

## RESUME SUMMARY

### Dr. John Milton Vance

Current Activity: Self Employed Consulting Engineer, Retired Professor of Mechanical Engineering, Texas A&M University,

Prior Research Affiliation: Turbomachinery Laboratory, Texas A&M University

Education: Ph.D., Mechanical Engineering, University of Texas

Experience: Forty years academic.  
Five years full time industrial.  
Extensive consulting for industry, government, patent attorneys and product liability

Numerous short courses taught for industry on rotordynamics and machinery vibration

Special Areas of Competence:

Rotordynamics of Turbomachinery  
Vibration Dampening Seals and Bearings  
Vibration Measurement and Analysis  
Industrial Compressors  
Turbochargers  
Energy Storage Flywheels  
Wind Turbines

Publications: More than 100 technical publications, including the reference books Rotordynamics of Turbomachinery, and Machinery Vibration and Rotordynamics

Professional and Technical Societies:

Registered Professional Engineer, ASME Fellow

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512-590-1100

## FULL DETAILED RESUME

### John Milton Vance

#### CONTACT DATA

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#### EDUCATION

- B. S. M. E. The University of Texas at Austin, August, 1960
- M.S.M.E. The University of Texas at Austin, January, 1964 Master of Science Thesis on "Mathematical Analysis of the Effect of a Shock Sub on the Longitudinal Vibrations of an Oil Well Drill String", Research Chairman: Dr. Leonardt Kreisle
- Ph.D.M.E. The University of Texas at Austin, January, 1967 Doctor of Philosophy Dissertation on "Stress and Strain in Right Circular Cylinders Rotating About a Transverse Axis", Research Chairman: Dr. William J. Carter

#### PROFESSIONAL SOCIETIES, AWARDS, HONORS AND REGISTRATION

Outstanding Graduate Teaching Award, ME-TAMU, 2002  
Lockheed-Martin "Award for Significant Technical Contributions", 1999  
TEES Research Fellow, 1991-1992  
Halliburton Professor of Mechanical Engineering, 1986-1987  
Dresser Industries Associate Professorship, 1979-1980  
Fellowship, 1965, American Petroleum Institute  
Fellow and Life Member: American Society of Mechanical Engineers  
Member: Turbomachinery Symposium Advisory Committee for TAMU  
Reviewer of papers and articles for:

- 1) Applied Mechanics Reviews
- 2) Shock & Vibration Digest
- 3) ASME Transactions
- 4) Vibration Institute
- 5) ASLE Transactions
- 6) Journal of Sound and Vibration

Registered Professional Engineer in the State of Texas, Listed in Who's Who in Engineering, Who's Who in Technology Today, American Men and Women in Science. Admiral in the Texas Navy, commissioned by Governor Mark White in 1984.

## EXPERIENCE

A. Academic – Forty years of university teaching, research and administration as follows:

1. September 1981 to June 2007- Professor, Department of Mechanical Engineering at Texas A&M University. Teaching courses in machinery dynamics, mechanical vibrations, mechanical design, and instrumentation laboratory. Conducting research on rotordynamics of turbomachinery in the Turbomachinery Laboratory, supported by an industrial consortium (TRC), by federal grants and by individual companies (e.g. General Electric, Pratt & Whitney, Lockheed Martin). Named as a TEES Research Fellow in 1991. Received “Outstanding Graduate Teaching Award” in 2002. Named as "Halliburton Professor of Mechanical Engineering" in 1986, for outstanding achievement in education, research and service. Served as Group Leader for Mechanical Systems in 1986-1987.
2. January 1980 to May 1981 - Associate Head and Associate Professor, Department of Mechanical Engineering, Texas A&M University. Responsible for development of graduate and research programs in the Department, and acting Head in the absence of Dr. Gordon Hopkins. Also, Director, Rotordynamics and Machinery Vibrations Laboratory, conducting experimental and analytical research in dynamics of rotating machinery.
3. August 1978 to January 1980 - Associate Professor of Mechanical Engineering at Texas A&M University. Taught courses in vibrations and dynamics. Introduced new graduate course in dynamics of rotating machinery. Conducted research on rotordynamics, machinery vibrations, and energy storage flywheels. Group Leader for Mechanical Systems and Design in 1979-1980. Designated as "Dresser Industries Associate Professor of Mechanical Engineering" in September, 1979, a position which provides support for research, special studies, writing, and other scholarly activities.
4. January 1974 to June 1978 - Associate Professor of Mechanical Engineering and Director, Rotordynamics Laboratory at the University of Florida. Taught graduate courses in advanced dynamics, vibrations, bearing design, and similitude. Introduced new undergraduate and graduate courses in dynamics of rotating machinery. Obtained significant funding for continuing research in machine dynamics, vibrations, and control stability, as applied to helicopter propulsion systems.
5. January 1969 to December 1973 - Assistant Professor of Mechanical Engineering at the University of Florida. Taught machine design and dynamics. Introduced new courses in bearing analysis, similitude and model design. Responsible for updating undergraduate machine design sequence. Conducted research in hydrodynamic skin friction, helicopter vibrations and dynamics. Served as an

elected member on both the University Administrative Council and the University Senate.

6. September 1965 to January 1967 - Taught machine design to mechanical engineering seniors as a teaching assistant. The position was considered as half-time at the University of Texas.

B. Full-Time Industrial - five years of engineering design, research and supervision as follows:

1. January 1967 to January 1969 - Engineer/Scientist III at Tracor, Inc., Austin, Texas. Promoted to Group Leader, Engineering Analysis, supervising the work of five engineering analysts including one other at the doctorate level. Performed analysis supporting the design of hardware for penetration aids (counter-measures) used on aircraft and missiles, involving work in the areas of three-dimensional rigid body dynamics, applied elasticity and elastic impact, mechanisms design, statistical distributions, and thermodynamics.

