

CURRICULUM VITAE

Luis A. San Andrés

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U.S. naturalized citizen. **Ethnic origin: Hispanic**

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	Escuela Politécnica, Ecuador	June 1981
	Summa Cum Laude		

ACADEMIC EXPERIENCE

Visiting Scientist	KIST, Korea Institute of Science and Technology	January 4-March 30, 2010
Visiting Faculty (Sabbatical leave)	National University of Singapore	August 2009- December 2009
Mast-Childs Professor	Mechanical Engineering	September 2005-present
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

2009, named Adjunct Professor, Jiaotong University, Xi'an, PR China (3 years)

2008, Reappointed Mast-Childs Professorship in Tribology, Texas A&M University

2008 BEST Rotordynamics Paper Award – IGTI Structures and 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.

2005, Inaugural Holder of Mast-Childs Professorship in Tribology, Texas A&M University
 2005, Fellow ASME, American Society of Mechanical Engineers, November
 2005, Fellow STLE, Society of Tribologists and Lubrication Engineers, May
 2005, Ruth and William Neele'52 Faculty Fellow, Dwight Look College of Engineering, Texas A&M University, April
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
 2004, E.D. Brockett Professorship, Dwight Look College of Engineering, Texas A&M University, October
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," ASME Paper GT 2003-38833.
 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.
 Fellow ASME, American Society of Mechanical Engineers (1987-date)
 Fellow STLE, Society of Tribologists and Lubrication Engineers (1991-to date)
 Member ASEE, American Society for Engineering Education

COLLABORATORS AT TAMU

Dara Childs, John Vance, Hong Liang

INDUSTRIAL PROFESSIONAL WORK EXPERIENCE AND CONSULTING:

<u>Year</u>	<u>Company – Description of Technical Problem or Issue</u>
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 submersible 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.
- 1997 Flowserve Corp., Evaluation of plain annular and grooved seals for water pumps, November.
 NMBT, Tests for vibration signatures in computer fans, November-December.
 KMC, Inc., Design of high speed flexure-pivot bearing, June.
- 1996 COMPAQ, Diagnosis of noise in faulty computer fans, February.
 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.

TEACHING

COURSES TAUGHT AT TEXAS A&M UNIVERSITY

Graduate

- MEEN 626 – Modern Lubrication Theory MEEN 617 – Mechanical Vibrations
 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

- FSE1203 Freshman Seminar – Practices of Modern Engineering (NUS, Fall 2009)
 MEEN 363 – Dynamics and Vibrations (2000-2008)
 MEEN 334 – Mechanical Systems I (1990-1999)
 ENGR 203 – Modeling of Engineering Systems (1995)

TEACHING IMPROVEMENT

Dr. San Andrés attended the following seminars to improve his teaching effectiveness and competence:

Active mentoring on program Faculty Learning Communities for the enhancement of teaching TAMU Center of Teaching Excellence, Fall 2001-to date

ABET 2000, Criteria and Assessment, 8 hour Seminar, Spring 2001

Participated on Pilot Program, “Early Feedback on Teaching and Assessment,” by TAMU Center of Teaching Excellence, October 2000 (Class video taped and reviews received).

Discussion on “Why Women and Minorities Leave Engineering,” TAMU College of Engineering, 3 hours, October 12, 2000.

“Building Interactive Media for Technical Education and Training Using Multimedia Software Tools, Multimedia Workshop”, TAMU College of Engineering, 40 hours, July 19-23, 1999.

“The Teaching Portfolio”, TAMU Center for Teaching Excellence, 4 hours, March 1998.

ENGR 11x and 21x Workshops, (several through the years).

“Mechanical Seals-Basic, Short Course”, TEES, International Pump Symposium, 8 hours, March 12, 1998.

Effective College Teaching, Lohman Lecture, TAMU College of Engineering, 12 hours, January 31-February 1, 1998.

Active and Collaborative Learning Seminar, Foundation Coalition, 4 hours, February 27, 1997.

Writing Assignments: Design and Use of a Teaching Tool, TAMU Center for Teaching Excellence, 4 hours, June 10 and 12, 1997.

Teaching Engineering Ethics Workshop, TAMU, 8 hours, August 30, 1996.

First Things First Seminar for Faculty, TAMU Engineering Program, 8 hours, January 12, 1996.

Getting the Most out of Teaming, Workshop, TAMU Center for Teaching Excellence, 8 hours, March 27, 1995.

Academic Workshop on Teaming, The Foundation Coalition, TAMU, 3x8hour/day seminar, December 14-16, 1994.

Seminar on Lubricants and their Uses, TAMU, United Nations and U.S. AID (Agency for International Development), 8 hours, July, 1994.

Role of Hispanic Faculty on Year 2,000, 4 hour seminar, TAMU, April 1994.

Quality Teaching with Dr. Karl Smith, TAMU, 8 hour seminar, January 1993.

Seven Habits of Highly Effective People, Mechanical Engineering Department, Texas A&M University, Walter Bradley, December 92 – February 1993, 2 hour lectures during 8 weeks.

STUDENT RESEARCH ADVISING

Bold face: Minority Hispanic, female

A. Doctorate (Ph.D.)

Student Name (employment)	Thesis title	Graduation date
Thomas Chirathadam TAMU PhD	Metal Mesh Foil Bearings for Microturbomachinery	May 2012
Keun Ryu Borg Warner	Gas Bearings for Oil Free Turbomachinery	December 2010
Tae Ho Kim KIST,	Computational Analysis of Gas Foil Bearings	December 2007
Adolfo Delgado GE Global RC	Identification of force coefficients in a sealed SFD	December 2008
Oscar de Santiago Dresser Rand, CIATEQ	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 (Elliott Compressors).	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	Thermohydrodynamic Analysis of Product Lubricated Hydrostatic	December 1993

B. Masters

Student Name (Employment)	Thesis title	Graduation date
Paola Mahecha	Experimental Verification of Pratt & Whitney Damper Performance	August 2011
Sanjeev Seshagiri	Experimental Verification of Pratt & Whitney Damper Performance	May 2011
Thomas Chirathadam Ph D Texas A&M University	Identification of Dynamic Force Coefficients in Metal Mesh Foil Bearings	August 2009
Arian Vistamehr Ph D University of Texas Austin	Nonlinear Hysteresis in Turbocharger Rotordynamics	August 2009
Yaying Niu PhD University of Trondheim	Performance of Flexure Pivot Gas Bearings – Base Induced Motions	August 2009
Zach Ashton Rocketdyne	Performance of High Temperature Seals	August 2009
Jose Baker KBR	Performance of Hybrid Brush Seals	December 2007
Ash Maruyama Sulzer Bingham	Nonlinear rotordynamics of turbochargers	September 2007
Keun Ryu TAMU PhD	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 GERC	Identification of force coefficients in a sealed SFD	December 2005
Suzan Xhu SKF China	Gas Tilting Pad Bearings for Turbochargers	May 2004
K Balantrapu Capgemini Consulting	Identification of Parameters in Flexible Rotor-Bearing Systems	May 2004
Jason Kerth Exxon-Mobil RC	Turbocharger Rotordynamics	August 2003
Deborah Wilde Honeywell Int	Measurement of the Dynamic Forced Performance of Air Bearing Supported Rotors	May 2002
Thomas Soulas Dresser Rand (Snecma SEP)	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 PDVSA, Venezuela	Dynamic Response of a Rotor Supported on Floating Ring Journal Bearings	June 1999
Oscar de Santiago Ciateq (Dresser Rand)	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 Southwest RI Turbocare, Rocketdyne	Test Rotordynamic Force Coefficients in Gas Damper Seals	August 1997
Daniel Lubell Capstone Turbine	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 (Rocketdyne)	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 Schlumberger	Experimental Study of a Grooved Squeeze Film Damper	May 1993

C. Sr. Honors Thesis

Student Name	Thesis title	Graduation date
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	Identification of Damping Force Coefficients in Sealed Integral Dampers	August 1998
Israel Silva	Effects of Air Entrainment on the Damping Coefficients of a Squeeze Film Damper	December 1998
C.W. Karstens	Finite Element Analysis of a Fixed Pad Thrust Bearing - Determination of Force Coefficients	December 1995
Nicole Zirkelback	Test Results for an Open End Squeeze Film Damper with a High Viscosity Oil	May 1995
Aquiles Lopez	Analysis of a Mechanical System with Structural Hysteresis	December 1993
Donald Plumlee	(*) 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.

In 2001, Dr. San Andrés established an exchange program with undergraduate students from Universidad Simon Bolivar (Venezuela).

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-Doctoral Research Associates

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, Xian University, China, 1991 (1 year)

RESEARCH

REFEREED PAPERS ACCEPTED FOR JOURNAL PUBLICATION

Bold face denotes student co-author

In print (*) papers published in electronic form

- March 10 San Andrés, L., **Ryu, K.**, and **Kim, T-H**, “Thermal Management and Rotordynamic Performance of a Hot Rotor-Gas Foil Bearings System. Part 1: Measurements”, ASME J. Eng. Gas Turbines Power, [ASME paper GT2010-22981](#)
- San Andrés, **Kim, T-H**, and **Ryu, K.**, “Thermal Management and Rotordynamic Performance of a Hot Rotor-Gas Foil Bearings System. Part 2: Predictions Versus Test Data,” ASME J. Eng. Gas Turbines Power, [ASME paper GT2010-22983](#)
- San Andrés, L., and **Chirathadam T.A.**, “Identification of Rotordynamic Force Coefficients of a Metal Mesh Foil Bearing Using Impact Load Excitations,” ASME J. Eng. Gas Turbines Power, [ASME paper GT2010-22440](#)
- Howard, S., and San Andrés, L., “A New Analysis Tool Assessment for Rotordynamic Modeling of Gas Foil Bearings,” ASME J. Eng. Gas Turbines Power, [ASME paper GT2010-22508](#)

Accepted

Manuscript Submitted (in review)

2011 ASME Turbo Expo Gas Turbine Conference, Vancouver (June 2011)

- GT2011-45264 San Andrés, L.,”Rotordynamic Force Coefficients of Bubbly Mixture Annular Pressure Seals”
- GT2011-45257 San Andrés, L., and **Chirathadam, T.**, “Metal Mesh Foil Bearings: Effect of Excitation Frequency on Rotordynamic Force Coefficients”
- GT2011-45274 San Andrés, L., and Delgado, A., “A Novel Bulk-Flow Model for Improved Predictions of Force Coefficients in Grooved Oil Seals Operating Eccentrically.”
- GT2011-46767 De Santiago, O., and San Andrés, L., “Parametric Study of Bump Foil Gas Bearings for Industrial Applications”

1. REFEREED JOURNAL PUBLICATIONS

Bold face denotes student co-author

- 127 San Andrés, L., **Ryu, K.**, and Kim, T.H., 2011, “Identification of Structural Stiffness and Energy Dissipation parameters in a 2nd Generation Foil Bearing; Effect of Shaft Temperature”, ASME J. Eng. Gas Turbines Power, vol. **133** (March) , pp. **032501**
- 126 Gjika, K., C. Groves, L. San Andrés, and LaRue, G., 2010, “Nonlinear Dynamic Behavior of Turbocharger Rotor-Bearing Systems with Hydrodynamic Oil Film and Squeeze Film Damper in Series: Prediction and Experiment,” ASME Journal of Computational and Nonlinear Dynamics, Vol. **5** (October), p. 041006-(1-8).
Delgado, A., and San Andrés, L., 2010, “A Model for Improved Prediction of Force Coefficients in Grooved Squeeze Film Dampers and Grooved Oil Seal Rings”, ASME Journal of Tribology Vol. 132(July), p. **032202** (1-12)
- 125 **Delgado, A.**, and San Andrés, L., 2010, “Identification of Force Coefficients in a Squeeze Film Damper with a Mechanical Seal: Large Contact Force,” ASME Journal of Tribology, Vol. 132(July), p. **032201** (1-7)
- 124 San Andrés, L., **Chirathadam, T.**, **Ryu, K.**, and **Kim, T.H.**, 2010, “Measurements of Drag Torque, Lift-Off Journal Speed and Temperature in a Metal Mesh Foil Bearing,” ASME J. Eng. Gas Turbines Power, Vol. 132(Nov), p. **112503** (1-7)
- 123 San Andrés, L., and **Ashton, Z.**, 2010, “Comparison of Leakage Performance in Three Types of Gas Annular Seals Operating at (300°C) High Temperature, STLE Tribology Transactions, Vol. 53(3), pp. 463

