)

"Practices of Modern Engineering," March 2012, XIII Congreso y Exposicion Latinoamericana de Turbomaquinaria, Queretaro, Mexico (Plenary Lecture, 2 hour)

"Identification of Force Coefficients in Rotor-Bearing Systems," Feb. 22-25, 2011, XII Congreso y Exposicion Latinoamericana de Turbomaquinaria, Queretaro, Mexico (Plenary Lecture)
CIATEQ, "Introduction to Rotordynamics and Lubrication," August 20, 2010, Queretaro, Mexico.
CIATEQ, "Principles of Modern Engineering," August 20, 2010, Queretaro, Mexico.
Escuela Politecnica Nacional, "Identification of Force Coefficients in Mechanical Components: Bearings and Seals," XII Encuentro de Matematica, Fisica y sus Aplicaciones, June 2010, Quito, Ecuador

KOREA

KIST, "Gas Bearings for Microturbomachinery: Rotordynamic Performance & Stability," Short Course, IFToMM International Conference on Rotordynamics," September 12, 2010, KIST, Seoul, South Korea, 39 participants (3 hours).
Seoul National University, Seoul, South Korea, "High Temperature Leakage Measurements in Three Types of Gas Seals," March 24, 2010
Doosan Heavy Industries, Pusan, South Korea, "Comparison of Leakage Performance for Three Gas Seal Types Operating at High Temperature," March 17, 2010
Korea University, Seoul, South Korea, "How to Get the Work Done," March 10, 2010
KAES, Co., Gyeongju, South Korea, "The Turbomachinery Laboratory at TAMU – Overview of Research Capabilities," March 9, 2010
Keyyang, Co., South Korea, "Vehicle Turbocharger Nonlinear Rotordynamics: Modeling and Experiments," February 9, 2010
KIST, Korea Institute of Science and Technology, Seoul, Korea
Seminar Series on **Practices of Modern Engineering** tailored to international graduate students

1. Introduction to Modern Engineering Practices – January 21, 2010
2. Engineering Criteria EC 2000 – January 28, 2010
3. The Complete Engineer, February 4, 2010
4. How to get the (graduate) Work Done, February 11, 2010
5. Writing and Reviewing Papers, February 25, 2010
6. Honesty and Integrity, March 4, 2010
7. Ethics in the Workplace, March 11, 2010
8. Intellectual Property and Innovation, March 18, 2010
9. Closure – The Road Ahead, March 25, 2010

National University of Singapore, Singapore
Development of Freshman Seminar on Modern Engineering Practices, December 29, 2009
Advances in sealing technology for power & oil & gas turbomachinery: Comparison of leakage performance for three gas seal types operating at high temperature, November 6, 2009
How to Get the Work Done, October 5, 2009

Chiang Mai University, Chiang Mai, Thailand
Advances in Metal Mesh Foil Bearings for Oil-Free Turbomachinery, November 20, 2009

NASA Glenn Research Center, Cleveland, (delivered from Singapore vie web)
Final Presentation: Thermohydrodynamic Analysis of Bump Type Gas Foil Bearings: A Model Anchored to Test Data," NASA SSRW2-1.3 Oil Free Engine Technology Program, August 26, 2009

Escuela Politécnica Nacional, Quito, Ecuador

Metal Mesh Foil Bearings for Oil-Free Turbomachinery, July 22, 2009

PLENARY TALK, Issues on Stability, Forced Nonlinear Response and Control in Gas Bearing Supported Rotors for Oil-Free Turbomachinery, International Conference in Rotating Machinery, ISROMAC 12, February 2008. Hawaii. Presentation available at **http://www.isromac.org/symposia/browse/ISROMAC-12/38/en**

National University of Singapore, **Advances in Gas Bearings for Oil-Free Turbomachinery,** March 2008, Singapore

Control of Stiffness for Elimination of Critical Speeds in Gas Bearing Supported Microturbomachinery, XI ENCUENTRO DE MATEMÁTICA Y SUS APLICACIONES, July 7-11, 2008, Quito, Ecuador, http://www.math.epn.edu.ec/xiencuentro/

MEEN 685 Seminar Series, Texas A&M University, Mechanical Engineering Department, February 2008

"How to Get the Work Done," LSAMP Undergraduate Research Program, Texas A&M University COE, April 2008, Sloan Scholars, Seminar, Texas A&M University COE, October 2007

43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, Cincinnati, OH, July 9-11. **2007 Special Session on Oil-Free Microturbomachinery**

Issues on Instability and Force Nonlinearity in Gas Foil Bearing Supported Rotors

Start- up Response of Fluid Film Lubricated Cryogenic Turbo- Pumps

8th Congreso Iberoamericano de Ingenieria Mecánica, CIBIM8, Cusco, Perú, October 21, 2007

Current developments in Gas Bearings for Microturbomachinery

von Karman Institute - RTO Lecture Series, RTO-MP-AVT-143, DESIGN AND ANALYSIS OF HIGH SPEED PUMPS, *20-23 March 2006, Belgium*, Introduction to Pump Rotordynamics, Hydrodynamic fluid film bearings and their effect on the stability of rotating machinery, Annular pressure seals and hydrostatic bearings

"Gas Bearings for Oil-Free Turbomachinery," ASME USB's V Annual Engineering Congress "Achievements and Tendencies of the XXI Century", Universidad Simon Bolivar, (Caracas, Venezuela), May 2006.

"Nonlinear Dynamics of Turbochargers," III Seminario Internacional de Ingenieria Industrial, Barranquilla, Colombia, Universidad Autonoma del Caribe, May 2006.

"Gas Bearings for Oil-Free Turbomachinery," MEEN Dept., Escuela Politecnica Nacional, (Quito, Ecuador) Graduate Seminar Lecture Series, December 20, 2005.

"Foil Gas Bearings – State of the Art," GE Global Research Center, Albany, NY, June 24, 2005.

"Turbocharger Rotordynamics," MEEN & NUE Dept., Pennsylvania State University, 2004-2005 Air Products Distinguished Lecture Series, April 26, 2005.

"Gas Bearings for Oil-Free Turbomachinery," MEEN Dept., University of Florida, Distinguished Lecture Series, March 24, 2005.

"Computational Prediction of Turbocharger Nonlinear Dynamic Response and Validation to Hot Gas Test Stand Data," Honeywell Turbocharging Systems, Torrance, CA, August 16. 2004.

"Identificación de parámetros en soportes de maquinaria rotativa", IX Encuentro de Matematica y sus Aplicaciones," Escuela Politécnica Nacional, Quito, Ecuador, July 22, 2004.

"Análisis no lineal de la respuesta dinámica de turbocargadores y validación experimental", IX Encuentro de Matematica y sus Aplicaciones," Escuela Politécnica Nacional, Quito, Ecuador, July 23, 2004 (Plenary Talk)

"Turbocharger Nonlinear Rotordynamics: Predictions and Test Validation," Invited Plenary Talk, Terceras Jornadas de Ingeniería Mecánica, Instituto Tecnológico de Monterrey – Campus Queretaro, Mexico, March 25, 2004.