Some examples of this work are:

- (a) Analysis of a mechanical device for de-spinning a vehicle in free flight, involving consideration of a five degree of freedom system in rigid body dynamics.
  - (b) Mathematical simulation of the ejection of a rocket-powered vehicle from a launch tube, involving computer analysis of a seven degree of freedom dynamic system with elastic impact forces.
  - (c) Heat transfer analysis of an aircraft chaff dispenser subjected to aerodynamic heating.
  - (d) Statistical analysis of dynamic and static imbalance induced in manufactured assemblies due to manufacturing tolerances.
2. September 1963 to September 1964 - Mechanical Engineer conducting drilling research for Texaco Research and Technical Division, Bellaire, Texas.

Approximately thirty percent of this period was spent on offshore platforms and drilling barges (shallow water), performing full-scale studies of factors affecting oil well drilling performance. Also designed a pressure chamber for a micro-bit (small scale) drilling laboratory, and performed a mathematical analysis of a proposed vibratory drilling system.

3. September 1960 to September 1962 - Mechanical Engineer at Sheffield Division of Armco Steel Corporation, Houston, Texas. Duties included the responsible design of hot steel handling equipment, steel testing facilities and the redesign of

overhead electric cranes. Promoted to "area engineer" for a portion of the plant (which included test facilities), being responsible for the engineering design of all new equipment and facilities for this area.

C. Engineering Consulting, Summers, Visiting Appointments, and Short Courses

1. December 7, 2010 – Consulted with Tom McGuinness on XLRotor models of torsional vibration in a turbomachinery drive train.
2. October 22, 2010 - Taught a 1-day short course on rotordynamics in my Austin office to Atul Nath from ABRO Balancing.
3. May 11-14, 2010 - Taught a 2-day short course on rotordynamics in my Austin office to Cac Nguyen,, from Direct Drive Systems, Inc.
4. November 8-24, 2009, Consulted for Bryan Seegers of M-Dot Aerospace on the rotordynamic design of very small gas turbines.
5. August 5, 2009 to present – Consulted for Bill Anderson at JetAir Technologies LLC on rotordynamics and design of a gearless turbo-blower with air bearings.
6. May 6, 2009 to December 2010 – Consulted for Chris Gabrys of Progressive Flywheel Energy Inc. to provide rotordynamic analysis of a new flywheel design for UPS applications.
7. February 16-17, 2009 – Taught a 2-day short course on rotordynamics in my Austin office to three engineers from John Crane and Torquemeters Ltd. Consulted on the design of a high speed test rig for testing dry gas seal cartridges.
8. January 17-18, 2009 – Consulted in my office for Houman Shokraneh from LA Turbines on shaft design and rotor dynamics for turbine wheels.
9. June 23, 2008 – Consulted in my office with Mark Natanael and Lance Underwood at Smith International to improve the rotordynamic design of downhole drilling turbines.
10. July 10-13, 2007 - Taught an in-house short course on rotordynamics to engineers at Kato Engineering, Mankato, Minnesota.
11. July 16-17, 2007 - Taught an in-house short course on rotordynamics to engineers at Dakota Gasification Co., Beulah, North Dakota.
12. May 11, 2007 to present – Consulted for Mariah Power in Reno, Nevada on rotordynamics and design of Windspire vertical axis wind turbines, constructing

computer models and working with Chris Gabrys, Mick Hansen, and Dennis Montgomery.

13. Almost every year annually 1981-2010 – Taught a four day short course for industry on "Machinery Vibration and Rotordynamics" at various locations including College Station, Conroe, and Houston, Texas. See [www.vavco.com](http://www.vavco.com) for the 2010 short course announcement.
14. June 1994 to present - KMC, Inc. , Greenwich, Rhode Island and Bearings Plus Inc., Houston, Texas. Designing TAMSEALS™ and computing the damping coefficients for specific applications to rotating machinery. The TAMSEAL™ is a damper seal invented by J. Vance and R. Shultz to suppress vibration in compressors and turbines. The patent is licensed by KMC Bearings and Bearings Plus, Houston, Texas.
15. October 2004 to 2006 – Innovative Energy, Wright City, Missouri. Supported the design of a gas turbine for an energy efficient turbo-generator with computer simulations of rotordynamic performance.
16. November 2003 - Technos Corp., San Antonio, Texas. Conducted diagnostic vibration testing on a 159" diameter kiln fan to determine the cause of blade fatigue failures. Calculated blade passing frequencies and related them to the test results. Submitted design recommendations to avoid future failures.
17. February to April 1999 - James Bowery, Inventor, Las Vegas, NV, (With Dr. Luis San Andres), developed a computer model of a rocket engine with a centrifugal rotary structure to support the filing of U.S. Patent #6,212,876.
18. November 1992 to February 1997 - Air Tractor, Inc., Olney, Texas. Supported the design and testing of a new 900 HP turboprop engine through rotordynamic analysis. Carried out the testing in the Turbomachinery laboratory at Texas A&M. Optimized the design of the squeeze film bearing dampers. Also designed a rotordynamic test rig for experimental determination of the critical speeds and verification of squeeze film damper performance.
19. May 1995, June 1996, and December 1996 - Atlas Copco Comptec, Voorheesville, NY. Consulted on problems with tilt pad bearings and rotordynamics of single stage compressors and large electric induction motors. Conducted rotordynamic analysis of rotor bearing systems.
20. December 1995 - AC Compressor Co., Appleton, Wisconsin. Performed a transient torsional response analysis of a compressor drive train with a gearbox and powered by a synchronous electric motor. Predicted the torsionally resonant speeds during startup and the maximum dynamic stress at resonance.