- 122 San Andrés, L., **Delgado, D.**, and **Baker, J.**, 2010, "Rotordynamic Force Coefficients of a Hybrid Brush Seal: Measurements and Predictions," ASME J. Eng. Gas Turbines Power, Vol. 132 (April), p. **042503** ([ASME Paper No. GT2009-59072](#))
- 121 San Andrés, L., and **Kim, T.H.**, 2010, "Thermohydrodynamic Analysis of Bump Type Gas Foil Bearings: A Model Anchored to Test Data," ASME J. Eng. Gas Turbines Power, Vol. 132 (April), p. **042504** ([ASME Paper No. GT2009-59919](#))
- 120 **Delgado, D.**, and San Andrés, L., 2010, "Identification of Squeeze Film Damper Force Coefficients from Multiple-Frequency, Non-Circular Journal Motions," ASME J. Eng. Gas Turbines Power, Vol. 132 (April), p. **042501** ([ASME Paper No. GT2009-59175](#))
- 119 **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**
- 118 San Andrés, L., **Maruyama, A.**, Gjika, K., and Xia, S., 2010, "Turbocharger Nonlinear Response with Engine-Induced Excitations: Predictions and Test Data," ASME J. Eng. Gas Turbines Power, Vol. 132(March), p. **032502** ([ASME Paper No. GT2009-59108](#))
- 117 San Andrés, L., **Chirathadam, T. A.**, and Kim, T.H., 2010, "Measurements of Structural Stiffness and Damping Coefficients in a Metal Mesh Foil Bearing," ASME J. Eng. Gas Turbines Power, Vol. 132(March), p. **032503** ([ASME Paper No. GT2009-59315](#))
- 116 **Delgado, A.**, and San Andrés, L., 2009, "Nonlinear Identification of Mechanical Parameters on a Squeeze Film Damper with Integral Mechanical Seal," ASME Journal of Engineering for Gas Turbines and Power, Vol. 131 (4), pp. 042504 ([ASME Paper GT2008-50528](#))
- 115 **Kim, T.H.**, **Breedlove, A.**, and San Andrés, L., 2009, "Characterization of Foil Bearing Structure at Increasing Temperatures: Static Load and Dynamic Force Performance," ASME Journal of Tribology, Vol. 131(3), pp. 041703-(1-9)
- 114 **Kim, T.H.**, and San Andrés, L., 2009, "Effects of a Mechanical Preload on the Dynamic Force Response of Gas Foil Bearings - Measurements and Model Predictions," Tribology Transactions, Vol. 52, pp. 569-580
- 113 San Andrés, L., **Baker, J.**, and **Delgado, A.**, 2009, "Measurements of Leakage and Power Loss in a Hybrid Brush Seal," ASME Journal of Engineering for Gas Turbines and Power, 131(1), pp. **012505**. ([ASME Paper GT2008-50532](#))
- 112 **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](#)) **2008 Best PAPER Rotordynamics IGTI Structures and Dynamics Committee**
- 111 San Andrés, L., and **Kim, T.H.**, 2009, "Analysis of Gas Foil Bearings Integrating FE Top Foil Models," Tribology International, **42**(2009), pp. 111-120.
- 110 San Andrés, L., and **Ryu, K.**, 2008, "Hybrid Gas Bearings with Controlled Supply Pressure to Eliminate Rotor Vibrations while Crossing System Critical Speeds," ASME Journal of Engineering for Gas Turbines and Power, Vol. 130(6), pp. 062505-1-10 ([ASME Paper GT2008-50393](#))
- 109 San Andrés, L., and **Kim, T.H.**, 2008, "Forced Nonlinear Response of Gas Foil Bearing Supported Rotors," Tribology International, **41**(8), pp. 704-715.
- 108 San Andrés, L., and **K. Ryu**, 2008, "Flexure Pivot Tilting Pad Gas Bearings: Operation with Worn Clearances and Two Load-Pad Configurations," ASME Journal of Engineering for Gas Turbines and Power, Vol. 130(4), pp. 042506. ([ASME Paper No GT2007-27127](#))
- 107 San Andrés, L., and **A. Delgado**, 2008, "Squeeze film Damper with a Mechanical Seal: Experimental Force Coefficients Derived from Circular Centered Orbits," ASME Journal of Engineering for Gas Turbines and Power, Vol. 130(4), pp. 042505 ([ASME Paper No GT2007-27436](#))
- 106 **Kim, T.H.**, and L. San Andrés, 2008, "Heavily Loaded Gas Foil Bearings: a Model Anchored to Test Data," ASME Journal of Engineering for Gas Turbines and Power, Vol. 130(1), pp. 012504-1-8. ([ASME Paper GT 2005-68486](#))
- 105 **Delgado, A.**, and L. San Andrés, 2007, "Identification of Structural Stiffness and Damping in a Shoed Brush Seal," ASME Journal of Vibrations, Vol. 129(5), pp. 648-655.
- 104 San Andrés, L., **J.C. Rivadeneira**, K. Gjika, C. Groves, and G. LaRue, 2007, "A Virtual Tool for Prediction of Turbocharger Nonlinear Dynamic Response: Validation Against Test Data," ASME Journal of Engineering for Gas Turbines and Power, 129(4), pp. 1035-1046 ([ASME Paper GT 2006-90873](#))
- 103 **Zhu, S.** and L., San Andrés, 2007, "Rotordynamic Performance of Flexure Pivot Hydrostatic Gas Bearings for Oil-Free Turbomachinery," Journal of Engineering for Gas Turbines and Power, 129(4), pp. 1020-1027. ([ASME Paper GT 2004-53621](#))

- 102 San Andrés, L., and **A. Delgado**, 2007, "Identification of Force Coefficients in a Squeeze Film Damper with a Mechanical Seal, I: Unidirectional Load Tests," ASME Journal of Engineering for Gas Turbines and Power, 129(3), pp. 858-864 ([ASME Paper GT 2006-90782](#))
- 101 San Andrés, L., **D. Rubio**, and **T.H. Kim**, 2007, "Rotordynamic Performance of a Rotor Supported on Bump Type Foil Gas Bearings: Experiments and Predictions," ASME Journal of Engineering for Gas Turbines and Power, 129(3), pp. 850-857. ([ASME Paper GT 2006-91238](#))
- 100 San Andrés, L., and **A. Delgado**, 2007, "Identification of Force Coefficients in a Squeeze Film Damper with a Mechanical Seal, Centered Circular Orbit Tests," ASME Journal of Tribology, Vol. 129(3), pp. 660-668. ([Paper IJTC 2006-12041](#))
- 99 **Kim, T-H**, and L., San Andrés, 2007, "Analysis of Gas Foil Bearings with Piecewise Linear Elastic Supports." Tribology International, **40**, pp. 1239-1245.
- 98 San Andrés, L., **J.C. Rivadeneira**, K. Gjika, C. Groves, and G. LaRue, 2007, "Rotordynamics of Small Turbochargers Supported on Floating Ring Bearings – Highlights in Bearing Analysis and Experimental Validation," ASME Journal of Tribology, Vol. 129, pp. 391-397 ([Paper IJTC 2006-12001](#)).
- 97 **Rubio, D.**, and L. San Andrés, 2007, "Structural Stiffness, Dry-Friction Coefficient and Equivalent Viscous Damping in a Bump-Type Foil Gas Bearing." ASME Journal of Engineering for Gas Turbines and Power, 129, pp. 494-502. ([ASME Paper GT 2005-68384](#)) **2005 Best PAPER Rotordynamics IGTI Structures and Dynamics Committee**
- 96 San Andrés, L., **J.C. Rivadeneira**, M. Chinta, K. Gjika, G. LaRue, 2007, "Nonlinear Rotordynamics of Automotive Turbochargers – Predictions and Comparisons to Test Data," ASME Journal of Engineering for Gas Turbines and Power, 129, pp. 488-493 ([ASME Paper GT 2005-68177](#))
- 95 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. [Editor's Choice – Tribology & Lubrication Technology, June 2007, pp. 40-50.](#)
- 94 San Andrés, L., and **T. Soulas**, 2007, "A Bulk Flow Model for Off-Centered Honeycomb Gas Seals," ASME Journal of Engineering for Gas Turbines and Power, 129, pp. 185-194.
- 93 San Andrés, L., **T. Soulas**, and P. Fayolle, 2007, "A Bulk Flow Model of Angled Injection Lomakin Bearing" ASME Journal of Engineering for Gas Turbines and Power, 129, pp. 195-204.
- 92 **De Santiago, O.**, and L., San Andrés, 2007, "Field Methods For Identification of Bearing Support Parameters. Part I-Identification from Transient Rotor Dynamic Response Due to Impacts," ASME Journal of Engineering for Gas Turbines and Power, 129, pp. 205-212.
- 91 **De Santiago, O.**, and L., San Andrés, 2007, "Field Methods For Identification of Bearing Support Parameters. Part II-Identification from Rotordynamic Response due to Imbalances," ASME Journal of Engineering for Gas Turbines and Power, 129, pp. 213-219.
- 90 **Osborne, D.A.**, and San Andrés, L., 2006, "Experimental Response of Simple Gas Hybrid Bearings for Oil-Free Turbomachinery," ASME Journal of Engineering for Gas Turbines and Power, 128, pp. 626-633. ([ASME Paper No. GT 2003-38833](#), **2003 BEST Rotordynamics Paper Award –ASME (IGTI)**)
- 89 **Osborne, D.A.**, and San Andrés, L., 2006, "Comparison of Rotordynamic Analysis Predictions with the Test Response of Simple Gas Hybrid Bearings for Oil Free Turbomachinery," ASME Journal of Engineering for Gas Turbines and Power, 128, pp. 634-643 ([ASME Paper No. GT2003-38859](#), **2003 BEST Rotordynamics Paper Award –ASME (IGTI)**)
- 88 **Rubio, D.**, and L., San Andrés, 2006, "Bump-Type Foil Bearing Structural Stiffness: Experiments and Predictions", ASME Journal of Engineering for Gas Turbines and Power, **128**, pp. 653-660. ([ASME Paper GT 2004-53611](#))
- 87 San Andrés, L., 2006, "Hybrid Flexure Pivot-Tilting Pad Gas Bearings: Analysis and Experimental Validation," ASME Journal of Tribology, **128**, pp. 551-558.
- 86 **Kim, T.H.**, and L. San Andrés, 2006, "Limits for High Speed Operation of Gas Foil Bearings," ASME Journal of Tribology, **128**, pp. 670-673.
- 85 San Andrés, L., and **O. de Santiago**, 2006, "Dynamic Response of Squeeze Film Dampers Operating with Bubbly Mixtures," ASME Journal of Engineering for Gas Turbines and Power, **126**, pp. 408-415. ([ASME Paper 2002-GT-30317](#))
- 84 San Andrés, L., and O. De Santiago, 2005, "Identification of Journal Bearing Force Coefficients Under High Dynamic Loading," STLE Tribology Transactions, **48**, pp. 9-18.
- 83 **Holt, C.**, L. San Andrés, S. Sahay, P. Tang, G. LaRue, and K. Gjika, 2005, "Test Response and Nonlinear Analysis of a Turbocharger Supported on Floating Ring Bearings," ASME Journal of Vibrations and Acoustics, **127**, pp. 107-212.
- 82 San Andrés, L. and **J. Kerth**, 2004, "Thermal Effects on the Performance of Floating Ring Bearings for Turbochargers", Journal of Engineering Tribology, Special Issue on Thermal Effects on Fluid Film