"Nonlinear Rotordynamics of Turbocharger Rotors," invited presentations at University of Poitiers and INSA Toulouse, France, November 2003.

"Experimental Lift Off Characteristics and the Effect of a Low Friction Coating on the Startup Response of Simple Gas Hybrid Bearings for Oil-Free Turbomachinery," 2003 ASME/STLE International Tribology Conference, Pontevedra, FLA, October 2003.

"Dynamic Response and Stability of a High Speed Rotor Supported on Gas Bearings," Plenary Presentation, Congreso Bolivariano de Ingenieria Mecanica, Lima, Perú, July, 2003.

"Turbocharger Nonlinear Rotordynamics: Predictions and Test Validation," Invited presentation at ASME Virtual Machine Design Workshop, Purdue University, Lafayette, IN, August 2003.

"Dynamic Response and Stability of a High Speed Rotor on Three Types of Gas Bearings," STLE Annual Meeting, Houston, TX, May 22, 2002 (with Ms. Deborah Wilde).

"Gas Bearings for Oil Free Turbomachinery", Gas Turbine Laboratory, MIT, Boston, MA, March 2002.

“Instability in Turbochargers Supported on Floating Ring Bearings”, Honeywell, Turbocharging, Los Angeles, CA, June 29, 2001.

“Oil Free Turbomachinery”, Capstone Microturbines, Los Angeles, CA, June 28, 2001.

“Gas Bearings for Oil Free Turbomachinery”, Meruit, Los Angeles, CA, June 28, 2001.

“Foil Bearings for Oil Free Turbomachinery”, Air Products, Allentown, PA, April 2001

“SFD Design and Considerations to Reduce Air Entrainment,” and “Advances in Rotordynamics or Turbomachinery: Bearings and Seals,” on Seminar on “Lagering van Sneldraaiende Rotoren – Rotordynamics of High Speed Machinery,” Bond for Materialenkennis, Delft, The Netherlands, September 30, 2000.

“Progress in Analysis of Floating Ring Bearings for Automotive Turbochargers,” Honeywell TLV Plant, Thaon-les-Vosges, France, April 2000.

“Tribology Needs for High Performance Compressors,” Demag-DeLaval, Hengelo, The Netherlands, March 30, 2000.

“Squeeze Film Dampers: operation, models and issues of interest,” Sulzer Pumps, Winterthur, Switzerland, March 16, 2000.

“Squeeze Film Dampers for High Performance Compressors,” Demag-DeLaval, Duisburg, Germany, February 4, 2000.

"Tribology Needs in the 2000’s - Rotordynamics,” Tribology Group, University of Twente, The Netherlands, January 12, 2000.

"Research at TAMU Rotordynamics Laboratory – Advances in High Speed Fluid Film Bearings and Dampers,” Laboratory of Solid Mechanics, University of Poitiers, Poitiers, France, November 6, 1999.

"Research at TAMU Rotordynamics Laboratory – Hybrid Thrust Bearings for Cryogenic Turbomachinery,” SNECMA-SEP, Vernon, France, October 21, 1999.

"Research at TAMU Rotordynamics Laboratory – Effects of Air Entrainment on Squeeze Film Damper Performance,” Tribology Group, University of Twente, The Netherlands, October 19, 1999.

“Dynamic Response of a Rotor-Integral Squeeze Film Dampers Test Rig due to Couple Imbalances,” STLE Annual Meeting, Nevada, May 25, 1999.

"XLTRC Rotordynamics Suite of Programs,” Mechanical Seals Workshop, STLE Annual Meeting, Nevada, May 23, 1999.

"Integral Dampers for Vibration Control," Design Review Meeting for Active Control of Surge/Stall in Axial Flow Compressors, NASA Glenn Research Center amd MIT Gas Turbines Laboratory, Cleveland, OH, May 17-18, 1999..

“Effect of Long Annular Seals on Rotordynamics,” Dupont, Sabine Riverworks Plant, Orange, TX, February 1999.

“Research in Fluid Film Bearings at Texas A&M University,” VI Congreso Nacional de Fisica, Matematicas, Informatica y Sus Applicaciones, Escuela Politecnica Nacional, Quito, Ecuador, July 1996.

“Thermohydrodynamic Analysis of Cryogenic Liquid Turbulent Flow Fluid Film Bearings,” Seals Code Development Workshop, NASA Lewis Research Center, Cleveland, OH, June 15, 1995.

"Development of Test Apparatus for Identification of Fluid Film Bearing Force Coefficients," TAMU Mechanical Engineering Department Graduate Seminar, November 7, 1994.

"An Introduction to Mechanical Systems," Science and Engineering Workshop for High School and Junior High School Teachers, TAMU Engineering Academic Programs Office, June 16, 1993

"Hispanic Culture and Engineering," Guest Speaker for the TAMU Mexican-American Student Association (MAES), November 19, 1992.

“Recent Advances in Rotordynamics and Fluid Film Lubrication,” and “Design of Exotic Geometry Hybrid Fluid Film Bearings,” IV Encuentro de Matematicas, Fisica y sus Aplicaciones, Escuela Politecnica Nacional, Quito, Ecuador, Honor Guest Speaker, July 1994.

“Analytical Research on Turbulent Flow High Speed Fluid Film Bearings,” Navy Tribology Workshop, US Naval Academy, Annapolis, Ma, May 11, 1992.

"Advanced Bulk-Flow Analysis of Cryogenic Liquid Fluid Film Bearings," Fluid Film Bearing Workshop, NASA Lewis Research Center, Cleveland, OH, December 5, 1991.

San Andrés, L.A., "Efecto de Desalineamiento en la Respuesta Dinamica de Sellos de Presion," III Encuento de Matematicas, Fisica y sus Aplicaciones, Escuela Politecnica Nacional, Quito, Honor Guest Speaker, December 21, 1991.

"Numerical Analysis of Fluid Film Bearings for Cryogenic Turbomachinery," NASA Marshall Space Flight Center, Huntsville, Alabama, November 22, 1991.

"Analysis and Design of Hydrostatic Bearings for Cryogenic Turbomachinery," Rocketdyne Division, Rockwell International, Los Angeles, CA, August 18, 1991.

"Analysis of Turbulent Flow, Inertial Fluid Film Bearings," Mechanical Technology Incorporated, Latham, NY, February 8, 1991.

"Improved Analysis of Hydrostatic Bearings for Cryogenic Turbomachinery," NASA Lewis Research Center, Cleveland, OH, July 1989.

"Dynamic Performance of Squeeze Film Dampers," General Electric Co., Aeromechanics and Engines System Division, Cincinnati, OH, August 1989.