21. June 1995 to September 1995 - Balcones Research Laboratory, Austin Texas. Research Fellow at the Center for Electromechanics. Worked with a team to perform iterative design analysis of an energy storage flywheel for an urban transit bus. Worked with another team to design an energy storage flywheel for a turboelectric locomotive (project sponsored by the Federal Railroad Administration and ARPA). Performed laboratory tests of an instrumentation system to measure rapid rotor speed transients caused by electric railgun discharges.
22. March 1995 - Applied Energy Systems, Tulsa, Oklahoma. Computed the torsional natural frequencies of a 2500 horsepower turbogenerator drive train containing a gearbox and determined all possible excitation frequencies.
23. June 1994 to September 1994 - Balcones Research Laboratory, Austin Texas, Research Fellow at the Center for Electromechanics, University of Texas at Austin. Conducted rotordynamic analysis of the FTP compulsator, a 12,000 rpm pulsed-power electric generator. Analyzed the effect of the nonrotating structure on critical speeds. Worked with a team to design an energy storage flywheel for a transit bus.
24. June 1993 to September 1993 - Balcones Research Laboratory, Austin Texas, Research Fellow at the Center for Electromechanics, University of Texas at Austin. Supported rotordynamic testing and redesign of the bearing dampers for the SMALLCAL compulsator, a 25,000 rpm pulsed-power electric generator. Also performed rotordynamic analysis of the CANNONCAL compulsator, which uses a 2000 lb composite rotor for pulsed power generation.
25. October 1992 to February 1993 - CITGO Petroleum Corp., Lake Charles, Louisiana. Performed rotordynamic analysis and squeeze film damper analysis to support troubleshooting of a nine-stage 14,000 HP propylene compressor. Also performed tests to determine the squeeze film damper support stiffness.
26. December 1990 to December 1992 - REDA Pumps, Tulsa, Oklahoma. Performed vibration measurements on a downhole oil well pump. Constructed a laboratory apparatus to simulate the rotordynamics of the full scale pump. Participated in a design audit to improve the vibration characteristics of the pump. Presented a short course on pump rotordynamics at REDA.
27. October 1990 to January 1992 - Aerodyne, Dallas, Texas. Performed a rotordynamic design audit, designed a test program for critical speeds, and supervised the testing of an automotive turbocharger at shaft speeds up to 120,000 rpm.

28. January 1989 to June 1989 - Balcones Research Laboratory, Austin, Texas. Visiting Professor in the Center for Electromechanics, University of Texas at Austin. Conducted computer analyses and experiments for the rotordynamic design analysis of homopolar generators and compulsators. These are hybrid flywheel/ electric machines capable of producing pulsed power at extremely high energy levels (e.g. IMJ per pulse, 60 HZ firing rate), for rail guns, welding, etc.
29. September 1985 to December 1988 - RADIANT Corporation, Austin, Texas. Conducted rotordynamic analysis of a large (460 MW) turbogenerator (steam turbine and electric generator) for an electric utility plant.
30. August 1986 to December 1987 - Mechanical Technology Inc., Latham, New York. Conducted design analysis of squeeze film bearing dampers for advanced aircraft engines (in support of USAF contract).
31. January to June 1982 - Plains Machinery Co., Houston, Texas. Made vibration measurements on a bulldozer in the field to determine the cause of air conditioner damage. Conducted laboratory shake tests of the condenser and evaporator units to determine resonances and to simulate the field-measured vibration environment. Made recommendations for isolator mounts to reduce the transmitted vibration.
32. January to March 1982 - I. W. Hickham, Inc., LaPorte, Texas. Developed a computer program for stresses in turbomachinery disks and impellers, considering the effects of interference fits and centrifugal loads at high speeds.
33. November 1980 to January 1981 - RADIANT Corporation, Austin, Texas. Consulted on problems of vibration and rotordynamics of a hydrogen compressor and a steam turbine. These problems involved rub-induced whirl and bearing modifications.
34. Summer of 1981 - Shell Development Co., Westhollow Research Center, Houston, Texas. Performed experimental and analytical research to improve the accuracy of critical speed computations for rotating machinery. Developed an analytical model for computer modeling of disk attachment flexibility in turborotors. Also developed an analytical model (transfer function) for the design of acoustical filters to attenuate flow pulsations in the discharge from reciprocating pumps.
35. July to September 1980. U.S. Air Force School of Aerospace Medicine, Brooks Air Force Base, Texas. Performed dynamics analysis of The Brooks Centrifuge Capsule for g-load testing of humans and animals. Developed a computer simulation (with experimentally measured parameters) of the capsule roll



dynamics to predict overshoot and roll oscillations of a proposed updated system, and used the simulation to analyze three alternate schemes to reduce the oscillations. One of the schemes has been successfully adopted in a redesign of the system.