- Lubrication, IMechE Proceedings Part J, **218**, pp. 437-450
- 81 **De Santiago, O.**, and L. San Andrés, 2004, "Forced Response of a Squeeze Film Damper and Identification of Force Coefficients from Large Orbital Motions," ASME Journal of Tribology, **126**, pp. 292-300 ([ASME Paper 2003-TRIB-162](#))
- 80 San Andrés, L., and **S. Diaz**, 2003, "Flow Visualization and Forces from a Squeeze Film Damper with Natural Air Entrainment," ASME Journal of Tribology, **125**, pp. 325-333 ([ASME Paper 2002-TRIB-81](#)).
- 79 **Soulas, T.**, and L. San Andrés, 2003, "Performance of Damaged Hydrostatic Bearings: Predictions vs. Experiments," ASME Journal of Tribology, **125**, pp. 451-457 (ASME Paper 2002-TRIB-17).
- 78 **De Santiago, O.**, and L. San Andrés, 2003, "Imbalance Response of a Rotor Supported on Flexure Pivot Tilting Pad Journal Bearings in Series with Integral Squeeze Film Dampers," 2003, ASME Journal of Engineering for Gas Turbines and Power, **115**, pp. 1026-1032. ([ASME Paper 2001-GT-257](#))
- 77 San Andrés, L., 2002, "Force and Moment Coefficients for Misaligned Hybrid Thrust Bearings," ASME Journal of Tribology, **124**, pp. 212-219. ([ASME Paper 2001-TRIB-119](#)).
- 76 **Diaz, S.**, and L. San Andrés, 2002, "Pressure Measurements and Flow Visualization in a Squeeze Film Damper Operating with a Bubbly Mixture," ASME Journal of Tribology, **124**, pp. 346-350. ([ASME Paper 2001-TRIB-118](#))
- 75 San Andrés, L., and **D. Wilde**, 2001, "Finite Element Analysis of Gas Bearings for Oil-Free Turbomachinery," Revue Européenne des Eléments Finis, **10** (6/7), pp. 769-790.
- 74 San Andrés, L., **S. Diaz**, and **L. Rodriguez**, 2001, "Sine Sweep Load Versus Impact Excitations and their Influence on the Damping Coefficients of a Bubbly Oil Squeeze Film Damper," Tribology Transactions, **44**, pp. 692-698, 2001 (Paper STLE 01-NP-18).
- 73 **Diaz, S.**, and L. San Andrés, L., 2001, "A Model for Squeeze Film Dampers Operating with Air Entrainment and Validation with Experiments," ASME Journal of Tribology, **123**, pp. 125-133. (ASME Paper 2000-Trib-207).
- 71 **Diaz, S.**, and L. San Andrés, 2001, "Air Entrainment Versus Lubricant Vaporization in Squeeze Film Dampers: An Experimental Assessment of their Fundamental Differences," ASME Journal of Gas Turbines and Power, **123**, pp. 871-877, 2001. (ASME Paper 99-GT-187).
- 70 **Faria, M.**, and L. San Andrés, 2000, "On the Numerical Modeling of High Speed Hydrodynamic Gas Bearings," ASME Journal of Tribology, **122**, pp. 124-130. ([ASME Paper 99-TRIB-2](#))
- 69 San Andrés, L., 2000, "Bulk-Flow Analysis of Hybrid Thrust Bearings for Process Fluid Applications," ASME Journal of Tribology, **122**, pp. 170-180. ([ASME Paper 99-TRIB-20](#))
- 68 Tao, L., **S. Diaz**, L. San Andrés, and K.R. Rajagopal, 2000, "Analysis of Squeeze Film Dampers Operating with Bubbly Lubricants" ASME Journal of Tribology, **122**, pp. 205-210. ([ASME Paper 99-TRIB-33](#)).
- 67 **Li, J.**, L. San Andrés, **R. Aguilar**, and J.M. Vance, 2000, "Dynamic Force Coefficients of a Multiple-Blade, Multiple-Pocket Gas Damper Seal: Test Results and Analytical Validation," ASME Journal of Tribology, **122**, pp. 317-322. ([ASME Paper 99-TRIB-35](#)).
- 66 **Diaz, S.**, and L. San Andrés, 1999, "A Method for Identification of Bearing Force Coefficients and its Application to a Squeeze Film Damper with a Bubbly Lubricant," STLE Tribology Transactions, **42**, pp. 739-746. ([STLE Paper 99-AM-5](#))
- 65 **Zirkelback, N.**, and L. San Andrés, 1999, "Effect of Frequency Excitation on the Force Coefficients of Spiral Groove Thrust Bearings and Face Gas Seals," ASME Journal of Tribology, **121**, pp. 853-863. ([ASME Paper 98-TRIB-12](#))
- 64 **Diaz, S.**, and L. San Andrés, 1999, "Reduction of the Dynamic Load Capacity in a Squeeze Film Damper Operating with a Bubbly Lubricant", ASME Journal of Gas Turbines and Power Vol. **121**, pp. 703-709 ([ASME Paper 98-GT-109](#)).
- 63 **De Santiago, O.**, San Andrés, L., and J. Oliveras, 1999, "Imbalance Response of a Rotor Supported on Open-Ends, Integral Squeeze Film Dampers," ASME Journal of Engineering for Gas Turbines and Power, Vol. **121**, 4, pp. 718-724 ([ASME Paper 98-GT-006](#))
- 62 **Ransom, D.**, and L. San Andrés, 1999, "Identification of Force Coefficients from a Gas Annular Seal, Effect of Transition Flow Regime to Turbulence," Tribology Transactions, 42, 3, pp. 487-494 ([STLE Paper No. 98-NP-5G-3](#))
- 61 **Li, J.**, **D. Ransom, D.**, L. San Andrés, and J.M. Vance, 1999, "Comparison of Predictions with Test Results for Rotordynamic Coefficients of a Four-Pocket Gas Damper Seal," ASME Journal of Tribology, Vol. **121**, 2, pp. 363-369 ([ASME Paper 98-TRIB-29](#))
- 60 **Ransom, D.**, **J. Li**, L. San Andrés, and J.M. Vance, 1999, "Experimental Force Coefficients for a Two-Bladed Labyrinth Seal and a Four-Pocket Damper Seal," ASME Journal of Tribology, Vol. **121**, 2, pp. 370-376 ([ASME Paper 98-TRIB-28](#))
- 59 **Li, J.**, San Andrés, L., and J. Vance, 1999, "Bulk Flow Analysis of Multiple-Pocket Gas Damper Seals," ASME

- Journal of Engineering for Gas Turbines and Power, Vol. 121, 2, pp. 355-362 ([ASME Paper 98-GT-013](#))
- 58 **Diaz, S.**, and L. San Andrés, 1998, "Measurements of Pressure in a Squeeze Film Damper with an Air/Oil Bubbly Mixture," STLE Tribology Transactions, Vol. 41, 2, pp. 282-288 ([STLE Paper 97-WTC-8](#))
- 57 **Jackson, M.**, and L. San Andrés, "Measurements of the Static Load (On Pad) performance and Pad Temperatures in a Flexure-Pivot Tilting Pad Bearing," STLE Tribology Transactions, Vol. 41, 2, pp. 225-232, 1998 (STLE Paper 97-WTC-7).
- 56 **Zirkelback, N.**, and L. San Andrés, "Finite Element Analysis of Herringbone Grooved Journal Bearings: A Parametric Study," ASME Journal of Tribology, Vol. 120, pp. 234-240, 1998 (ASME Paper 97-Trib-14).
- 55 **Lubell, D.**, and L., San Andrés, "Imbalance Response of a Test Rotor Supported on Squeeze Film Dampers," ASME Journal of Engineering for Gas Turbines and Power, Vol. 120, 2, pp. 397-404, 1998 (ASME Paper 97-GT-12).
- 54 **Arauz, G.**, and L. San Andrés, "Analysis of Two Phase Flow in Cryogenic Damper Seals, I: Theoretical Model," ASME Journal of Tribology, Vol. 120, pp. 221-227, 1998 (ASME Paper 97-Trib-12).
- 53 **Arauz, G.**, and L. San Andrés, "Analysis of Two Phase Flow in Cryogenic Damper Seals, II: Model Validation and Predictions," ASME Journal of Tribology, Vol. 120, pp. 228-233, 1998 (ASME Paper 97-Trib-13).
- 52 **Arauz, G.**, and L. San Andrés, "Experimental Force Response of a Grooved Squeeze Film Damper," Tribology International, Vol. 30, 1, pp. 77-86, 1997.
- 51 **Marquette, O.**, D. Childs, and L. San Andrés, "Eccentricity Effects on the Rotordynamic Coefficients of Plain Annular Seals: Theory Versus Experiment," ASME Journal of Tribology, Vol. 119, 3, pp. 443-448, 1997 (ASME Paper 96-TRIB-35).
- 50 **Walton, N.**, and L. San Andrés, "Measurement of Static Loading Versus Eccentricity in a Flexure-Pivot Tilting Pad Journal Bearings," ASME Journal Of Tribology, Vol. 119, 2, pp. 297-305, 1997 (ASME Paper 96-TRIB-23).
- 49 San Andrés, L., and D. Childs, "Angled Injection - Hydrostatic Bearings, Analysis and Comparison to Test Results," ASME Journal of Tribology, Vol. 119, 1, pp. 179-187, 1997 (ASME Paper 96-TRIB-10).
- 48 San Andrés, L., "Transient Response of Externally Pressurized Fluid Film Bearings," STLE Tribology Transactions, Vol. 40, 1, pp. 147-155, 1997 (STLE Paper 96-TC-3A-1).
- 47 **Zirkelback, N.**, and L. San Andrés, "Bulk-Flow Model for the Transition to Turbulence Regime in Annular Seals," STLE Tribology Transactions, Vol.39, 4, pp. 835-842, 1996 (STLE Paper 96-AM-7B-3)
- 46 **Arauz, G.**, and L. San Andrés, "Experimental Study on the Effect of a Circumferential Feeding Groove on the Dynamic Force Response of a Sealed Squeeze Film Damper," ASME Journal of Tribology, Vol. 118, 4, pp. 900-905, 1996, (ASME Paper 95-Trib-50).
- 45 San Andrés, L., "Theoretical and Experimental Comparisons for Damping Coefficients of a Short Length Open End Squeeze Film Damper," ASME Journal of Engineering for Gas Turbines and Power, Vol. 118, 4, pp. 810-815, 1996 (ASME Paper 95-GT-98).
- 44 San Andrés, L., **Yang, Z.**, and D. Childs, "Thermal Effects in Liquid Oxygen Hybrid Bearings," STLE Tribology Transactions, Vol. 39, 3, pp. 654-662, 1996 (STLE Paper 95-TC-3A-1).
- 43 San Andrés, L., "Turbulent Flow, Flexure-Pivot Hybrid Bearings for Cryogenic Applications," ASME Journal of Tribology, Vol. 118, 1, pp. 190-200, 1996 (ASME Paper 95-TRIB-14).
- 42 San Andrés, L., **Yang, Z.**, and D. Childs, "Turbulent Flow Hydrostatic Bearings: Analysis and Experimental Results," International Journal of Mechanical Sciences, Vol. 37, 8, pp. 815-829, 1995.
- 41 **Yang, Z.**, L. San Andrés and D. Childs, "Thermohydrodynamic Analysis of Process Liquid Hydrostatic Bearings in Turbulent Regime, Part I: The Model and Perturbation Analysis," ASME Journal of Applied Mechanics, Vol. 62, 3, pp. 674-679, 1995.
- 40 **Yang, Z.**, L. San Andrés and D. Childs, "Thermohydrodynamic Analysis of Process Liquid Hydrostatic Bearings in Turbulent Regime, Part II: Numerical Solution and Results," ASME Journal of Applied Mechanics, Vol. 62, 3, pp. 680-684, 1995.
- 39 San Andrés, L., "Thermohydrodynamic Analysis of Fluid Film Bearings for Cryogenic Applications," AIAA Journal of Propulsion and Power, Vol. 11, 5, pp. 964-972, 1995.
- 38 **Hill, D.**, E. Baskharone, and L. San Andrés, "Inertia Effects in a Hybrid Bearing with a 45 degree Entrance Region," ASME Journal of Tribology, Vol. 117, 3, pp. 498-505, 1995.
- 37 San Andrés, L., "Turbulent Flow Foil Bearings for Cryogenic Applications," ASME Journal of Tribology, Vol. 117, 1, pp. 185-195, 1995 (ASME Paper 94-TRIB-33).
- 36 **Franchek, N.**, D. Childs, and L. San Andrés, "Theoretical and Experimental Comparisons for Rotordynamic Coefficients of a High-Speed, High-Pressure, Orifice-Compensated Hybrid Bearings," ASME Journal of Tribology, Vol. 117, 2, pp. 285-290, 1995 (ASME Paper 94-TRIB-43).
- 35 **Semanate J.**, and L. San Andrés, "Thermal Analysis of Locked Multi - Ring Oil Seals," Tribology International, Vol. 27, 3, pp. 197-206, 1994.