Review of Journal papers and/or Research Proposals

Associate Editor for ASME Journal of Tribology, January 1999 – December 2012

Year	Number of papers
1999	15
2000	15
2001	13
2002	10
2003	9
2011	6
2012	11
2013	15

http://journaltool.asme.org/

Associate Editor for STLE Tribology Transactions, December 1999 –

Year	Number of papers
1999	1
2000	2
2001	3
2002	4
2003	4
2004	3
2005	5
2006	5
2007	6
2008	5
2009	5
2010	7
2011	10
2012	9
2013	12
2014	11
2015	9
2017	1
2018	5
2019	6
2020	7

Editorial Activities for the Structures and Dynamics Committee, International Gas Turbine Institute

(The Session organizer performs entire peer review process and provides recommendation on technical manuscripts for presentation at the ASME Turbo-Expo Conference and publication in the ASME Journal of Gas Turbines and Power.)

Conference	Place and date	Number of manuscripts handled	Number of sessions
Turbo-Expo'95	Houston, TX, 06/95	6 (5 accepted)	1
Turbo-Expo'97	Orlando, FL, 06/97	9 (7 accepted)	2
Turbo-Expo'98	Stockholm, Sweden, 06/98	7 (6 accepted)	1
Turbo-Expo'99	Indianapolis, IN, 06/99	13 (11 accepted)	2
Turbo-Expo 2000	Munich, Germany, 05/00	45 (30 accepted)	5
VANGUARD CHAIR	Structures and Dynamics	Rotordynamics sessions	
Turbo-Expo 2003	Atlanta, USA, 05/2003	97 manuscripts, 33 papers	10
ViceCHAIR	Structures and Dynamics	accepted	
Turbo-Expo 2004	Vienna, Austria, 06/2004	98 manuscripts, 65	17
ViceCHAIR	Structures and Dynamics	accepted	
Turbo-Expo 2005	Reno, NV, 06/2005	> 60 manuscripts, 58	15
CHAIR	Structures and Dynamics	accepted	
Turbo-Expo 2006	Barcelona. Spain, 05/2006	87 manuscripts, 60	14

CHAIR Structures and Dynamics accepted

Dr. Luis San Andrés is a regular reviewer for the following peer- reviewed publications:
ASME Journal of Tribology, STLE Tribology Transactions, Tribology International, ASME Journal of Engineering for Gas Turbines and Power, ASME Journal of Vibrations and Acoustics, ASME Journal of Applied Mechanics, ASME Journal of Dynamic Systems, Measurement and Control, ASME Quarterly Transactions Journal of Vibrations and Acoustics, ASME Journal of Heat Transfer, WEAR, IMechE Journal of Mechanical Engineering Science, International Journal of Rotating Machinery, ASME Design and Vibrations Conferences, Tribotest, Computers & Fluids.

Panel Reviewer, National Science Foundation, Surface and Tribology Program, February 1996, October 1997, January 1999, October 2000.

TECHNICAL REPORTS

Research Progress Reports to Funding Agencies and Companies

Monthly progress reports to Honeywell Turbocharging Systems, 2004-2010, Northrop-Grumman, 2005-2007, Pratt & Whitney, 2008-2018, Borg-Warner (2013-15), Hitachi RL (2014-15), Samsung (2012-2015), Elliott Co (2016-18), KeyYang (2017-19)

6th month and Year end report to Siemens-Westinghouse, 2006, 2007.

Quarter Progress Reports to NASA GRC, 2007=2009

Annual Progress report to NSF, 2003-2007

Luis San Andrés, Tae Ho Kim, and Keun Ryu, 2009, "Thermohydrodynamic Analysis of Bump Type Gas Foil Bearings: A Model Anchored to Test Data," Final Project Report to NASA SSRW2-1.3 Oil Free Engine Technology Program, August

Kerth, J. and L. San Andrés, "Prediction and Measurement of the Rotordynamic Response on an Automotive Turbocharger with Floating Ring Bearings," Final Report to Garrett Boosting Systems, July 2003.

San Andrés, L., Analysis of Performance and Rotordynamic Force Coefficients of Brush Seals with Reverse Rotation Ability," Final Report to Advanced Turbomachinery Solutions (ATS), March 2003.

San Andrés, L., "Feasibility Study on Alternative Oil-Less Bearing Technologies for Automotive Turbochargers," Progress Report to Garrett Boosting Systems, October 2001.

San Andrés, L., "Measurements of Vibration and Instability on T2 Turbocharger," Progress Report to Honeywell Turbocharging Systems, August 2001.

San Andrés, L., "Force and Moment Coefficients for Misaligned Hybrid Thrust Bearings," Final Progress Report to NASA Marshall Space Flight Center, December 2000.

Naranjo, J., I. Silva, P. Uranga, and L. San Andrés, "Imbalance Response of a Rotor Supported on a Floating Ring Fluid Film Bearing, " Final Technical Progress Report to Allied Signal Turbocharging, Inc., August 1999.

San Andrés, L., "Measurements of the Dynamic Response of a Rotor Supported on a Floating and Semi-Floating Journal Bearing", Technical Progress Report to Allied Signal Turbocharging, Inc., October 1998.

San Andrés, L., "Bulk Flow Analysis of Hybrid Thrust Bearings for Advanced Cryogenic Turbopumps", FINAL Technical Report to NASA Marshall Space Flight Center, NASA Grant NAG8-1395, October 1998.

San Andrés, L., "Thermohydrodynamic Analysis of Cryogenic Liquid Turbulent Flow Fluid Film Bearings", FINAL Technical Report to NASA Lewis Research Center, NASA Grant NAG3-1434, December 1996.

San Andrés, L., "Angled Injection - Hybrid Fluid Film Bearings for Cryogenic Applications, Phase III" Technical Report to NASA Lewis Research Center, NASA Grant NAG3-1434, December 1996

San Andrés, L., "Thermohydrodynamic Analysis of Cryogenic Liquid, Turbulent Flow Fluid Film Bearings, Phase II" Technical Report to NASA Lewis Research, NASA Grant NAG3-1434, December 1994.

San Andrés, L., "Thermohydrodynamic Analysis of Cryogenic Liquid, Turbulent Flow Fluid Film Bearings," Technical Report to NASA Lewis Research Center, NASA Grant NAG3-1434, December 1993.

San Andrés, L., and Z. Yang, "Thermohydrodynamic Analysis of Turbulent Flow Hydrostatic Bearings," Technical Report to Pratt and Whitney, December 1992.

San Andrés, L., "Analysis of Turbulent Bulk Flow Hydrostatic Pad Bearings with a Barotropic Liquid," TAMU Research Foundation, Technical Report to Rockwell International, October 1992.

San Andrés, L., "Analysis of Hydrostatic Bearings for Cryogenic Applications - Variable Properties Solution," TAMU Research Foundation, Technical Report to Rockwell International, October 1990.