36. Summer of 1978 and 1979 - Pratt & Whitney Aircraft, Rotordynamics Section, West Palm Beach, Florida. Developed a computer analysis to predict the transient response of squeeze film bearing dampers used in aircraft turbine engines for vibration suppression. Conducted design analysis for a proposed new type of bearing damper, and analyzed experimental results from a rotordynamics test rig for turbojet engines.
37. November 1977 to June 1978 - Battelle Consultant to the U.S. Army Research and Technical Laboratory, Propulsion Branch, Ft. Eustis, Virginia, for vibration analysis of two stroke engines being developed for remotely piloted aircraft. Also conducted a design audit for a turbogenerator under development by the U.S. Army MERADCOM, Ft. Belvoir, Virginia.
38. Summer 1977 - Battelle consultant to the U.S. Army Research and Technical Laboratory, Aeromechanics Branch, Ft. Eustis, VA. Determined the detailed requirements of technical modules within The Second Generation Comprehensive helicopter Analysis System (SGCHAS), a computer program (analogous to NASTRAN) under development by the U.S. Army for helicopter design analysis. The specific technical modules related to rotary wing dynamics.
39. April and May 1977 - Consultant to the Florida Department of Transportation, Lake City District. Located the source of machinery noise in the Main Street Bridge, Jacksonville, Florida. Accomplished this by designing and constructing an electronic "crack and noise detector" which is still in use by bridge maintenance engineers. A letter of commendation from the Florida DOT was received and is on file.
40. Summers of 1975 and 1976 - Consultant to Southwest Research Institute, San Antonio, Texas, to develop improved methods for analyzing field measurements of vibration in rotating machinery for industrial clients. This work included the development of a test rig to demonstrate causes of rotor whirling instability, new mathematical models to predict non-synchronous whirling frequencies, computerized design of bearing dampers to reduce shaft vibration, and prediction of the destabilizing influence of gas labyrinth seals and fluid forces on centrifugal impellers and bladed disks in rotating machinery.
41. January to June 1976 - Consultant to Pratt & Whitney Aircraft West Palm Beach, Florida, to develop a new computer analysis of the dynamic response of squeeze film bearing dampers with various types of end seals and inlet holes, to be used

for vibration reduction in high speed turboshaft engines. This program was available from the U.S. Army (USARTL) under the name "DANDI", and was used by aircraft engine design engineers.

42. May 1970 to June 1990 - Consultant to Harris Mineral Productions, Inc. of Houston, Texas for development of new product ideas into prototype hardware for marketing.
43. January to December 1974 - Consultant (Battelle Scientific Advisor) to the U.S. Army Missile Command, Redstone Arsenal, Huntsville, Alabama. This work included design of a vibration isolator for a helicopter-mounted LASER target designator system, and analysis of vibration problems in the fluidic control system of a guided missile.
44. January to December 1974 - Consultant to J. C. Renfroe and Sons, industry. Inc. of Jacksonville, Florida, for stress analysis of lifting hooks, clamps, and other new materials handling products for heavy industry.
45. Summers of 1971, '72, '73 and '74 - Consultant (Battelle Scientific Advisor) to the U.S. Army Research and Technical Laboratory, Propulsion Branch Ft. Eustis, Virginia. Conducted vibration analysis of small turboshaft engines, high speed drive trains; and performed torsional stability analysis of automatic speed controls. Visited every major manufacturer of turboshaft engines and helicopter airframes while designing two army research programs to address: (a) Vibratory compatibility problems with helicopter engines and airframes, and (b) Rotordynamics problems in turboshaft engines.
46. Summer of 1969 and 1970 - Assistant Design Project Engineer for Pratt & Whitney Research and Development, West Palm Beach, Florida. Developed a mathematical model simulating the transient dynamics of a rigid turborotor mounted in flexible bearing supports with dampers. The result of this work was an interactive computer program which graphically described (in computer time) the response of any rigid turborotor to the sudden loss of a blade, or to a sudden impact (such as a carrier landing).

D. Expert Witness, Consulting for Attorneys (Patents, and for Products Liability Litigation)  
[PR -patent research, I - Insurance, P - Plaintiff, D - Defense]

1. American Pile Driving Equipment vs. multiple defendants. Studied pile driving patents, calculated eccentric moments of vibratory piledrivers, and wrote an expert opinion on a patent dispute for attorneys Scott Woloson and Robert Reckers at Shook, Hardy, and Bacon in Houston, Texas. February 2009 to present. PR and D

2. Scroll compressor bearings. Conducted literature research and wrote a report for attorney Alan Witte at Baker Botts in Houston, Texas. The subject involved the theory of shear stresses in ball bearings and bearing life prediction factors for scroll compressors. April - May 2001. PR
3. Womack vs. Andrews. Conducted a motorcycle accident analysis for attorney Tim Tesch and client Tommy Womack, computing the speed of a motorcycle at the point of impact with an automobile, based on distance traveled in the air and on the ground after impact. Austin, Texas, May 1996. (Case has not come to court)  
P
4. Alaska I and Alaska Voyager - Insurance claims for damaged gearboxes. Conducted a design audit of the gearboxes in 194' LOA fishing vessels powered by 3600 HP diesel engines. A report explaining the possible cause of premature bearing failures was submitted to Attorney James E. Ross in Houston, Texas, April, 1993. I
5. Baptist Mid-Missions vs. McDonnell-Douglas and Helicopters Inc. Consulted with attorneys David Myers and Wendell Bird, Atlanta, Georgia, on a helicopter ground resonance (rotordynamic instability) which destroyed a Hughes Model 269C helicopter. This case also involved questions relating to the design and maintenance of landing gear shock absorbers. A working model was built and used to demonstrate rotordynamic instability to the court. (Testified in court May, 1990). P
6. Allied Steel & Tractor Products vs. Pierce Arrow International. Evaluated the design of pneumatic underground piercing tools for a patent infringement suit. Several of the technical questions, which revolved around the effectiveness of a rubber shock absorber, were answered by my tests of the tool conducted at the Pierce-Arrow (Ditchwitch) plant in Perry, Oklahoma. The attorney for Pierce-Arrow was John Cooper of Foley & Lardner, Milwaukee, Wisconsin, (Case settled in November, 1989). D
7. Wolfe vs. Vermeer. Consulted with Attorney William Perry, Chadbourne and Parke, New York on the design of a mechanical cable plow (lays telephone lines underground). Conducted field tests (San Angelo, Texas) and dynamic analysis to determine the cause of catastrophic drive shaft failures involving a Rockwell universal joint. (Case settled as to Rockwell September 1988). D
8. Laster vs. Kenlee's Inc. Conducted tests on a .22 caliber Chipmunk rifle for attorney William Guidry, Nacogdoches, Texas to determine the cause of inadvertent discharges due to shock. Evaluated the design and made measurements on parts in the firing mechanism. (Submitted report June 1988). p