- 34 San Andrés, L., "Dynamic Force Response of Spherical Hydrostatic Journal Bearings for Cryogenic Applications", STLE Tribology Transactions, Vol. 37, 3, pp. 463-470, 1994.
- 33 **Arauz, G.**, and L. San Andrés, "Effect of a Circumferential Feeding Groove on the Force Response of a Short Squeeze Film Damper," ASME Journal of Tribology, Vol. 116, 2, pp. 369-377, 1994, (ASME Paper 93-Trib-15).
- 32 **Yang, Z.**, L. San Andrés, and D. Childs, "Dynamic Force Performance of Gas Seals at Off-Center Conditions," STLE Tribology Transactions, Vol. 37, 1, pp. 33-44, 1994. (STLE Paper 93-AM-4D-1)
- 31 **Semanate, J.** and San Andrés, L., "Analysis of Multi-Land High Pressure Oil Seals," STLE Tribology Transactions, Vol. 36, 4, pp. 661-669, 1993.
- 30 San Andrés, L., "The Effect of Journal Misalignment on the Operation of a Turbulent Hydrostatic Bearing," ASME Journal of Tribology, Vol. 115, 3, pp. 355-363, 1993.
- 29 San Andrés, L., **Yang, Z.** and Childs, D., "Thermal Effects in Cryogenic Liquid Annular Seals, I: Theory and Approximate Solutions", ASME Journal of Tribology, Vol. 115, 2, pp. 267-276, 1993 (ASME Paper 92-TRIB-4).
- 28 **Yang, Z.**, San Andrés, L. and Childs, D., "Thermal Effects in Cryogenic Liquid Annular Seals, II: Numerical Solution and Results", ASME Journal of Tribology, Vol. 115, 2, pp. 277-284, 1993 (ASME Paper 92-TRIB-5).
- 27 San Andrés, L., Meng, G. and Yoon, S., "Dynamic Force Response of an Open Ended Squeeze Film Damper," ASME Journal of Engineering for Gas Turbines and Power, Vol. 115,2, pp. 341-343, 1993.
- 26 **Cardon, B.P.**, Vance, J.M., San Andrés, L. and Storace, A., "A Gas Operated Damper for Turbomachinery," ASME Journal of Engineering for Gas Turbines and Power, Vol. 115,2, pp. 383-389, 1993 (ASME Paper 91-GT-249).
- 25 San Andrés, L., "Effect of Shaft Misalignment on the Dynamic Force Response of Annular Pressure Seals," STLE Tribology Transactions, Vol. 36, 2, pp. 173-182, 1993 (STLE Paper 92-AM-8B-2).
- 24 San Andrés, L., **Yang, Z.** and Childs D., "Importance of Heat Transfer from Fluid Film to Stator in Turbulent Flow Annular Seals," WEAR, Vol. 160, pp. 269-277, 1993.
- 23 San Andrés, L., and **G. Arauz**, "Experimental Pressures and Film Forces in a Squeeze Film Damper," ASME Journal of Tribology, Vol. 115, pp.134-140, 1993.
- 22 San Andrés, L., "Dynamic Force and Moment Coefficients for Short Length Annular Seals, ASME Journal of Tribology, Vol. 115, 1, pp. 61-70, 1993.
- 21 **Kurtin, K.**, Childs, D., San Andrés, L. and Hale, K., "Experimental versus Theoretical Characteristics of a High Speed Hybrid (combination Hydrostatic and Hydrodynamic) Bearing," ASME Journal of Tribology, Vol. 115, 1, pp. 160-169, 1993 (ASME Paper 91-TRIB-35).
- 20 San Andrés, L., "Analysis of Turbulent Hydrostatic Bearings with a Barotropic Fluid," ASME Journal of Tribology, Vol. 114, 4, pp. 755-765, 1992.
- 19 San Andrés, L., "Analysis of Hydrostatic Journal Bearings with End Seals," ASME Journal of Tribology, Vol. 114, 4, pp. 802-811, 1992.
- 18 San Andrés, L., "Analysis of Short Squeeze Film Dampers with a Central Groove," ASME Journal of Tribology, Vol. 114, 4, pp. 659-665, 1992 (ASME Paper 91-TRIB-46).
- 17 San Andrés, L., and **Velthuis, J.M.**, "Laminar Flow in a Recess of a Hydrostatic Bearing," STLE Tribology Transactions, Vol. 35, 4, pp. 738-744, 1992.
- 16 San Andrés, L., "Analysis of Variable Fluid Properties, Turbulent Annular Seals," ASME Journal of Tribology, Vol. 113, pp. 694-702, 1991.
- 15 San Andrés, L., "Effect of Eccentricity on the Force Response of a Hybrid Bearing," STLE Tribology Transactions, Vol. 34, 4, pp. 537- 544, 1991.
- 14 San Andrés, L., "Fluid Compressibility Effects on the Dynamic Response of Hydrostatic Journal Bearings," WEAR, Vol. 146, pp. 269-283, 1991.
- 13 San Andrés, L., **Jung, S.Y.** and Vance, J., "Measurements of Pressure Distributions in a Squeeze Film Damper, I- Fully Open Ended Configuration," STLE Tribology Transactions, Vol. 34, No. 3, pp. 375-382, 1991.
- 12 San Andrés, L., **Jung, S.Y.** and Vance, J., "Measurements of Pressure Distributions in a Squeeze Film Damper, II- Partially Sealed Configuration," STLE Tribology Transactions, Vol. 34, No. 3, pp. 383-389, 1991.
- 11 San Andrés, L., "Turbulent Hybrid Bearings with Fluid Inertia Effects", ASME Journal of Tribology, Vol. 112, pp. 699-707, 1990 (ASME Paper 90-TRIB-3).
- 10 San Andrés, L., "Approximate Analysis of Turbulent Hybrid Bearings. Static and Dynamic Performance for Centered Operation," ASME Journal of Tribology, Vol. 112, pp. 692-698, 1990 (ASME Paper 90-TRIB-4).
- 9 San Andrés, L., "Approximate Design of Statically Loaded Cylindrical Journal Bearings," ASME Journal of Tribology, Vol. 111, pp. 391-393, 1989.
- 8 San Andrés, L., "Effect of Fluid Inertia on Force Coefficients for the Long Squeeze Film Damper," STLE

- Tribology Transactions, Vol. 31, 2, pp. 371-375, 1988.
- 7 San Andrés, L. and Vance, J., "Effect of Fluid Inertia on the Performance of Squeeze Film Damper Supported Rotors," ASME Journal of Engineering for Gas Turbine and Power, Vol. 110, 1, pp. 51-57, 1988 (ASME Paper 87-GT-220).
 - 6 San Andrés, L. and Vance, J., "Experimental Measurement of the Dynamic Pressure Distribution in a Squeeze-Film Bearing Damper Executing Circular Centered Orbits," ASLE Transactions, Vol. 30, No. 3, pp. 373-383, 1987.
 - 5 San Andrés, L. and Vance, J., "Effect of Fluid Inertia on Finite Length Sealed Squeeze Film Dampers," ASLE Transactions, Vol. 30, No. 3, pp. 384-393, 1987
 - 4 San Andrés, L. and Vance, J., "Effect of Fluid Inertia on Squeeze Film Damper Forces for Small Amplitude Circular Centered Motions," ASLE Transactions, Vol. 30, No. 1, pp. 69-76, 1987.
 - 3 San Andrés, L. and Vance, J., "Force Coefficients for Open Ends Squeeze Film Dampers Executing Small Amplitude Motions About an Off-Centered Equilibrium Position," ASLE Transactions, Vol. 30, No. 1, pp. 63-68, 1987.
 - 2 San Andrés, L. and Vance, J., "Effects of Fluid Inertia and Turbulence on the Force Coefficients for Squeeze Film Dampers," ASME Journal of Engineering for Gas Turbines and Power, Vol. 108, pp. 332-339, 1986 (ASME Paper 85-GT-191).
 - 1 Szeri, A.Z. and San Andrés, A., "Flow Between Eccentric Rotating Cylinders," ASME Journal of Applied Mechanics, Vol. 106, pp. 869-878, 1984.

2. PUBLICATIONS OF BOOKS OR AUTHORITATIVE REFERENCES:

STLE Tribology Transactions: Handbook of Tribology: Chapter on Gas Lubrication (2010)

Modern Lubrication Theory (2009) L. San Andrés (**set of 14 lecture notes + predictive codes**)

Open Source: <http://rotorlab.tamu.edu/ME626>

Encyclopedia of Tribology: Squeeze Film Dampers, Cryogenic Fluid Film Bearings,

Edited by Q. Jane Wang & Yip-Wah Chung, Springer Science+Business Media, LLC, New York, 2009

von Karman Institute - RTO Lecture Series, RTO-MP-AVT-143,

DESIGN AND ANALYSIS OF HIGH SPEED PUMPS, 20-23 March 2006, Belgium.

NATO RTO-AVT-143, DESIGN AND ANALYSIS OF HIGH SPEED PUMPS,

ISBNs 92-837-0063-5 / 978-92-837-0063-0 (<http://www.rta.nato.int/pubs/rdp.asp?RDP=RTO-EN-AVT-143>)

San Andrés, L., Paper 9 - Introduction to Pump Rotordynamics

San Andrés, L., Paper 10 - Hydrodynamic fluid film bearings and their effect on the stability of rotating machinery

San Andrés, L., Paper 11 - Annular pressure seals and hydrostatic bearings

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

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, University 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.