San Andrés, L., "Analysis of Turbulent Hybrid Bearings with Fluid Inertia Effects," TAMU Research Foundation, Technical Report to Rockwell International, October 1989.

Research Progress Reports to the TAMU Turbomachinery Research Consortium (TRC)

2022

Rodriguez, B., and San Andrés, L., 2022, "Measurements of the Dynamic Forced Response of an O-rings Sealed Squeeze Film Damper Supplied with a Low Supply Pressure," **TRC-SFD-01-22**

Torres, J., and San Andrés, L., "Leakage and Rotordynamic Force Coefficients of a Pocket Damper Seal and Labyrinth Seal Operating with Wet Gas," **TRC-Seal-01-22**

2021

Torres, J., and San Andrés, L., "Leakage and Dynamic Force Coefficients for a Stepped Labyrinth Seal and a Stepped Pocket Damper Seal Supplied with Wet Gas," **TRC-Seal-01-21**

2020

Koo ,B., and San Andrés, L., "EXPERIMENTS AND MODELS FOR OPERATION OF A SEALED ENDS SQUEEZE FILM

DAMPER: A STEP TOWARD QUANTIFYING AIR INGESTION IN SQUEEZE FILMS," **TRC-SFD-01-20**

Rodriguez, B., and San Andrés, L., "Experimental force Coefficients in a sealed Ends SFD supplied with Lubricant Through a Check Valve," **TRC-SFD-02-20**

Wu, T., and San Andrés, L.,"A COMPUTATIONAL FLUID DYNAMICS MODIFIED FRICTION FACTOR AND LEAKAGE MODEL FOR AN IMPROVED BULK-FLOW ANALYSIS OF LABYRINTH GAS SEALS," **TRC-Seal-01-20**

Lu, X., and San Andrés, L., "A NONHOMOGENEOUS BULK FLOW MODEL FOR PREDICTION OF THE STATIC AND DYNAMIC FORCED PERFORMANCE OF TWO PHASE FLOW ANNULAR SEALS", **TRC-Seal-02-20**

Yang, J., and San Andrés, L., "A Simple Two-Phase Flow Model for prediction of leakage in Wet Gas labyrinth seals and Pocket Damper Seals," **TRC-Seal-03-20**

Yang, J., and San Andrés, L., "MAKING BETTER SWIRL BRAKES USING CFD: PERFORMANCE ASSESSMENT AND GEOMETRY OPTIMIZATION," **TRC-Seal-04-20**

Cable, T., and San Andrés, L., "EXPERIMENTS AND PREDICTIONS WITH A FOIL THRUST BEARING SUPPORTED BY METAL MESH SCREEN," **TRC-B&C-01-20**

Koosha, R., and San Andrés, L., **"**A MODEL FOR THE ANALYSIS OF FLOW STARVED TILTING PAD THRUST BEARINGS**," TRC-B&C-02-20**

Bolen, R., and San Andrés, L., "Experiments on a Tilting Pads, Porous Carbon-Graphite, Gas Bearing: Static load and Force Coefficients," **TRC-B&C-03-20**

Alcantar, A., and San Andrés, L., " EFFECT OF FLOW RATE ON THE EXPERIMENTAL PERFORMANCE OF A TILTING PAD JOURNAL BEARING (LBP)," **TRC-B&C-04-20**

2019

Toner, J., and San Andrés, L., "Measurements to Quantify the Effect of a Reduced Flow Rate on the Performance of a Flooded Tilting Pad Journal Bearing (LBP)," **TRC-B&C-03-19.**

Koosha, R., and San Andrés, L., "A Computational Model for Self-Equalizing Tilting Pad Thrust Bearings," **TRC-B&C-01-19**

Wu, T., and San Andrés, L., "IMPROVED PREDICTION OF LEAKAGE IN GAS LABYRINTH SEALS USING AN UPDATED KINETIC ENERGY CARRY-OVER COEFFICIENT," **TRC-Seal-01-19**

Yang, J., San Andrés, L., and **Lu, X.**, "On the Leakage and Dynamic force coefficients of a Novel stepped Shaft Pocket Damper Seal: Experimental Results and CFD Model verification," **TRC-Seal-02-19**

Lu, X, San Andrés, L., Koo, B., and Tran, S., "Experimental Identification of Force Coefficients in an Integral Squeeze Film Damper and Predictive Model Validation", **TRC-SFD-01-19**

2018

Koosha, R., and San Andrés, L.,"THERMO- ELASTO-HYDRODYNAMIC (TEHD) COMPUTATIONAL ANALYSIS OF TILTING PAD THRUST BEARINGS: ANALYTICAL AND FE PAD STRUCTURE MODELS," **TRC-B&C-01-18**

Lu, L., and San Andrés, L., "EXPERIMENTAL LEAKAGE AND DYNAMIC FORCED PERFORMANCE OF A GROOVED WET (BUBBLY) LIQUID SEAL," **TRC-SEAL-01-18**

Wu, T., and San Andrés, L., "GAS LABYRINTH SEALS: ON THE EFFECT OF GEOMETRY AND OPERATING CONDITIONS ON FLOW FRICTION FACTORS – A CFD INVESTIGATION," **TRC-SEAL-02-18**

Yang, J, and San Andrés, L., "A CFD MODEL FOR PREDICTION OF LEAKAGE AND DYNAMIC FORCE COEFFICIENTS IN POCKET DAMPER SEALS: FROM GAS TO A WET GAS," **TRC-SEAL-03-18**

2017

San Andrés, L., **Koo, B**., and **Lu, L**., "Effect of Lubricant Supply Pressure on SFD Performance: Ends Sealed with O-rings and Piston Rings," **TRC-SFD-01-17**

San Andrés, L., and **Lu, X**., "Leakage and Rotordynamic Force Coefficients of a Three-wave (Air in Oil) *Wet* Annular Seal: Measurements and Predictions," **TRC-Seal-01-17**

San Andrés, L., and **Wu, T.**, "An Improved Bulk-flow Analysis for Interlocking Labyrinth Gas Seals: Leakage and Force

Coefficients," **TRC-Seal-02-17**

Abdollahi, B., and San Andrés, L., "A Computational Model for Tilting Pad Journal Bearings: Accounting for Thermally Induced Pad Deformations and Improving a Feed Groove - Thermal Mixing Model," **TRC-B&C-01-17**

Cable, T., and San Andrés, L., "A Test Rig for Evaluation of Foil Thrust Bearings: Dynamic Stiffness of a Metal Mesh Thrust Foil Bearing," **TRC-B&C-02-17**

San Andrés, L., **Wilkinson, S**., and **Haq, S.**, "Measurement of a Rotor (Dynamic) Axial Response in a Test Rig with Water Lubricated Hydrostatic Thrust Bearings," **TRC-B&C-04-17**

San Andrés, L., and **Koosha, R**., "Thermo-Hydrodynamic (THD) Computational Analysis of Tilting Pad Thrust Bearings," **TRC-B&C-05-17**