9. Muzyka vs. Remington. Consulted with attorney Joe Longley, Austin, Texas, on the design of safety features in a Remington Model 700 deer rifle. (Testified in court May 1987). P
10. Chapman vs. Kawasaki. Consulted with Attorney Jerry Duchowicz, Chicago, Illinois, on cases involving high speed wobble and weave instabilities of motorcycles. Collaborated on the design of a road test to investigate the effect of engine vibration on wobble dynamics of the motorcycle. Analyzed the road test data and a theory of excitation from engine vibration. (1983-1985, settled before trial). D
11. Pictorial offset vs. Harris Printing. Consulted with Attorney Stephen Sussman, New York, on vibration-induced printing anomalies in an offset printing press. Monitored and analyzed measurements of torsional vibration in the roller press drive train. (Submitted report September 1984, no trial).
12. Wausau vs. Exxon and Bell Helicopter. Consulted with Attorney Craig W. Marks, Lafayette, Louisiana, on the design of a tail rotor drive coupling in a helicopter. (No trial, report submitted October, 1983). P
13. TRW-Reda vs. S & N Pump Company. Consulted with President Karen Draper of S & N Pump in Houston, Texas, and with Attorney Carl Maley as expert witness in a case involving thrust bearing and overheating failures of submersible water pump motors. (Testified in court, August, 1983). D
14. King vs. Interarms. Consulted with and advised Attorney Joe Longley, Austin, Texas, on the design of a 12 gauge shotgun. (Testified in court November, 1982). P
15. Mitchell vs. Hughes Helicopter. Conducted dynamic and stress analysis of a tail rotor failure on a Hughes Model 269-C helicopter. Advised Attorney Michael P. Atkinson, Tulsa, Oklahoma. (1980, settled before trial). P
16. Davlin vs. Ingersoll Rand and Impco Carburetor. Conducted design and strength analysis of the intake manifold and carburetor for a large internal combustion engine. Advised Attorney Jack Meyer, Houston, Texas. (1980, no court testimony required). P
17. NHTSA vs. Ford Motor Co.. Consulted for The Texas Engineering Experiment Station on failures of automatic transmission gear selectors at the request of Ford Motor Co. (Report submitted June 1980). D
18. Capilla vs. Teleflex, Incorporated. Conducted design analysis of a powerboat steering mechanism, including considerations of vibration, strength, corrosion,

and marine maintenance requirements. Advised Attorney Luis Bustamante, Miami, Florida. (1979, settled before trial). D

19. Hughes vs. Merrill. Conducted design analysis of lifting clamps for steel plates and sheets. Advised Attorney Robert Fairchild, Center Texas. (1979, no court testimony required). P
20. Masters vs. Enstrom. Conducted design analysis of a helicopter tail rotor spindle shaft, including considerations of stress concentration, vibratory stresses, rotor dynamics, preload design to avoid fatigue, and maintainability. Advised Attorney Bruce Downey, Montgomery, Alabama. (1977-1979, testified in court August, 1979). P
21. Brown/Edmondson vs. Bell Helicopter. Consulted and advised on a drive shaft failure in a Model 206 Jet Ranger helicopter, for Attorney Barbara Parriente, West Palm Beach, Florida (1978, settled before trial). P
22. Terrell vs. Demag. Consulted on the design of a hydraulic control system for the electric furnace in a steel mill. Advised Attorney Dalton Floyd, Surfside Beach, South Carolina. (1976-1978, testified in court October, 1978). P
23. Caswell vs. Powermatic. Conducted design analysis of a lathe face plate, including considerations of loads from rotordynamics and vibration, shock loads and stresses, and choice of material. Advised Attorney Joseph Farley, Jacksonville, Florida. (1978, testified in court May, 1978). P
24. Woods vs. Thomas Foundries. Conducted design analysis of a centrifugal slurry pump impeller, with special emphasis on maintainability and repair considerations. Advised Attorney Michael Edson, Miami, Florida. (1977, no court testimony required). P

## **BOOKS AUTHORED**

1. Vance, J.M., Rotordynamics of Turbomachinery, John Wiley & Sons, New York, 1988, 388 pages, ISBN 0-471-80258-1.
2. Vance, J.M., Zeidan, F.Y., and Murphy, B.T., Machinery Vibration and Rotordynamics, John Wiley & Sons, New York, 2010, 402 pages, ISBN 978-0-471-46213-2.

## CONTRIBUTIONS TO BOOKS

1. Al-Khateeb, E.M., Ertas, B.H., and Vance, J.M. "Experimental Evaluation of Wire Mesh Bearing dampers at Cryogenic Conditions", *Computational Methods in Materials Characterisation*, Section 3 – Thermomechanical Behavior, WIT Press, 2004, Southampton, Boston.
2. Vance, J.M., "Energy Storage of Flywheels; A New Flywheel Concept", published in Veziroglu, *Alternative Energy Sources: An International Compendium*, Volumes Hemisphere Publishing Corp., Washington, D.C., 1978.