3. OTHER PUBLICATIONS

A. Conference Proceedings - Peer Reviewed

Bold face: journal publication

- 55 Hung, W., San Andrés, L., and Leon, V.J., 2010, "Research Experiences for Undergraduates in

- Micromanufacturing,” Paper AC 2010-2373, ASEE Annual Conference and Exposition, Louisville, KY, June
- 54 San Andrés, L., and **Vistamehr, A.**, 2010, “Nonlinear Rotordynamics of Vehicle Turbochargers: Parameters Affecting Sub Harmonic Whirl frequencies and Their Jump,” Proc. of the 8th IFToMM International Conference on Rotordynamics, September 12-15, Seoul, Korea, Paper P-1115
- 53 San Andrés, L., **Camero, J., Muller, S., Chirathadam, T., and Ryu, K.**, 2010, “Measurements of Drag Torque, Lift Off Speed, and Structural Parameters in a 1st Generation Floating Gas Foil Bearing”, Proc. of the 8th IFToMM International Conference on Rotordynamics, September 12-15, 2010, Seoul, Korea, Paper WeD1-5.
ASME Turbo Expo 2010, June 2010, Glasgow, Scotland
- 52 San Andrés, L., **Ryu, K.**, and Kim, T-H, “Thermal Management and Rotordynamic Performance of a Hot Rotor-Gas Foil Bearings System. Part 1: Measurements”, **ASME paper GT2010-22981**
- 51 San Andrés, Kim, T-H, and **Ryu, K.**, “Thermal Management and Rotordynamic Performance of a Hot Rotor-Gas Foil Bearings System. Part 2: Predictions Versus Test Data,” **ASME paper GT2010-22983**
- 50 San Andrés, L., and **Chirathadam T.A.**, “Identification of Rotordynamic Force Coefficients of a Metal Mesh Foil Bearing Using Impact Load Excitations,” **ASME paper GT2010-22440**
- 49 Howard, S., and San Andrés, L., “A New Analysis Tool Assessment for Rotordynamic Modeling of Gas Foil Bearings,” ASME paper GT2010-22508
- 48 San Andrés, L., **Niu, Y.**, and **Ryu, K.**, “Dynamic Response of a Rotor-Hybrid Gas Bearing System Due To Base Induced Periodic Motions,” **ASME paper GT2010-22277**
ASME Turbo Expo 2009, June 2009, Orlando, FLA
- 47 San Andrés, L., Delgado, D., and Baker, J., “Rotordynamic Force Coefficients of a Hybrid Brush Seal: Measurements and Predictions,” **ASME Paper No. GT2009-59072**
- 46 San Andrés, L., Maruyama, A., Gjika, K., and Xia, S., “Turbocharger Nonlinear Response with Engine-Induced Excitations: Predictions and Test Data,” **ASME Paper No. GT2009-59108**
- 45 San Andrés, L., and Kim, T.H., “Thermohydrodynamic Analysis of Bump Type gas Foil Bearings: A Model Anchored to Test Data,” **ASME Paper No. GT2009-59919**
- 44 San Andrés, L., and Ryu, K., “Dynamic Forced Response of a Rotor-Hybrid Gas Bearing System Due to Intermittent Shocks,” **ASME Paper No. GT2009-59199**
- 43 San Andrés, L., Chirathadam, T. A., and Kim, T.H., “Measurements of Structural Stiffness and Damping Coefficients in a Metal Mesh Foil Bearing,” **ASME Paper No. GT2009-59315**
- 42 Delgado, D., and San Andrés, L., “Identification of Squeeze Film Damper Force Coefficients from Multiple-Frequency, Non-Circular Journal Motions,” **ASME Paper No. GT2009-59175**
- 41 San Andrés, L., Kim, T.H., Ryu, K., Chirathadam, T. A., Hagen, K., Martinez, A., Rice, B., Niedbalski, N., Hung, W., and Johnson, M., “Gas Bearing Technology for Oil-Free Microturbomachinery – Research Experience for Undergraduate (REU) Program at Texas A&M University,” **ASME Paper No. GT2009-59920**
ASME Turbo Expo 2008, June 2008, Berlin
- 40 **Kim, T.H.**, and San Andrés, L., 2008 “Effect of Side Pressurization on the Performance of Gas Foil Bearings – A Model Anchored to Test Data,” **ASME Paper GT2008-50571**
2008 Best PAPER Rotordynamics IGTI Structures and Dynamics Committee
- 39 San Andrés, L., **Baker, J.**, and **Delgado, A.**, 2008, “Measurements of Leakage and Power Loss in a Hybrid Brush Seal,” **ASME Paper GT2008-50532**
- 38 San Andrés, L., and **Ryu, K.**, 2008, “Hybrid Gas Bearings with Controlled Supply Pressure to Eliminate Rotor Vibrations while Crossing System Critical Speeds,” **ASME Paper GT2008-50393**
- 37 **Delgado, A.**, and San Andrés, L., 2008, “Nonlinear Identification of Mechanical Parameters on a Squeeze Film Damper with Integral Mechanical Seal,” **Paper GT2008-50528**
- 36 **Kim, T.H.**, San Andrés, L., and **Breedlove, A.**, 2008, “Characterization of Foil Bearing Structure for Increasing Shaft Temperatures: Part II – Dynamic Force Performance,” **Paper GT2008-50570**
- 35 **Kim, T.H.**, **Breedlove, A.**, and San Andrés, L., 2008, “Characterization of Foil Bearing Structure for Increasing Shaft Temperatures: Part I – Static Load Performance,” **Paper GT2008-50567**
2007, 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Cincinnati, OH, July 9-11,
- 34 San Andrés, L., and **T.H. Kim**, 2007, “Issues on Instability and Force Nonlinearity in Gas Foil Bearing Supported Rotors,” Paper AIAA-2007-5094.
- 33 San Andrés, L., 2007, “Start- up Response of Fluid Film Lubricated Cryogenic Turbo- Pumps,” Paper AIAA-2007-5093.

2007 ASME IDETC/CIE Conference, Las Vegas, Nevada, September, 4-7, 2007

- 32 Gjika, K., C. Groves, L. San Andrés, and G. LaRue, “Nonlinear Dynamic Behavior of Turbocharger Rotor-Bearing Systems with Hydrodynamic Oil Film and Squeeze Film Damper in Series: Prediction and Experiment,” [ASME Paper DETC2007-34136](#)

ASME Turbo Expo 2007, May 14-17, 2007, Montreal, Canada

- 31 San Andrés, L., and **A. Delgado**, “Squeeze film Damper with a Mechanical Seal: Experimental Force Coefficients Derived from Circular Centered Orbits,” [ASME Paper No GT2007-27436](#)
- 30 San Andrés, L., and **T-H Kim**, “Improvements to the Analysis of Gas Foil Bearings: Integration of Top Foil 1D and 2D Structural Models,” [ASME Paper No GT2007-27249](#)
- 29 San Andrés, L., and **K. Ryu**, “Flexure Pivot Tilting Pad Gas Bearings: Operation with Worn Clearances and Two Load-Pad Configurations,” [ASME Paper No GT2007-27127](#)

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

- 28 San Andrés, L., 2006, “Hybrid Flexure Pivot-Tilting Pad Gas Bearings: Analysis and Experimental Validation,” [Paper IJTC 2006-12026](#)
- 27 San Andrés, L., **J.C. Rivadeneira**, K. Gjika, C. Groves, and G. LaRue, 2006, “Rotordynamics of Small Turbochargers Supported on Floating Ring Bearings – Highlights in Bearing Analysis and Experimental Validation,” [Paper IJTC 2006-12001](#)
- 26 San Andrés, L., and **A. Delgado**, 2006, “Identification of Force Coefficients in a Squeeze Film Damper with a Mechanical Seal, Centered Circular Orbit Tests,” [Paper IJTC 2006-12041](#).

ASME Turbo Expo 2006, May 8-11, 2006, Barcelona, Spain

- 25 San Andrés, L., **D. Rubio**, and **T.H. Kim**, 2006, “Rotordynamic Performance of a Rotor Supported on Bump Type Foil Gas Bearings: Experiments and Predictions,” [ASME Paper GT 2006-91238](#)
- 24 San Andrés, L., and **A. Delgado**, 2006, “Identification of Force Coefficients in a Squeeze Film Damper with a Mechanical Seal. I: Unidirectional Load Tests,” [ASME Paper GT 2006-90782](#)
- 23 San Andrés, L., **J.C. Rivadeneira**, K. Gjika, C. Groves, and G. LaRue, 2006, “A Virtual Tool for Prediction of Turbocharger Nonlinear Dynamic Response: Validation Against Test Data,” [ASME Paper GT 2006-90873](#)

2005 ASME IDETC/CIE Conference, Long Beach, CA, September 24-28, 2005

- 22 **Delgado, A.**, and L. San Andrés, 2005, “Identification of Structural Stiffness and Damping in a Shoed Brush Seal,” [ASME Paper DETC 2005-84159](#), Proceedings of IDETC/CIE 2005, ASME 2005 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, September 24-28, Long Beach, California

ASME Turbo Expo 2005, May 2005, Reno, NV

- 21 **Rubio, D.**, and L. San Andrés, 2005, “Structural Stiffness, Dry-Friction Coefficient and Equivalent Viscous Damping in a Bump-Type Foil Gas Bearing,” [ASME Paper GT 2005-68384](#). **2005 Best PAPER Rotordynamics IGTI Structures and Dynamics Committee**
- 20 **Kim, T.H.**, and L. San Andrés, 2005, “Heavily Loaded Gas Foil Bearings: a Model Anchored to Test Data,” [ASME Paper GT 2005-68486](#).
- 19 San Andrés, L., **J.C. Rivadeneira**, M. Chinta, K. Gjika, G. LaRue, 2005, “Nonlinear Rotordynamics of Automotive Turbochargers – Predictions and Comparisons to Test Data,” [ASME Paper GT 2005-68177](#)
- 18 **Zhu, X.**, and L. San Andrés, 2005, “Experimental Response of a Rotor Supported on Rayleigh Step Gas Bearings,” [ASME Paper GT 2005-68296](#).
- 17 **Delgado, A.**, L., San Andrés, 2005, “Measurements of Leakage, Structural Stiffness and Energy Dissipation Parameters in a Shoed Brush Seal,” 4th EDF/LMS Poitiers Workshop “*Advanced Topics and Technical Solutions In Dynamic Sealing*” FUTUROSCOPE, France, October 6, 2005
- 16 **De Santiago, O.**, and L., San Andrés, 2004, “Identification of Bearing Force Coefficients in Flexible Rotor Systems”, Eighth International Conference on Vibrations in Rotating Machinery, September 7th to 9th, 2004, University of Wales, Swansea, Wales, UK