Gu, L, and San Andrés, L., "On the Morton Effect: Simplified Predictive Model for a Thermally Instability Induced by Differential Heating in a Journal Bearing," **TRC-RD-01-17**

2016

Jeung, S-H., and San Andrés, L., "Experimental Response of an Open Ends SFD Versus a Sealed Ends SFD," **TRC-SFD-01-16.**

San Andrés L., and **Lu, X.**, "Leakage and Rotordynamic Force Coefficients in an (Air in Oil) Wet Seal: Influence of Shaft Speed," **TRC-Seal-01-16**

San Andrés L., and **Zheng, Y**., "Rotordynamic Performance of a Rotor Supported on Carbon-Graphite Tilting-Pad Air Bearings," **TRC-B&C-01-16**

San Andrés L., and **Cable, T**., "Structural Force Coefficients from Metal Mesh Pads for a Foil Bearing," TRC-B&C-02-16

San Andrés, L., **Rohmer, M., Wilkinson, S., and Jani, H.,** "Measurement of Static Load Performance of a Water Lubricated Thrust Bearing," **TRC-B&C-03-16**

San Andrés, L., and **Abdollahi, B**., "Thermal Effects on Pad Deformations and Tilting-Pad Journal Bearing Performance," **TRC-B&C-04-16.**

2015

Jeung, S-H., and San Andrés, L., "Response of an Open Ends Squeeze Film Damper to Intermittent Impact Loads, **TRC-SFD-01-15**

Li, Y., and San Andrés, L., "A Computational Model for Tilting Pad Journal Bearings with Pad Flexibility," T**RC-B&C-01-15**

Rohmer, M., Wilkinson, S., and San Andrés, L., "Revamping and Preliminary Operation of a Thrust Bearing Test Rig," **TRC-B&C-02-15**

Cable, T., and San Andrés, L.,, "Identification of Structural Stiffness and Material Loss Factor in a Large Diameter Metal Mesh Foil Bearing," **TRC-B&C-03-15**

Liu, Q., Lu, X., and San Andrés, L., "Measurement of Leakage and Estimation of Force Coefficients in a Short Length Annular Seal Supplied with a Liquid/Gas Mixture (Stationary Journal)," **TRC-Seal-01-15**

Wu, T., and San Andrés, L., "Issues and Considerations for the Accurate Modeling of Long, Grooved Annular Seals for Pumps," **TRC-Seal-02-15**

2014

Jeung, S-H., and San Andrés, L., "Response of an Open Ends Squeeze Film Damper to Large Amplitude Impact Loads, **TRC-SFD-01-14**

Norsworthy, J., and San Andrés, L. , "A Shimmed Bump Foil Bearing: Measurements of Drag Torque, Lift-Off Speed, and Stiffness and Damping Coefficients," **TRC-B&C-01-14**

Li, Y., and San Andrés, L., "A FE Model for Static Load in Tilting Pad Journal Bearings with Pad Flexibility," **TRC-B&C-02-14**

Rohmer, M. and San Andrés, L., "A Destructive Failure Incident and Revamping of the Thrust Bearing Test Rig," **TRC-B&C-03-14**

San Andrés, L. and **Liu, Q.,** "Flow Rates in a Short Length Wet (Bubbly) Seal and Test Rig Re-Design," **TRC-SEAL-01-14**

2013

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year XXII, 2012/2013, May 2013.

San Andrés, L. and **Q. Liu, "**Automated Analysis of XLTRC^2 Time Transient Responses in Rotor Bearing Systems with Nonlinear Supports," **TRC-RD-01-13.**

San Andrés, L., and **Tao, Y., "**A Novel Computational Model for Tilting Pad Journal Bearings with Soft Pivot Stiffnesses," **TRC-B&C-01-13**

San Andrés, L., and **Chirathadam, T., "**Metal Mesh Foil Bearings: Prediction and Measurement of Static and Dynamic Performance Characteristics," **TRC-B&C-02-13**

San Andrés, L., and **Anderson, A. , "**Gas Seal Leakage at High Temperature: a Labyrinth Seal and an All-Metal Compliant Seal of Similar Clearances", **TRC-SEAL-01-13**

San Andrés,.L., and **Norsworthy, J., "**Identification of Structural Stiffness and Material Loss Factor in a Shimmed (Generation One) Bump-Type Foil Bearing," **TRC-B&C-03-13**

San Andrés,.L., and **Jeung, S-H., "**On the Forced Performance of an Squeeze Film Damper Operating with Large Amplitude Orbital Motions: Measurements and Assessment of the Accuracy of the Linearized Force Coefficients Model," **TRC-SFD-01-13**

San Andrés,.L., and **Shan, W., "**Predictions vs. Test Results for Leakage and Rotordynamic Force Coefficients of a Fully Partitioned Pocket Damper Seals and a Labyrinth Seal – Limitations of the Current Computational Model," **TRC-SEAL-02-13**

2012

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year XXI, 2011/2012, May 2012.

San Andrés, L., "Force Coefficients for a Large Clearance Open Ends SFD with a Central Feed Groove: Test Results and Predictions," **TRC-SFD-01-12**.

San Andrés, L., and Chirathadam, T., "Measurements of Rotordynamic Response in a High temperature Rotor Supported on Two Metal Mesh Foil Bearings," **TRC-BC001-12**

2011

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year XX, 2010/2011, May 2011.

San Andrés, L., "Comparison of Leakage between a Labyrinth Seal and an All-Metal Compliant Gas Seal at High Temperature," TRC-SEAL-02-11

2010

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year XIX, 2009/2010, May 2010.

San Andrés, L., and **T. Chirathadam**, "More on Metal Mesh Foil Bearings: Effect of Excitation Frequency on Dynamic Force Coefficients," TRC-B&C-01-10

2009

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year XVIII, 2008/2009, May 2009.

San Andrés, L., and **Y. Niu**, "Dynamic Response of a Rotor-Air Bearing System due to Base Induced Periodic Motions," TRC-B&C-1-09.

San Andrés, L., **K. Ryu,** and T-H Kim, "Measurements of Rotordynamic Response in a Hot Rotor Gas Foil Bearing System," TRC-B&C-2-09.

San Andrés, L., and **T. Chirathadam**, "Measurement of Bearing Drag Torque, Lift Off Speed and Identification of structural Stiffness and Damping in a Metal Mesh Foil Bearing," TRC-B&C-3-09.

2008

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year XVII, 2007/2008, May 2008.