## PATENTS

1. "Aircraft Engine Rotor Squeeze Film Damper", U.S. Patent No. 5,067,825, November 26, 1991.
2. "Pressure Damper Seals", U.S. Patent No. 5,540,547, 1998.
3. "Modulated Pressure Damper Seals", U.S. Patent No. 5,707,064, 1998

## PEER REVIEWED PUBLICATIONS IN JOURNALS

1. Ertas, B.H., and Vance, J.M., "Rotordynamic Force Coefficients for a New Pocket Damper Seal Design", IFToMM 7th International Conference on Rotor Dynamics, Vienna, Austria, September 25-28, 2006, and *ASME Journal of Tribology*, Vol. 129, April 2007, pp. 365-374.
2. Ertas, B.H., Gamal, A. and Vance, J.M., "Rotordynamic Force Coefficients of Pocket Damper Seals", *ASME Journal of Turbomachinery*, October 2006, pp. 725 – 737.
3. Ertas, B.H., and Vance, J.M., "The Influence Of Same-Sign Cross-Coupled Stiffness on Rotordynamics" , DETC2005-84873, Proceedings of the ASME Design Engineering and Technical Conference, Long Beach, CA, September 24-28, 2005, and the *Journal of Vibrations and Acoustics*, 2007.
4. Gamal, A , Ertas, B.H.,. and Vance, J.M., High-Pressure Pocket Damper Seals: Leakage Rates And Cavity Pressures, Proceedings of GT2006, ASME Turbo Expo 2006: Power for Land, Sea and Air, May 8-11, 2006, Barcelona, Spain. Accepted for publication in the *ASME Journal of Turbomachinery*.

5. Ertas, B.H., and Vance, J.M., "Effect of Static and Dynamic Misalignment on Ball Bearing Radial Stiffness", AIAA Journal of Propulsion and Power, Vol. 20, No. 4, July-August 2004, pp. 634-647.
6. Ertas, B.H., Al-Khateeb, E., and Vance, J.M., "Rotordynamic Bearing Dampers for Cryogenic Rocket Engine Turbopumps", AIAA Journal of Propulsion and Power, Vol. 19, No. 4, July-August 2003, pp. 674-682.
7. Vance, J.M., Ying, D., and Nikolajsen, J.L., "Actively Controlled Bearing Dampers for Aircraft Engine Applications", ASME Journal for Gas Turbines and Power (99-GT-18), Vol. 122, July 2000, pp. 466-472.
8. Vance, J.M. and Ying, D., "Experimental Measurements of Actively Controlled Bearing Damping With An Electrorheological Fluid", ASME Journal for Gas Turbines and Power (99-GT-17), Volume 112, No 2, April 2000, pp. 337-344.
9. Laos, H.E., Vance, J.M., and Buchanan, S.E., "Hybrid Brush Pocket Damper Seals for Turbomachinery", ASME Journal for Gas Turbines and Power (99-GT-16), Volume 112, No 2, April 2000, pp. 330-336.
10. Zarzour, M. and Vance, J.M., "Experimental Evaluation of a Metal Mesh Bearing Damper", ASME Journal for Gas Turbines and Power (99-GT-15), Volume 112, No 2, April 2000, pp. 326-329.
11. Li, J., L. San Andrés, R. Aguilar, and J.M. Vance, Dynamic Force Coefficients of a Multiple-Blade, Multiple-Pocket Gas Damper Seal: Test Results and Analytical Validation," ASME Journal of Tribology (99-TRIB-35), Vol. 122, No. 1, 2000, pp. 317-322.
12. "Experimental Force Coefficients for a Two-Bladed Labyrinth Seal and a Four-Pocket Damper Seal," Journal of Tribology , Vol. 121, April 1999, pp. 370-376.
13. "Comparison of Predictions With Test Results for Rotordynamic Coefficients of a Four-Pocket Gas Damper Seal", Journal of Tribology , Vol. 121, April 1999, pp. 363-369.
14. "A Bulk Flow Analysis of Multiple Pocket Gas Damper Seals", ASME Paper No. 98-GT-13, accepted for publication in the Journal for Gas Turbines and Power.
15. "Test Results of a New Damper Seal for Vibration Reduction in Turbomachinery", Journal of Engineering for Gas Turbines and Power, Vol. 118, No. 4, October 1996, pp. 843-846.