2004 ASME Turbo Expo, Vianan, Austria

- 15 **Zhu, S.** and L., San Andrés, 2004, "Rotordynamic Performance of Flexure Pivot Hydrostatic Gas Bearings for Oil-Free Turbomachinery," [ASME Paper GT 2004-53621](#)
- 14 **Delgado, A., L.,** San Andrés, and J. Justak, 2004, "Analysis of Performance and Rotordynamic Force Coefficients of Brush Seals with Reverse Rotation Ability", [ASME Paper GT 2004-53614](#)
- 13 **De Santiago, O.,** and L., San Andrés, 2004, "Identification of Bearing Force Coefficients from Measurements of Imbalance Response of a Flexible Rotor", [ASME Paper GT 2004-54160](#)
- 12 **Wilde, D.,** and L., San Andrés, 2004, "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," [ASME Paper GT 2004-54183](#).
- 12 **Rubio, D.,** and L., San Andrés, 2004, "Bump-Type Foil Bearing Structural Stiffness: Experiments and Predictions", [ASME Paper No GT2004-53611](#)
- 2003 ASME IDETC/CIE Conference, Chicago, IL September 2003**
- 11 **Holt, C., L.** San Andrés, S. Sahay, P. Tang, G. LaRue, and K. Gjika, 2003, "Test Response of a Turbocharger Supported on Floating Ring Bearings – Part I: Assessment of Subsynchronous Motions," [ASME Paper DETC 2003/VIB-48418](#), Proceedings of the 19th Biennial Conference on Mechanical Vibration and Noise," Chicago (IL), September, 2003.
- 10 **Holt, C., L.** San Andrés, S. Sahay, P. Tang, G. LaRue, and K. Gjika, 2003, "Test Response of a Turbocharger Supported on Floating Ring Bearings – Part II: Comparisons to Nonlinear Rotordynamic Predictions," [ASME Paper DETC 2003/VIB-48419](#), Proceedings of the 19th Biennial Conference on Mechanical Vibration and Noise," Chicago (IL), September 2003.
- 9 San Andrés, L., 2001, "A Hybrid Bearing with Improved Rotordynamic Stability," 1st International Conference in Rotordynamics of Machinery, ISCORMA1, Lake Tahoe, NV, Paper 2006, August 2001 (CD only).
- 8 Naranjo, J., **C. Holt, and L. San Andrés,** 2001, "Dynamic Response of a Rotor Supported in a Floating Ring Bearing., 1st International Conference in Rotordynamics of Machinery, ISCORMA1, Paper 2005, August 2001 (CD only).
- ASME Turbo Expo 2000, Munich, Germany, June 2000**
- 7 **Diaz, S.** and L. San Andrés, 2000, "Orbit-Based Identification of Damping Coefficients on Off-Centered Squeeze Film Dampers Including Support Flexibility," [ASME Paper 2000-GT-0394](#).
- 6 **De Santiago, O.,** and L. San Andrés, 2000, "Dynamic Response of a Rotor-Integral Squeeze Film Damper to Couple Imbalances," [ASME Paper 2000-GT-0388](#).
- ASME Turbo Expo 1999**
- 5 **De Santiago, O.,** and L. San Andrés, 1999, "Imbalance Response and Damping Force Coefficients of a Rotor Supported on End Sealed Integral Squeeze Film Dampers," [ASME Paper 99-GT-203](#)
- 4 Vance, J.M., and L. San Andrés, 1999, "Analysis of Actively Controlled Coulomb Damping for Rotating Machinery," [ASME Paper 99-GT-175](#), 1999.
- 3 **Robison, M.,** G. Arauz, and L. San Andrés, 1995, "A Test Rig for the Identification of Rotordynamic Coefficients of Fluid Film Bearings," ASME Paper 95-GT-431. **ASME Turbo Expo 1995**
- 2 San Andrés, L. and Scharrer, J., 1992, "The Axisymmetrically Stepped, Orifice Compensated Hydrostatic Bearing", AIAA Paper 92-3405, 28th AIAA/SAE/ASME/ASEE Joint Propulsion Conference, Nashville, Tennessee, July 6-8, 1992.
- 1 San Andrés, L., Meng, G. and Vance, J., 1991, "Experimental Measurement of the Dynamic Pressure and Force Response of a Partially Sealed Squeeze Film Damper," 13th Biennial Conference on Mechanical Vibration and Noise, Miami, FLA. Rotating Machinery and Vehicle Dynamics, ASME Publication, DE-Vol. 35, pp. 251-256, September 1991.

B Conference Proceedings - Not Peer Reviewed & other publications

- 39 San Andrés, L., Kim, T.H., **Chirathadam, T.A.,** and **Ryu, K.,** 2009, "Measurements of Drag Torque, Lift-Off Journal Speed and Temperature in a Metal Mesh Foil Bearing," American Helicopter Society 65th Annual Forum, Grapevine, Texas, May 27-29, 2009.
- 38 San Andrés, L., and Kim, T.H., 2009, "Thermohydrodynamic Model Predictions and Performance Measurements of Bump-type Foil Bearing for Oil-Free Turbohaft Engines in Rotorcraft Propulsion Systems," American

- 37 San Andrés, L., Phillips, S., and Childs, D., 2008, "Static Load Performance of a Hybrid Thrust Bearing: Measurement and Validation of Predictive Tool," 6th Modeling and Simulation Subcommittee / 4th Liquid Propulsion Subcommittee / 3rd Spacecraft Propulsion Subcommittee Joint Meeting. December 8-12, Orlando, Florida, JANNAF-120 Paper (Paper of restricted distribution – Joint Army, Navy, Nasa, Air Force Interagency Propulsion Committee)
- 36 Kim, T. H., and San Andrés, L., 2008, "Gas Foil Bearings for Oil-Free Microturbomachinery: Effect of Mechanical Preloads on the Rotordynamic Performance," *US-Korea Conference (UKC) 2008 on Science, Technology, and Entrepreneurship*, San Diego, CA.
- 35 San Andrés, L., **Baker, J.**, and **Delgado, A.**, 2007, "Measurements of Leakage and Power Loss in a Hybrid Brush Seal," Proceedings of 6th EDF/LMS Poitiers Workshop, Universite de Poitiers, France, September 27.
- 34 San Andrés, L., **J.C. Rivadeneira**, K. Gjika, C. Groves, and G. LaRue, 2006, "Rotordynamics of Small Turbochargers Supported on Floating Ring Bearings: Highlights in Bearing Analysis and Experimental Validation," Paper CELT06-76, Memorias del IX Congreso y Exposición Latinoamericana de Turbomaquinaria, Boca del Río Veracruz, Mexico, June 22-23, 2006, ISBN 968-6114-20-3
- 33 San Andrés, L., and **A. Delgado**, 2006, "Identification of Force Coefficients in a Squeeze Film Damper with a Mechanical End Seal," Paper CELT06-74, Memorias del IX Congreso y Exposición Latinoamericana de Turbomaquinaria, Boca del Río Veracruz, Mexico, June 22-23, 2006, ISBN 968-6114-20-3
- 32 San Andrés, L., **A. Delgado**, and J. Justak, 2005, "Measurements of leakage, structural stiffness and energy dissipation parameters in a shoed brush seal," *Sealing Technology*, December, (Elsevier Pubs)
- 31 San Andrés, L., 2005, HYBRID GAS BEARINGS FOR OIL-FREE TURBOMACHINERY: EXPERIMENTS AND MODEL VALIDATION, 1st International Conference on Experiments/Process/System Modeling/Simulation/Optimization, Athens, Greece, July 6-9
- 30 **Rubio, D.**, and L. San Andrés, 2005, "Identification of Structural Parameters in a Bump-Type Foil Gas Bearing," DMI-NSF Grantees Conference, Prescott, Arizona, January
- 29 San Andrés, L., 2004, "Análisis no lineal de la respuesta dinámica de turbocargadores y validación experimental", Proceedings of the IX Encuentro de Matematica y sus Aplicaciones, Escuela Politécnica Nacional, Quito, Ecuador, July 19-23.
- 28 San Andrés, L., 2004, "Identificación de parámetros en soportes de maquinaria rotativa", Proceedings of the IX Encuentro de Matematica y sus Aplicaciones, Escuela Politécnica Nacional, Quito, Ecuador, July 19-23.
- 27 **De Santiago, O.**, and L., San Andrés, 2004, "Identification of Bearing Force Coefficients from Measurements of Imbalance Response of a Flexible Rotor", reproduction of ASME Paper GT 2004-54160, *INSIGHTS*, a publication of the Dresser-Rand Co., Vol. 7, 1, pp. 14-20.
- 26 San Andrés, L., 2004, "Gas bearings Will Soon be Widely Used," *Research makes a difference, Turbomachinery International*, Vol. 45, 3, pp. 35.
- 25 **Rubio, D.**, and L. San Andrés, 2003, "Identification of Structural Stiffness in a Bump-Type Foil Bearing," Proceedings of the VII Congreso y Exposición Latinoamericana de Turbomaquinaria, Veracruz, Mexico, October.
- 24 **Delgado, A.**, L. San Andrés, and J. Justak, 2003, "Identification of Stiffness and Damping Coefficients in a Shoed Brush Seal," Proceedings of the VII Congreso y Exposición Latinoamericana de Turbomaquinaria, Veracruz, Mexico, October.
- 23 **De Santiago, O.**, L. San Andrés, and D. Wilde, 2003, "Gas Bearings for Turbocharger Applications," Proceedings of the VII Congreso y Exposición Latinoamericana de Turbomaquinaria, Veracruz, Mexico, October.
- 22 San Andrés, L., "Squeeze Film Dampers, A History of their Technological Development," De Appel Nr. 3, pp. 11-13, February 2000 (Magazine from the Isaac Newton Mechanical Engineering Student Society at Universiteit Twente).
- 21 **Beets, T.**, **S. Diaz**, and L. San Andrés, "Pressure Measurement and Flow Visualization on a SFD Operating With a Bubbly Lubricant," Proceedings of the 2000 NSF Design & Manufacturing Research Conference, CD rom, Vancouver, Canada, January 3-6, 2000 (Award number 9820845 CMS).
- 20 San Andrés, L., and **S. Diaz**, "Effects of Bubbly Oil on Squeeze Film Damper Force Performance," Proceedings of the VI PACAM Conference, Rio de Janeiro, Brazil, January 1999, Applied Mechanics in the Americas, Volume 8, Dynamics, pp. 1523-1526.
- 19 **Diaz, S.**, and L. San Andrés, "Noise Related to Mechanical Vibration and Repeated Impacts in a Computer Fan, an Example of a Chaotic Dynamic System," Proceedings of the VI PACAM Conference, Rio de Janeiro, Brazil, January 1999, Applied Mechanics in the Americas, Volume 8, Dynamics, pp. 1243-1246.
- 18 Merino, A., J. Perea, F. Baquero, and L. San Andrés, "Vibración Subsíncrona en Compresor Centrifugo con Cambio de Sellos," Memorias del VII Congreso Latinoamericano de Turbomaquinaria, Veracruz, Mexico, November