San Andrés, L., and **K. Ryu,** "Dynamic Forced Response of a Rotor-Hybrid Gas Bearing System due to Intermittent Shocks," TRC-B&C-1-08

San Andrés, L., and. **T.H. Kim,** "Thermohydrodynamic Analysis of Bump Type Gas Foil Bearings: Model and Predictions," TRC-B&C-2-08

San Andrés, L., and. **T.H. Kim,** "Rotordynamic Measurements on a High Temperature Rotor Supported on Gas Foil Bearings," TRC-B&C-3-08

Goldsmith, J., and San Andrés, L., "The Effect of (Nonlinear) Pivot Stiffness on Tilting Pad Bearing Dynamic Force Coefficients," TRC-B&C-4-08

San Andrés, L., and **Kim, T.H.,** "Measurements of Structural Stiffness and Damping in a Metal Mesh Bearing and Development of a Test Rig for Foil Gas Bearings," TRC-B&C-5-08

Delgado, A., and San Andrés, L., "Dynamic Performance of a Squeeze Film Damper with Non-Circular Motions: Multi-Frequency Excitations Reproducing Multi-Spool Engine Operating Conditions," TRC-SFD-1-08

Delgado, A., and San Andrés, L., "A Novel FE Lubrication Model for Improved Predictions of Force Coefficients in Off-Centered Grooved Oil Seals," TRC-Seal-1-08

2007

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San Andrés, L., and **K. Ryu,** "Hybrid Gas Bearings with Controlled Supply Pressure to Eliminate Rotor Vibrations while Crossing System Critical Speeds," TRC-B&C-1-07
San Andrés, L., and. **T.H. Kim,"** Effect of Side Feed Pressurization on the Performance of Shimmed Foil Gas Bearings – Part I: Experimental Verification," TRC-B&C-2-07
San Andrés, L., and. **T.H. Kim,** "Effect of Side Feed Pressurization on the Performance of Shimmed Foil Gas Bearings – Part II: Model, Predictions and Comparisons to Rotordynamic Measurements, "TRC-B&C-3-07
San Andrés, L., and**. A. Delgado,** "Parameter Identification of an End Sealed SFD: Identification of Force Coefficients and Operating Conditions Leading to Air Ingestion," TRC-SFD-1-07
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2006

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year XV, 2005/2006, June 2006.
San Andrés, L., and **Kim, T-H,** "Computational Analysis of Gas Foil Bearings Integrating 1D and 2D Finite Element Models for Top Foil," TRC-B&C-1-06
San Andrés, L., and **Kim, T-H,** "Further Imbalance Response Measurements of Rotor Supported on Bump-Type Gas Foil Bearings – Operation to 50 krpm," TRC-B&C-2-06
San Andrés, L., and **Delgado, D.,** "Squeeze Film Damper with Mechanical Seal: Identification of Force Coefficients from Circular Centered Orbit Tests," TRC-SFD-1-06
San Andrés, L., and **Ryu, K., "**Test Results for Load-On-Pad and Load-Between-Pad Hybrid Flexure Pivot Tilting Pad Gas Bearings**,** TL-B&C-1-06

2005

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year XIV, 2004/2005, May 2005.
San Andrés, L., HYBRID TILTING PAD GAS BEARINGS: ANALYSIS & EXPERIMENTAL VALIDATION, TRC-B&C-1-05
Rubio, D., and L. San Andrés, Rotordynamic Performance of a Rotor Supported on Gas Foil Bearings, TRC-B&C-2-05
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Delgado, A., and L. San Andrés, Identification of Structural Stiffness and Damping in a Shoed Brush Seal, TRC-SEAL-3-05

2004

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year XIII, 2003/2004, May 2004.
Delgado, A., and L San Andrés, "Experimental Force Coefficients for a Sealed Squeeze Film Damper – Test Rig Development," TRC-SFD-1-04
Zhu, X., and L San Andrés, "Experimental Response of a Rotor Supported on Rayleigh Step Gas Bearings," TRC-B&C-2-04.
Balantrapu, K., and L San Andrés, "Identification of Force Coefficients in Flexible Rotor-Bearing Systems – Enhancements and Further validations," TRC-B&C-1-04

2003

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2001

San Andrés, L., Editor, “Research on Fluid Film Bearings, Tribology Group,” Year X, 2000/2001, May 2001.

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2000

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San Andrés, and D. Lubell, D., "Unbalance Response of a Test Rotor Supported on Squeeze Film Dampers," Report # TRC-SFD-2-96, May 1996.

Walton, N., "Measurements of Static Load Characteristics of a Flexure Pivot Tilt Pad Hydrodynamic Bearing," Report # TRC-B&C-2-96, May 1996.

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1994

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year 3, 1993/94, May 1994.

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1993

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year 2, 1992/93, April 1993.

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1992

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1991

San Andrés, L., and **Semanate, J.,** "Analysis of Multi-Land High Pressure Oil Seals," (#344) TRC-SEAL-2-91, April 1991.

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San Andrés, L., "Analysis of Short Squeeze Film Dampers with a Central Groove," (#120) TRC-SFD-3-91, April 1991.

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San Andrés, L., "Analysis of Hydrostatic Journal Bearings with End Seals," # 1004, TRC-B&C-2-91, April 1991.

1990

San Andrés, L., "Analysis of High Pressure Oil Seals," (#340) TRC-SEAL-2-90, May 1990.

San Andrés, L., "Experimental Results for Variable Speed TRC Squeeze Film Damper Test Rig," (#117) TRC-SFD-3-90, May 1990.

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San Andrés, L., "Experimental Measurements of Squeeze Film damper Force Coefficients with a Serrated Piston Ring End Seal," (#110) TRC-SFD-1-86, April 1986.

San Andrés, L., "Finite Length Correction Factors for Squeeze Film Dampers Executing Circular Centered Orbits-with Effects of End Seals and Fluid Inertia," (#107) TRC-SFD-84-1, July 1984.

San Andrés, L., "Linearized Force Coefficients for Open-Ended Squeeze Film Dampers Including Effects of Fluid Inertia," (#108) TRC-SFD-84-2, October 1984.

San Andrés, L., "Experimental Measurement of the Dynamic Pressure Distribution and Force Coefficients in a Squeeze Film Bearing Damper Test Rig Executing Circular Centered Orbits," (#109) TRC-SFD-84-3, October 1984

San Andrés, L., "Transient Rotordynamics Simulation Examples: A Rigid Rotor Mounted on Journal Bearings or Squeeze Film Dampers," (#204), TRC Report, May 1984.

San Andrés, L., "Solutions for the Fluid Flow Equations for a Squeeze Film Damper, Including Temporal Inertia Effects," (#105), TRC Report, October 1983.

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TECHNICAL PUBLICATIONS IN SPANISH

San Andrés, L.A., "Efecto de Desalineamiento en la Respuesta Dinamica de Sellos de Presion," III Encuentro Nacional de Física, Matemática e Informática, Quito, December 1991.

San Andrés, L.A., "Analisis Dinamico de un Amortiguador Gaseoso Tipo Alveolo," II Encuentro Nacional de Física, Matemática e Informática, Quito, December, 1989.

San Andrés, L.A., "Efecto de la Inercia del Fluido en Amortiguadores de Pelicula Delgada - Una Solucion Numerica," I Encuentro Nacional de Física, Matemática e Informática, Quito, December 1987.