16. "A Theoretical and Experimental Investigation of a Gas-Operated Bearing Damper for Turbomachinery: Part I - Theoretical Model and Predictions", Journal of Engineering for Gas Turbines and Power, Vol. 117, No. 4, October 1995, pp. 742-749.
17. "A Gas-Operated Bearing Damper for Turbomachinery - Theoretical Predictions versus Experimental Measurements: Part II - Experimental Results and Comparison With Theory", Journal of Engineering for Gas Turbines and Power, Vol. 117, No. 4, October 1995, pp. 750-756.
18. "Effects of Vapor Cavitation and Fluid Inertia on the Force Coefficients of a Squeeze Film Damper, Part 1: Analysis of a Long SFD", STLE Tribology Transactions, Vol. 36, No. 4, October 1993, pp. 597-604.
19. "Effects of Vapor Cavitation and Fluid Inertia on the Force Coefficients of a Squeeze Film Damper, Part II: Experimental Comparisons", STLE Tribology Transactions, Vol. 36, No. 4, October 1993, pp. 700-706.
20. "A Gas-Operated Bearing Damper For Turbomachinery", Journal of Engineering for Gas Turbines and Power (ASME Transactions), April 1993, Vol. 115, pp. 383-389.
21. "Measurements of Pressure Distribution and Force Coefficients in a Squeeze Film Damper, Part I: Fully Open-Ended Configuration", STLE Tribology Transactions, Vol. 34, No. 3, pp. 375-382, 1991.
22. "Measurements of Pressure Distributions in a Squeeze Film Damper, 11: Partially Sealed Configuration", STLE Tribology Transactions, Vol. 34, No. 3, pp. 383-388, 1991.
23. "Cavitation and Air Entrainment Effects on the Response of Squeeze Film Supported Rotors", ASME Journal of Tribology Vol. 112, pp. 347-353, April 1990.
24. "Cavitation Regimes in Squeeze Film Dampers and Their Effect on the Pressure Distribution", STLE Tribology Transactions, Vol. 33, No. 3, pp. 447-453, 1990.
25. "Cavitation and Air Entrainment Effects on the Response of Squeeze Film Supported Rotors", presented at the 35th STLE/ASME Joint Tribology Conference in Fort Lauderdale, Florida, October 16-19, 1989, and published in the ASME Journal of Tribology, 1990.
26. "Cavitation Regimes in Squeeze Film Dampers and Their Effect on the Pressure Distribution", presented at the 44th Annual Meeting of STLE in Atlanta, Georgia, May 1-4, 1989, and published in the STLE Tribology Transactions, 1988.



27. "Cavitation Leading to a Two Phase Fluid in a Squeeze Film Damper", presented at the STLE Annual Meeting in Cleveland, Ohio, May 9-12, 1988 and published in Tribology Transactions, Volume 32' No. 1, 1989, pp. 100-104.
28. "Effect of Fluid Inertia on the Performance of Squeeze Film Damper Supported Rotors", ASME Journal of Gas Turbines and Power, January 1988, Vol. 110, No. 1, pp. 51-57.
29. "Experimental Measurement of the Dynamic Pressure Distribution in a Squeeze-Film Damper Executing Circular-Centered Orbits", presented at the ASME/ASLE Tribology Conference in Pittsburgh, Pennsylvania, October 20-22, 1986 and published in the ASLE Transactions, Volume 30, No. 3, July 1987, pp. 384-393.
30. "Effects of Fluid Inertia on Finite Length Squeeze-Film Dampers", presented at the ASME/ASLE Tribology Conference in Pittsburgh, Pennsylvania, October 20-22, 1986. Published in the ASLE Transactions, Volume 30, No. 1, January 1987, pp. 384-393.
31. "Effect of Tangential Torque on the Dynamics of Flexible Rotors", ASME Journal of Applied Mechanics, Vol. 53, September 1986, pp. 711-718.
32. "Force Coefficients for Open-Ended Squeeze-Film Dampers Executing Small Amplitude Motions About an Off-Center Equilibrium Position", presented at the 1986 ASLE Annual Meeting in Toronto, Canada, May 12-15, 1986 and published in the ASLE Transactions, Volume 30, No. 1, January 1987, pp. 69-76.
33. "Effect of Fluid Inertia on Squeeze-Film Damper Forces for Small Amplitude Circular Centered Motions", presented at the 1986 ASLE Annual Meeting in Toronto, Canada, May 12-15, 1986 and published in the ASLE Transactions, Volume 30, No.1, January 1987, pp. 63-76.
34. "Critical Speeds of Rotating Machinery: Computer Predictions vs. Experimental Measurements Part I - The Rotor Mass-Elastic Model", ASME Paper for the 1985 Vibrations Conference, September 10-13, 1985, Cincinnati, Ohio. Published in the ASME Journal of Vibration, Acoustics, Stress and Reliability in Design, Vol. 109 (1), 1987, pp 1-7.
35. "Critical Speeds of Turbomachinery: Computer Predictions vs. Experimental Measurements - Part 11: Effect of Tilt-Pad Bearings and Foundation Dynamics", ASME Paper No. 85-DET-146, presented at the ASME Design Engineering Division Conference on Mechanical Vibration, Cincinnati, September 10-13, 1985. Published in ASME Journal of Vibration, Acoustics, and Reliability in Design, Vol. 109 (1), 1987, pp 8-14.
36. "Effects of Fluid Inertia and Turbulence on the Force Coefficients for Squeeze Film Dampers", ASME Paper No. 85-GT-191, Gas Turbine Conference, March 18-21, 1985, Houston, Texas, Journal of Engineering for Gas Turbines and Power, September 1985.