- 1998.
- 17 **Diaz, S.**, and L. San Andrés, "A Method for Identification of Bearing Force Coefficients and its Application to Squeeze Film Damper with a Bubbly Lubricant," *Memorias del VII Congreso Latinoamericano de Turbomaquinaria*, pp. 49-55, Veracruz, Mexico, November 1998.
 - 16 **De Santiago, O.**, and L. San Andrés, "Measurements of the Synchronous Response of a Rotor Supported on Integral Squeeze Film Dampers: Couple Imbalance Experiments," *Memorias del VII Congreso Latinoamericano de Turbomaquinaria*, pp. 43-47, Veracruz, Mexico, November 1998.
 - 15 **Diaz, S.**, and L. San Andrés, "Effects of Bubbly Flow on the Dynamic Pressure Fields of a Test Squeeze Film Damper," ASME Fluids Engineering Division Summer Meeting (FEDSM'98), Washington, DC June 1998, Paper FEDSM98-5070.
 - 14 **Lubell, D.**, and L. San Andrés, "Imbalance Response of a Squeeze Film Damper Supported Rotor," *Memorias del VI Congreso Latinoamericano de Turbomaquinaria*, Mexico, Mexico, November, pp. 89-96, 1997.
 - 13 Zeidan, F., L. San Andrés, and J. Vance, "Design and Application of Squeeze Film Dampers in Rotating Machinery," *Proceedings of the 25th Turbomachinery Symposium*, Turbomachinery Laboratory, Texas A&M University, September, pp. 169, 188, 1996.
 - 12 San Andrés, L., and D. Childs, "Angled Injection, Turbulent Flow Hybrid Bearings, Comparison to Test Results," *Proceedings of the 8th Workshop on Rotordynamic Instability Problems in High-Performance Turbomachinery*, Texas A&M University, 1996.
 - 11 **Lopez, A.**, L. San Andrés, and F. Baquero, "Effect of Pressurization on a Squeeze Film Damper: Experimental Results," *Memorias del V Congreso Latinoamericano de Turbomaquinaria*, Acapulco, Mexico, November, pp. 231-238, 1995.
 - 10 Baquero, F., Santiago, O., Merino, A., and L. San Andrés, "Efecto Rotodinamico de la Sustitucion de Sellos de Aceite por Sellos Secos en un Compresor Centrifugo," *Memorias del V Congreso Latinoamericano de Turbomaquinaria*, Acapulco, Mexico, November, pp. 225-230, 1995.
 - 9 **Yang, Z.**, L. San Andrés, and D. Childs, "Process Liquid Turbulent Flow Hydrostatic Bearings: Analysis and Tests for Rotordynamic Coefficients," *Proceedings of the 4th International IFToMM Rotordynamics Conference*, Chicago, September, pp. 233-242, 1994.
 - 8 **Sundarajan, P.**, S. Noah, and L. San Andrés, "Fluid Inertia Effects on the Non-Linear Response of a Rigid Rotor Supported on Squeeze Film Dampers," *Proceedings of the 4th International IFToMM Rotordynamics Conference*, Chicago, September, pp.333-340, 1994.
 - 7 San Andrés, L., "Analysis of Exotic Geometry Hybrid Fluid Film Bearings," *III Encuentro Fisica, Matematicas, Informatica y sus Aplicaciones*, EPN, Quito, Ecuador, July, pp. 41-58, 1994.
 - 6 San Andrés, L., and **Yang, Z.**, "Thermohydrodynamic Analysis of Fluid Film Bearings for Cryogenic Applications," *Proceedings of the 6th NASA Conference on Advanced Earth-to-Orbit Propulsion Technology*, Huntsville, Alabama, May, NASA CP 3282, Vol. II, pp. 421-430, 1994.
 - 5 San Andrés, L., "Analysis of Arbitrary Recess Geometry Hydrostatic Bearings," *Proceedings of the 6th NASA Conference on Advanced Earth-to-Orbit Propulsion Technology*, Huntsville, Alabama, May, NASA CP 3282, Vol. II, pp. 431-441, 1994.
 - 4 **Semanate J.**, and San Andrés, L., "A Quasi-Static Method for the Calculation of Lock-up Conditions in Floating Ring Oil Seals," *Proceedings of the IV Congreso Latinoamericano de Turbomaquinaria*, Queretaro, Mexico, December, pp. 55-64, 1993.
 - 3 San Andrés, L., and **Arauz, G.**, "Experimental Study of a Groove Squeeze Film Damper," , *Proceedings of the III Congreso Latinoamericano de Turbomaquinaria*, Cuernavaca, Mexico, February, pp. 11-18, 1993.
 - 2 San Andrés, L., **Yang, Z.** and Childs, D., "Thermohydrodynamic Analysis of Cryogenic Liquid Annular Seals," *5th NASA Conference on Advanced Earth-to-Orbit Propulsion Technology*, Huntsville, Alabama, May, NASA CP 3174, Vol. I, pp. 468-487, 1992.
 - 1 San Andrés, L., "Improved Analysis of High Speed, Turbulent Hybrid Bearings," *4th NASA Conference on Advanced Earth-to-Orbit Propulsion Technology*, Huntsville, Alabama, May, NASA CP 3092, Vol. II, pp. 414-431, 1990.

C Extended Abstracts

San Andrés, L. and **K. Ryu**, 2009, "Experimental Structural Stiffness and Damping in a 2nd Generation Foil Bering for Increasing Shaft Temperatures, ASME/STLE International Joint Tribology Conference, IJTC2009-15188, October 19-21, 2009, Memphis, Tennessee, USA

Kim, T.H., L. San Andrés , J. Nourse, J.L. Wade, and D. Lubell, 2009, "Modeling of a Gas Foil Bearing for

- Microturbine Applications: Predictions versus Experimental Stiffness and Damping Force Coefficients,” World Tribology Congress 2009, Kyoto, Japan, September 6-11, 2009
- Delgado, A., and L. San Andrés, 2009, “Identification of Force Coefficients in a Squeeze Film Damper with a Mechanical Seal: Large Seal Contact Force,” World Tribology Congress 2009, Kyoto, Japan, September 6-11, 2009
- San Andrés, L., Ashton, Z., and Delgado, A., 2009, “Comparison of Leakage Performance in Three Types of Gas Annular Seals Operating at High Temperature”, 2009 STLE Annual Meeting & Exhibition, May 17-21, 2009, Disney’s Coronado Springs Resort, Orlando, Florida, USA
- Kim, T.H.**, and L. San Andrés, 2008, “Effect of Mechanical Preloads on the Dynamic Performance of Gas Foil Bearings”, Paper IJTC2008-71195, STLE/ASME International Joint Tribology Conference, Miami, Fla, October 2008
- San Andrés, L., Baker, J., and Delgado, A., 2008, “Measurement of Leakage and Identification of Structural Force Coefficients in a Hybrid Brush Seal,” STLE Annual Meeting & Exhibition, Cleveland, OH, May 19-21.
- 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 Diego, CA, October 2007
- 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, ASME/STLE International Joint Tribology Conference, San Antonio, TX, October 2006
- 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
- 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 World Tribology 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

C. TECHNICAL REPORTS

Research Progress Reports to Funding Agencies and Companies

Monthly progress reports to Honeywell Turbocharging Systems, 2004-2008, Northrop-Grumman, 2005-2007, Pratt & Whitney, 2008-2009.

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)

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

- San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year XVI, 2006/2007, June 2007.
- 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
- San Andrés, L., and **A. Delgado**, "Parameter Identification of an End Sealed SFD: Improved Predictions of Added Mass and Damping Coefficients for Grooved SFDs and Oil Seals," TRC-SFD-2-07

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

Delgado, A., and L. San Andrés, Identification of Force Coefficients in a Squeeze Film Damper with a Mechanical Seal, TRC-SFD-1-05

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

San Andrés, L., Editor, “Research on Fluid Film Bearings, Tribology Group,” Year XII, 2002/2003, May 2003.

San Andrés, L., “A Method for Identification of Force Coefficients in Flexible Rotor-Bearing Systems,” TRC-B&C-2-03.

San Andrés, L., “Journal bearing Force Coefficients under High Dynamic Loading – Experimental Results,” TRC-B&C-3-03.

San Andrés, L., and **X. Zhu**, “Experimental Response of a Rotor Supported on Flexure Pivot Hydrostatic Pad Gas Bearings,” TRC-B&C-4-03.

Rubio, D. and L. San Andrés, “Bump Type Foil Bearing Structural Stiffness: Experiments and Predictions,” TRC-B&C-5-03.

2002

San Andrés, L., Editor, “Research on Fluid Film Bearings, Tribology Group,” Year XI, 2001/2002, May 2002.

Oscar de Santiago, “Identification of Bearing Supports’ Force Coefficients from Rotor Responses due to Imbalances and Impact Loads,” TRC-RD-1-02.

Luis San Andrés, “Response of a Squeeze Film Damper Under High Dynamic Loading and Identification of Damping and Inertia Coefficients,” TRC-SFD-1-02.

Deborah Wilde, “Experimental Response of Gas Hybrid Bearings for High Speed Oil-Free Turbomachinery,” TRC-B&C-2-02.

2001

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

San Andrés, L., “Parameter Identification of Series Bearing Supports from Imbalance Response and Impact Excitations”, TRC-RD-1-01.

San Andrés, L., “Flow Visualization and Forces from a Squeeze Film Damper Operating with Natural Air Entrainment”, TRC-SFD-1-01.

2000

San Andrés, L., Editor, “Research on Fluid Film Bearings, Tribology Group,” Year IX, 1999/2000, May 2000.

San Andrés, L., and **O. de Santiago**, “Measurements of the Imbalance Response in a Rotor Supported on Tilting Pad Bearings and Integral Squeeze Film Dampers,” TRC-SFD-1-00.

Beets, T., S. Diaz, and L. San Andrés, “Pressure Measurements and Flow Visualization on a SFD Operating with a Bubbly Mixture,” TRC-SFD-2-00.

Rodriguez, L., S. Diaz, and L. San Andrés, “Sine Sweep Load Versus Impact Excitations and their Influence on the Identification of Damping in a Bubbly Oil Squeeze Film Damper,” TRC-SFD-3-00.

San Andrés, L., and **R. Aguilar**, “Leakage and Dynamic Response of a Hybrid Brush Seal-Gas Damper Seal,” TRC-SEAL-3-00.

1999

San Andrés, L., Editor, “Tribology Group Research Report,” Year VIII, 1998/99, May 1999.

de Santiago, O., and L. San Andrés, "Design of a Series Tilting Pad Bearing and Squeeze Film Damper for NSF-TRC Rotordynamics Test Rig and Analysis for Optimum Damping at Bearing Supports," TRC-SFD-1-99, May 1999.

Diaz, S., and L. San Andrés, "An Engineering Model for Prediction of Forces in SFDs and Experimental Validation for Operation with Air Entrainment," TRC-SFD-2-99, May 1999.

Diaz, S., T. Beets, G. Dunn, and L. San Andrés, "High Speed Test Rig for Identification of Gas Journal Bearing Performance: Design, Constraints and Fabrication," TRC-RD-1-99, May 1999.

1998

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year VII, 1997/98, May 1998.

Zirkelback, N., and L. San Andrés, "Computational Analysis of Spiral Groove Thrust Bearings and Face Seals," TRC-Seal-7-98, May 1998.

Ransom, D., and L. San Andrés, "Identification of Dynamic Force Coefficients of a Labyrinth and Gas Damper Seals Using Impact Load Excitations," TRC-Seal-8-98, May 1998.

Li, J., and L. San Andrés, "A Bulk-Flow Model of Multiple Blade, Multiple Pocket Gas Damper Seals," TRC-Seal-9-98, May 1998.

De Santiago, O., and L. San Andrés, "Imbalance Response of a Rotor Supported on Sealed Integral Dampers," TRC-SFD-1-98, May 1998.

Tao, L., S. Diaz, L. San Andrés and K.R. Rajagopal, "Flow Analysis of Squeeze Film Dampers Operating with Bubbly Lubricants," TRC-SFD-2-98, May 1998.

1997

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year VI, 1996/97, April 1997.

Ransom, D., and L. San Andrés, "Identification of Force Coefficients from a Gas Annular Seal, Effect of Transition Regime to Turbulence", Report TRC-SEAL-4-97, April 1997.

San Andrés, L., "A Test Rig for Measurement of the Dynamic Response and Stability of Rotor Supported on Floating Ring Journal Bearings", Report TRC-B&C-3-97, April 1997.

De Santiago, O., J. Oliveras, and L. San Andrés, "Imbalance Response of a Rotor Supported on Integral Squeeze Film Dampers", Report TRC-SFD-2-97, April 1997.

Diaz, S. and L. San Andrés, "Forced Response of a Squeeze Film Damper Operating with a Bubbly (Air/Oil) Mixture," Report TRC-SFD-1-97, April 1997.

Zirkelback, N., and L. San Andrés, "Computational Analysis of Compressible Fluid Spiral Groove Face Seals," Report TRC-SEAL-7-97, April 1997.

Li, J., L. San Andrés, and J. Vance, "A Bulk-Flow Analysis of a Novel Gas Damper Seal", Report TL-SEAL-2-97, April 1997.

1996

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year V, 1995/96, May 1996.

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.