San Andrés, L.A., "Generacion de Sistemas de Coordenadas Curvilineos y su Aplicacion a la Generacion Automatica de Mallas," I Encuentro Nacional de Física, Matemática e Informática, Quito, December 1987.

San Andrés, L.A., "Una Solucion a la Ecuacion de Adveccion Difusion en 1-D y Comparacion con el Esquema Numerico de Diferencias Finitas Corriente Arriba," I Encuentro Nacional de Física, Matemática e Informática, Quito, December 1987.

San Andrés, L.A., "Efecto de la Inercia del Fluido en la Respuesta Dinamica de Maquinaria Rotativa Soportada en Amortiguadores de Película Delgada," I Congreso Nacional de Ciencias, Quito-Ecuador, March 1987.

San Andrés, L.A., "Flujo Incompresible y Fuerzas Hidrodinamicas en Amortiguadores de Película Delgada," I Congreso Nacional de Ciencias, Quito-Ecuador, March 1987.

B. SOFTWARE COPYRIGHTS

See list at end

SOFTWARE 2006-15	**Company**	date
	KIST	01/2012
	Snecma SEP	10/2010/15
	AENTL	02/2013
XLGFBTH	Toyota	09/2013
	Williams Int.	11/2013
	UTRC	11/2013
	KIMM	01/2015
	Bosch RD	
	KIMM	11/2012
XLGFBPRESS	Barber Nichols	11/2010
	Air Products	02/2011
	Snecma	06/2012
SPIRALC	Ciateq	02/2010
	GERC	12/2013
HSEALH, HSEALHMOM	Ramgen, Knight Hawk, ATGI, FMCT, Kin Techs, Sulzer	07/2010 03/2011
XLBRG THERMAL	Honeywell Turbocharging Systems	12/2012
XLBRG VERSION 8	Honeywell Turbocharging Systems	08/2008
XLBRG VERSION 6.1	Honeywell Turbocharging Systems	08/15/06
2DXLGFB & 1DXLGFB	TRC: Dresser Rand, SWRI, GERC, Snecma, NASA MSFC	06/01/06
TILTPADHGB	TRC: Dresser Rand, SWRI, GERC, Corac	06/01/06
XLHYDRO_TRAN 5.0	Barber Nichols, Northrop Grumman	12/08/06

The Texas A&M University System through its Technology Licensing Office holds copyrights for the computational programs developed by Dr. Luis San Andrés for NASA and its contractors. The programs predict the static and dynamic force performance for the following fluid film bearings and seal types:

2DHYDROPAD©	gas hydrodynamic/hydrostatic rigid bearings
DSEAL©	gas labyrinth and gas pocket damper seals
HYDROSEALT©	hydrostatic/hydrodynamic radial bearings and annular seals
HYDROFLEXT©	+ tilting and flexure pivot journal bearings, foil bearings,
HYDROTRAN©	+ transient analysis for blade loss and g-load simulations,
HYDROJET©	+ angled injection hydrostatic bearings.
HSEAL2P©	two-phase flow cryogenic fluid annular seals.
HYDROTHRUST©	hydrostatci/hydrodynamic thrust bearings and inner pressurized face seals.

The programs running on PCs include full fluid inertia, turbulence flow and thermohydrodynamic models for high-speed, high-pressure, hot/cold cryogenic and process fluid operating conditions. The computational programs have been validated with extensive experimental measurements performed at TAMU and elsewhere. The codes built in Fortran F90 are extremely fast and user friendly.

These programs and the experimental validation have allowed the success and implementation of an all-fluid film bearing technology for advanced rocket engine turbopumps. Full descriptions of the programs, options for calculations and system requirements are given at the following URL address: http://rotorlab.tamu.edu under the SOFTWARE heading.

A list of the HYDROcodes users from government, industry and academia follows.

HYDROSEALT		date
NASA Lewis RC	Space Propulsion Technology	02/94
NASA Marshall SFC	Tribology Research	04/94

NASA Marshall SFC	CFD Research	04/94
Edwards Air Force Base	Phillips Laboratory	09/94
Pratt & Whitney	P&W Government Engines	09/94
Rockwell, Inc.	Rocketdyne	09/94

HYDROFLEXT, HYDROTRAN

NASA Lewis RC	Space Propulsion Technology	01/95
Edwards Air Force Base	Phillips Laboratory	02/95
NASA Marshall SFC	Tribology Research	03/95
Pratt & Whitney	P&W Government Engines	04/95
Rockwell, Inc.	Rocketdyne	06/95
Cleveland State University	(Mechanical Eng. Dept.	11/96
MIT	Mechanical Eng. Dept.	11/95
Hamilton Standard	Windsor Locks, CT	10/97
SNECMA, France	Division SEP	04/98

HYDROJET

NASA Lewis RC	Space Propulsion Technology	01/96
NASA Marshall SFC	Tribology Research	03/96
	CFD Research	05/97
Rockwell	Rocketdyne	08/96
Pratt & Whitney	P&W Government Engines	10/96
SNECMA, France	Division SEP	04/98
Argo-Tech Corporation	Cleveland, OH	08/98
Grundfos Tech	Denmark	12/99
Concepts ETI	Boston, USA	05/00
Advanced Turbomachinery Solutions	Justak Research, FLA	08/00
Exxon-Mobil R&D	John Fulton	09/01

HSEAL2P

NASA Lewis RC	Space Propulsion Technology	01/97
NASA Marshall SFC	CFD Research	06/97
Boeing	Rocketdyne	04/99
SNECMA SEP	Nicholas Juhel	05/06

HYDROTHRUST

NASA Marshall SFC	Tribology Research Branch	10/98
Edwards Air Force Base	Phillips Laboratory	10/98
Pratt & Whitney	P&W Government Engines	10/98
Argo-Tech Corporation	Cleveland, OH	09/99
SNECMA, France	Division SEP	12/99

XLHYDROJET

Graphical Interface

Blue Origin		2016
GE RC	Adolfo Delgado	11/12
Dresser-Rand	Oscar de Santiago	01/07
Siemens-Westinghouse	Bastian Korten	06/06
Barber Nichols	Tim Miller	01/05
NASA Marshall SFC	Tribology Research, CFD Research	12/02
Exxon – Mobil RC	John Fulton	02/03
Boeing _ Rocketdyne	John Keba	06/03
Qualiseal	Roberto Viloria	06/03
Ødegaard & Danneskiold-Samsøe A/S	Klaus Myllerup	03/03

Massachusetts Institute of Technology	Zoltan Spakosvky – Gas Turbine Laboratory	05/03
Dynatech Engineering – USAF SBIR Phase I	Lyn Greenhill	11/03
XLHYDROTHRUST	**Graphical Interface**	
Blue Origin		2016
GE RC	Adolfo Delado	11/12
Barber Nichols		04/05
Florida Turbines	Tim Miller	03/14
KIMM		12/14

Since 1990 Dr. Luis San Andrés has developed a number of computational programs for the Turbomachinery Research Consortium (TRC). Some of these programs have been recently integrated to the XLTRC© rotordynamics analysis suite of programs developed exclusively for the TRC members. XLTRC© performs complete rotordynamic analysis (stability and imbalance response) of rotors supported in fluid film bearing elements, seals, ball bearings, etc. Dr. San Andrés codes predict the steady state rotor eccentricity and rotordynamic force coefficients as a function of the operating conditions (rotational speed and load) for the following types of bearing and seal configurations:

XLLANSEAL©	annular pressure seals (laminar and turbulent flow, variable fluid properties),
XLHYDPAD©	laminar flow hydrostatic/hydrodynamic radial bearings of arbitrary geometry,
XLLSFD©	laminar flow squeeze film dampers with end seals, circular centered orbits,
XLLUBGT©	floating ring multiple-groove seals (laminar flow and thermal effects),
XLOSFD©	laminar flow open end squeeze film dampers, arbitrary static eccentricity,
XLPRESDM©	laminar flow pressure dam and multiple-lobe journal bearings,
XLSFDFEM©	laminar flow open/sealed squeeze film dampers with fluid inertia effects,
XLTFPBRG©	tilting pad journal bearings and fixed arc bearings, laminar and turbulent flows, Includes a number of thermal models.

In addition, Dr. San Andrés and students have developed the following computational programs for the TRC:

JBFISH© ©	herringbone grooved journal bearings and spirally grooved seals (laminar flow).
SPIRAL©, SPIRALC©	flat & spirally grooved face (noncontacting) seals, incompressible fluid and ideal (buffer) gases. Flowserve (Durametallic) is currently evaluating this software for licensing (04/99).

INDUSTRIAL PROFESSIONAL WORK EXPERIENCE AND CONSULTING:

Year	Company – Description of Technical Problem or Issue
2022	Blue Origin, Ursa Major Tech
2021	Calnetix, Exxon-Mobil, Dow Chem, Oil Free Machinery, ABL SPace
2020	Emerson, Elliott Group, Dow Chem, Daikin Applied
2019	Elliott Group, Hunan Sund
2018	Lundinton CM Co.
2017	Lundinton CM Co., Danfoss, Hunan Sund
2016	Hunan Sund, GE Aviation
2015	Climeon, Echogen, Atlas-Copco
2014	Echogen, NewWay Bearings
2013	Parker, NewWay Bearings, Echogen
2012	StarRotor, Selection of bearings
2011	Echogen – Evaluation CO_2 turboalternator system and CO_2 turbopump
2010	United Technologies Research Center: Evaluation of foil bearing modeling
2009	EcoTurbine – SFD for turbo engine
2008	Siemens – Gas Foil Bearings
2007	Volvo. Rotordynamics of turbochargers – evaluation of performance.
2006	Barber-Nichols, Rotordynamics Evaluation of USET TP
	Argo-Tech, Inc. Design Evaluation of Hydraulic Motor
2005	Barber-Nichols, Rotordynamics Evaluation of USET TP
2004	Micro-Diffusion, Inc.: Assessment of flow induced instability in micro-diffusion water pump.
2003	General Electric Canada: Analysis of nonlinear forces in tilting pad bearings for hydroelectric power generator.
	Northrop Grumman – Software Tool Assessment for New Cryogenic Turbopump
2002	Qualiseal: Design of high pressure gas seals for oil-free turboexpander
	Weatherford: Analysis of lubricated surfaces for novel submergible water pump
2001	Textron Union Pump, Design of water bearing for vertical boiler feed pump. January-February, September.
	Exxon-Mobil R&D, Verification of honeycomb seal dynamic forced performance in 900 bar hydrocarbon compressor. August – September.
	Arco-RBTS, Evaluation of test performance of gas bearings for SPARC turbo expander. July, October.
2000	DynaTech, Inc. Analysis of gas Hypad© bearings for oil-free turbomachinery, August.
	DynaTech, Inc. Testing of gas Hypad© bearings, December.
	Ciateq, Mexico, Rotordynamic Analysis of Compressor and Design of Tilting pad Bearings for Retrofit, August & December.
	Arco Alaska, Analysis of hydrostatic radial bearings and thrust bearings for SPARC2 turboexpander, February, April.
	Sulzer Pumps, Squeeze film damper for multiple-phase pump in Siberia, March.
1999	Arco Alaska, Analysis of hydrostatic thrust bearing for SPARC turboexpander, November.
	Dupont, Sabine Riverworks, Orange, TX. Analysis of long oil seal seizure in autoclave agitators, February.
	Fermi Laboratory, Evaluation of foil bearing changes for cryogenic compressor, February
	James Bowery, California. Evaluation of novel compact rocket engine, March.
1998	CIATEQ, Burgman, Inc., and PEMEX: Rotordynamic Analysis of two centrifugal compressors, January.
	TAMU Turbomachinery Laboratory, Verification of XLTRC suite of computer programs for calculation of dynamic force coefficients from fluid film bearings, May-December.
	TAMU Turbomachinery Laboratory, Code for calculation of rotordynamic force coefficients in pressure-dam journal bearings, January.
	Flowserve Corp., Evaluation of plain annular and grooved seals for water pumps, November.
1997	NMBT, Tests for vibration signatures in computer fans, November-December.
	KMC, Inc., Design of high speed flexure-pivot bearing, June.
	COMPAQ, Diagnosis of noise in faulty computer fans, February.
1996	NOVA Corp, Canada, Analysis of spiral groove seals for process agitator, July.
	ABB Corp., Germany, Transient response of two-lobed journal bearings for industrial gas power turbine, January. (Joint work with Dr. D. Childs)
1994	CIATEQ, Qro, Mexico. Rotordynamic Effects of Dry-Gas Seals and Oil-Seals on a Cetrifugal

	Compressor, December.
1993	Health Products, PA, Design of high-speed spherical hydrostatic bearings for a hand dental drill, January.
1990	Center for Electromechanics, University of Texas, Design of Hydrostatic Bearings for a Homopolar Generator, February.
1987	Esmeraldas Oil Refinery, Ecuador. Balancing of water feed boiler pumps and development of a plant predictive maintenance program, January 1 – October 1987.
1979-1981	Maintenance Supervisor (INECEL) Guangopolo Power Plant, Quito, Ecuador. Maintenance of 35 Mw Diesel Motors, July 1979 – May 1981.
1991-date	Consultant to numerous fluid film bearing and seal manufacturers: designs of tilting pad bearings, damper seals, squeeze film dampers, hydrostatic bearings for KMC, Inc., Bearings+, RSR, GE, Pratt & Whitney, Rocketdyne, Allied Signal, Carrier, Hamilton Std, NOVA Corp., ABB Corp., etc.