Jackson, C., "Experimental Identification of the Static Load (On Pad) and Pad Temperatures of a Flexure Pivot, Tilting Pad Hydrodynamic Bearing", Report # TRC-B&C-3-96, May 1996.

Zirkelback, N., "Simplified Analysis of Hydrodynamic Thrust Bearings ", Report # TRC-B&C-4-96, May 1996.

Diaz, S., "Measurements of Pressure in a Squeeze Film Damper with a Bubbly Mixture," Report # TRC-SFD-1-96, May 1996.

1995

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year IV, 1994/95, May 1995.

Zirkelback, N., and L. San Andrés, "Annular Seal Bulk-Flow Model for the Transition to Turbulence Regime: Numerical Predictions," TRC-SEAL-3-95, May 1995.

San Andrés, L., and **D. Lubell**, "Overview of NSF-TRC Squeeze Film Damper Research Project, Year I," TRC-RD-4-95, 1995.

San Andrés, L., "Bulk-Flow Analysis of Flexure- and Tilting-Pad Fluid Film Bearings," TRC-B&C-3-95, May 1995.

Laos, H., and L. San Andrés, "Measurement of Unbalance Response in a SFD Test Rotor Kit, (Part II)", TRC-RD-5-95, May 1995.

Lopez, A., and L. San Andrés, "Test Results for an Open-End Squeeze Film Damper with a High Viscosity," TRC-SFD-1-95, May 1995.

Robison, M., Walton N., and L. San Andrés, "Experimental Force Coefficients for a Short Length Squeeze Film Damper, Experimental Force Coefficients for several a Plain Journal Bearing, Preliminary Tests for a Flexure-Pivot, Tilting Pad Journal Bearing," TRC-B&C-4-95, May 1995.

1994

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year 3, 1993/94, May 1994.
San Andrés, L., "Analysis of Exotic Geometry Hybrid Fluid Film Bearings," (#1013) TRC-B&C-3-94, May 1994.
San Andrés, L., **H. Laos, and A. Lopez**, "Measurement of Unbalance Response in a SFD-Rotor Kit - Centered Journal," (#125) TRC-SFD-4-94, May 1994.

Robison, M., Walton N., Arauz, G., and L. San Andrés, "Development of Parameter Identification Method and Preliminary Tests for a Hydrodynamic Journal Bearing and Squeeze Film Damper," (#1012) TRC-B&C-2-94, May 1994.

1993

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year 2, 1992/93, April 1993.
San Andrés, L., and Semanate, J., "Dynamic Force Coefficients for Hybrid Journal Bearings with Arbitrary Recess Geometry," (#10009), TRC-B&C-3-93, April 1993.

Robison, M., Arauz, G., and L. San Andrés, "Development of a Test Rig for Measurement of the Rotordynamic Force Coefficients of Generic Fluid Film Bearings, (#10008) TRC-B&C-2-93, April 1993.

1992

San Andrés, L., Editor, "Research on Fluid Film Bearings, Tribology Group," Year 1, 1991/92, April 1992.
San Andrés, L., "Laminar Hydrostatic Bearings with Optimum Recess Geometry," (#1005) TRC-B&C-1-92, April 1992.

1991

San Andrés, L., and **Semanate, J.**, "Analysis of Multi-Land High Pressure Oil Seals," (#344) TRC-SEAL-2-91, April 1991.
San Andrés, L., "Dynamic Force Response of an Open Ended Squeeze Film Damper," (#119) TRC-SFD-2-91, April 1991.
San Andrés, L., "Analysis of Short Squeeze Film Dampers with a Central Groove," (#120) TRC-SFD-3-91, April 1991.
Meng, J., San Andrés, L. and Vance, J., "Experimental Investigation of the Dynamic Pressure and Force Response of a Partially Sealed Squeeze Film Damper," (#122) TRC-SFD-5-91, April 1991.
Vance, J., San Andrés, L. and **Arauz, G.**, "Effect of Inlet Holes on the Pressure Field of a Squeeze Film Damper," (#123) TRC-SFD-6-91, April 1991.
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.

FUNDING FOR RESEARCH

TOTAL 12/10/2010: \$6'756,953 (EXTERNAL + INTERNAL – ALL COMPETITIVE)

External research	4'862,844
Internal research	1'537,169
Gifts	60,000
Equipment	224,240
Student support	72,700
total	6'756,953

External Research Funds, total \$ 4'862,844

Principal Investigator(s)	Sponsor Project #	Amount	Project	Dates (GS support)	
L. San Andrés 32525/39600/ME	Honeywell Turbocharging Technologies	\$208,340	Turbocharger Bearing Code Development	09/01/10- 08/31/12	–
L. San Andrés 32513/A2850/ME	Pratt & Whitney	\$339,086	Squeeze Film Damper – design of test rig for high frequency & high load operation	07/01/08- 12/31/10 (2)	–
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% L. San Andrés	Entergy Operations, Inc. 32525/49000/ME	\$ 40,165	Evaluation of Grand Gulf Nuclear Station Reactor Recirculation Pump At Parameters Oscillations	04/01/96 - 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 \$1'537,169

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 (April/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	TRC 32514/1519X5/ME	\$34,863	Automated Modeling XLTRC2 RBS transient response	12/01/10 08/31/11
L. San Andrés	TRC 32514/15193B/ME	\$39,863	High Temperature Low Leakage Seals	08/01/10 08/31/11
L. San Andrés	TRC 32514/15196B/ME	\$34,863	Modeling of Tilting pad Bearings	08/01/10 08/31/11
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

GIFTS

Honeywell Foundation TAMU 510319	\$25,000	Oil-Free Turbocharger Development	08/01/02
Honeywell AeroSpace, Phoenix	\$35,000	Squeeze Film Damper Research	October 2007

SUPPORT FOR EQUIPMENT: TOTAL \$ 224,240

Source	Amount	Purpose	Date
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 Laboratory	\$ 3,000	Cost sharing for acquisition of four foil bearings	11/01
COE Funds	\$ 3,000	Cost sharing for acquisition of HP 35670A Analyzer	10/00
Turbomachinery Laboratory	\$ 3,700	Two-channel analyzer for vibration demonstrations	07/99
TAMU	\$ 9,000	Data acquisition software upgrade for Rotordynamics Laboratory	01/98
Solar Turbines	\$ 1,500	Portable computer for class demonstrations	04/98
TAMU PUBF	\$ 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

- 1 Mohamed, Z., and San Andrés, L, "Foil Bearing," May 21, 1996, U.S. Patent # 5,518,320, Texas A&M University System
- 2 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.
- 4 San Andrés, L., "Hydrostatic Bearing with Improved Stability Characteristics", January 1991, disclosed to Rockwell International
- 5 Vance J., and San Andrés, L., "Gas Operated Bearing for Turbomachinery", April 1992, disclosed to TAMU Texas Experiment Engineering Station.

B. SOFTWARE COPYRIGHTS

SOFTWARE 2006-10	Company	date
XLGFBPRESS	Barber Nichols	11/2010
SPIRALC	Ciateq	02/2010
HSEALH	Ramgen, Knight Hawk	07/2010
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	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©	hydrostatic/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://metrib.tamu.edu/rotorlab.htm> under the SOFTWARE heading.

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

HYDROSEALT		<u>date</u>
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 CFD Research	03/96 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

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 Viloría	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

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:

XLLEANSEAL©	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,
XLPRESMD©	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 (Durametall) is currently evaluating this software for licensing (04/99).

SERVICE

1. PROFESSIONAL SERVICE

IFTtoMM Rotordynamics (International Federation of Mechanics and Mechanisms)

US Member, Appointed, Sept 2010

International Journal of Rotating Machinery, (Open Access Journal), Editorial Board, Member, April 2010-data

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.

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.

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.

OTHER

Congreso Latinoamericano de Turbomaquinaria, Conference Planning Committee, Member, Honorary Appointment, 1995 – present

Congreso Bolivariano de Ingenieria Mecanica, Member Scientific and Organizing Committee, 2001-present

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)

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)

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

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, Awards Committee, Member, Appointed 2008

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

MEEN Department, Honors and Awards Committee, appointed 2005.

MEEN ABET Preparation Committee, member, appointed 2006

MEEN Department, Tenure and Promotion Committee, elected 2003-2005

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

- "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 en Vibraciones," 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," TEEEX 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," TEEEX 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," TEEEX 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," TEEEX 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 Hidrodinamicas, 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 Rotodinamica, Instituto de Investigaciones Electricas, Cuernavaca, Mexico, February 1994, 42 participants (8 hours). (Taught in Spanish).

INVITED SIGNIFICANT SEMINARS OR LECTURES

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

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

Tsinghua University, Beijing, China, "Gas Bearings for Microturbomachinery – an Overview," March 15, 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 via 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 Ingeniería 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 and 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 Aplicaciones, 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 Encuentro 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 2005

<u>Year</u>	<u>Number of papers</u>	<u>Dates received</u>
1999	15	3x(02/99), 5x(03/99), 1x(04/99), 1x(05/99), 1x(06/99), 2x(10/99), 2x(11/99)
2000	15	6x(02/00), 4x(03/00), 3x(10/00), 1x(11/00), 1x(12/00)
2001	13	3x(01/01), 2x(02/01), 2x(04/01), 2x(07/01), 2x(08/01), 2x(10/01).
2002	10	1x(01/02), 1x(02/02), 2x(03/02), 4x(04/02), 1x(05/02), 1x(11/02)
2003	9	4 x(02/03), 1x(02/03), 1x(08/03), 1(09/03), 1(11/03), 1(12/03)
2004- 2007	30+	http://journaltool.asme.org/

Associate Editor for STLE Tribology Transactions, December 1999 –

<u>Year</u>	<u>Number of papers</u>	<u>Dates received</u>
1999	1	1x(12/99)
2000	2	1x(03/00), 1x(04/00)
2001	3	1x(01/01), 1x(02/01), 1x(03/01)
2002	4	2x(01/02), 1x(03/02), 1x(04/02)

2003	4	2x(06/03), 2(12/03)
2004	3	2x(03/03), 1(06/03)
2005	5	2x(01/05), 2x(04/05), 1(07/05)
2006	5	1x06,2x09,5x(08)
2007	6	
2008	5	
2009	5	
2010	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 accepted	10
ViceCHAIR	Structures and Dynamics		
Turbo-Expo 2004	Vienna, Austria, 06/2004	98 manuscripts, 65 accepted	17
ViceCHAIR	Structures and Dynamics		
Turbo-Expo 2005	Reno, NV, 06/2005	> 60 manuscripts, 58 accepted	15
CHAIR	Structures and Dynamics		
Turbo-Expo 2006	Barcelona, Spain, 05/2006	87 manuscripts, 60 accepted	14
CHAIR	Structures and Dynamics		

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.

OTHER PUBLICATIONS (AS A GRADUATE STUDENT)

A. EARLY PUBLICATIONS FOR TAMU TURBOMACHINERY RESEARCH CONSORTIUM.

San Andrés, L. and Vance, J., "Flow in a Long Journal Bearing Subject to Arbitrary Motions with Applications to Squeeze Film Dampers," (#112) TRC-SFD-1-88, April 1988.

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.

San Andrés, L., "Effects of Fluid Inertia on Squeeze Film Damper Forces, the Added Mass Effect," (#104), TRC Report, October 1983.

San Andrés, L., "Analytical Solutions for the Effect of Fluid Inertia (Temporal Terms) Squeeze Film Damper Forces," (#103), TRC Report, October 1983.

San Andrés, L., "Analytical and Experimental Investigation of the Pressure Distribution and Force Coefficients in Squeeze Film Dampers," (#102), TRC Report, October 1983.

B. 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., "Análisis Dinámico 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 Película 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.