37. "Measurement of Torsional Vibration in Rotating Machinery", ASME Paper No. 84-DET-55, Design Engineering Technical Conference, Cambridge, Mass., October 7-10, 1984, Journal of Mechanisms, Transmissions, and Automation in Design, Vol. 108, December 1986, pp. 565-577.
38. "Experimental Measurement of Alford's Force in Axial Flow Turbomachinery", ASME Journal of Engineering for Power, July 1984, pp. 585-590.
39. "An Improved Method for Calculating Critical Speeds and Rotordynamic Stability of Turbomachinery", ASME Journal of Engineering for Power, July 1983, pp. 591-595.
40. "Rotordynamic Instability in Centrifugal Compressors - Are all the Excitations Understood?", ASME Journal of Engineering for Power, April, 1981, pp. 288-293.
41. "Squeeze Film Damper Characteristics for Gas Turbine Engines", ASME Journal of Mechanical Design, January 1978, pp. 139-146.
42. "Absorbers and Isolators for Torsional Vibrations", The Shock and Vibration Digest, Vol. 9, No. 2, February 1977, pp. 3-6.
43. Torquewhirl, "A Theory to Explain Nonsynchronous Whirling Failures of Rotors with High Load Torque", ASME Journal of Engineering for Power, April 1978, pp. 235-240.
44. "Experimental Measurement of the Dynamic Force Response of a Squeeze-Film Bearing Damper", ASME Journal of Engineering for Industry, November 1975, pp. 1282-1290.
45. "High Speed Rotor Dynamics - An Assessment of Current Technology for Small Turboshaft Engines", AIAA Journal of Aircraft, Volume 12, No. 4, April 1975, pp. 295-303.
46. Suppression of Torsional Vibration with Zero Torsional Stiffness Couplings", The Shock and Vibration Bulletin, No. 44, Part 5. August 1974, pp. 43-54.
47. "Torsional Stability Analysis of a Gas-Turbine Powered Helicopter Drive System", ASME Journal of Engineering for Power, October 1974, pp. 335-341.
48. "Stability of High Speed Rotors with Internal Friction", ASME Paper No. 73-DET-127, ASME Journal of Engineering for Industry, August 1974, pp. 960-968.
49. "Numerical Solution of Dynamical Systems by Direct Application of Hamilton's Principle", Journal for Numerical Methods in Engineering, Vol. 4, 1972, pp. 207-216.
50. "Derivation of First Order Difference Equations for Dynamical Systems by Direct Application of Hamilton's Principle", ASME Journal of Applied Mechanics, June 1970, pp. 276-288.

51. "Mathematical Analysis of the Effect of a Shock Sub on the Longitudinal Vibrations of a Drill String", Society of Petroleum Engineers Journal Quarterly, December 1970.

**PUBLISHED IN CONFERENCE PROCEEDINGS (some with co-authors)**

1. "Shrink Fit Effects on Rotordynamic Stability: Experimental Study", GT2008-50410, Proceedings of ASME Turbo Expo 2008: Power for Land, Sea and Air, June 9-13, 2008, Berlin, Germany.
2. "Shrink Fit Effects on Rotordynamic Stability: Theoretical Study", Proceedings of ASME Turbo Expo 2008: Power for Land, Sea and Air, June 9-13, 2008, Berlin, Germany.
3. "Diagnosing Coupled Lateral-Torsional Vibrations In Turbomachinery", GT2008-50125, Proceedings of ASME Turbo Expo 2008: Power for Land, Sea and Air, June 9-13, 2008, Berlin, Germany.
4. "Diagnosing Sub-synchronous Vibration: Unstable Or Benign", DETC2007-35694, Proceedings of the ASME 2007 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, IDETC/CIE 2007, September 4-7, 2007, Las Vegas, Nevada, USA
5. "Sub-Synchronous Vibrations in Rotating Machinery – Methodologies to Identify Potential Instability", Proceedings of GT2007 ASME Turbo Expo 2007: Power for Land, Sea and Air, May 14-17, 2007, Montreal, Canada.
6. "Labyrinth Seal Leakage Tests: Tooth Profile, Tooth Thickness, And Eccentricity Effects", Proceedings of GT2007 ASME Turbo Expo 2007: Power for Land, Sea and Air, May 14-17, 2007, Montreal, Canada.
7. "Rotordynamic Force Coefficients for a New Pocket Damper Seal Design", 7<sup>th</sup> IFToMM Conference on Rotordynamics, Vienna, Austria, September 25-28, 2006.
8. "Rotordynamic Force Coefficients of Pocket Damper Seals", GT2006-91058, *Proceedings of GT2006, ASME Turbo Expo 2006*, Barcelona, Spain, May 8-11, 2006.
9. "High-Pressure Pocket Damper Seals: Leakage Rates and Cavity Pressures", GT2006-90858, *Proceedings of GT2006, ASME Turbo Expo 2006*, Barcelona, Spain, May 8-11, 2006.
- 10.

11. "The Influence Of Same-Sign Cross-Coupled Stiffness On Rotordynamics", DETC2005-84873, *Proceedings of the ASME Design Engineering and Technical Conference*, Long Beach, CA, September 24-28, 2005.
12. "Design Equations For Wire Mesh Bearing Dampers In Turbomachinery", GT2005-68641, *Proceedings of ASME Turbo Expo 2005*, Reno-Tahoe, Nevada, June 6-9, 2005.
13. "Modeling of Impact Dynamics of a Tennis Ball With a Flat Surface", DETC2005-84077, *Proceedings of the ASME Design Engineering and Technical Conference*, Long Beach, CA, September 24-28, 2005.
14. "Design for Rotordynamic Stability of Vertical-Shaft Energy Storage Flywheels", AIAA 2004-5605, *Proceedings of the 2nd Energy Conversion Engineering Conference*, August 16-19, 2004, Providence, Rhode Island.
15. "Response and Stability of a Gas Pocket Damper Seal to Large Rotor Displacements", *Proceedings of the ASME Design Engineering Technical Conference*, Chicago, Illinois, September 2-6, 2003.
16. "Effect Of Static And Dynamic Misalignment On Ball Bearing Radial Stiffness", AIAA Paper 2002-4160, *Proceedings of the AIAA-ASME-SAE Joint Propulsion And Power Conference*, Indianapolis, Indiana, July 2002.
17. "Cryogenic Temperature Effects On Metal Mesh Dampers And Liquid Hydrogen Turbopump Rotordynamics", AIAA Paper 2002-4164, *Proceedings of the AIAA-ASME-SAE Joint Propulsion And Power Conference*, Indianapolis, Indiana, July 2002.
18. "Effect of Frequency and Design Parameters on Pocket Damper Seal Performance", IMECE 2002-32561, *Proceedings of Fluid Structure Interactions*, ASME Winter Annual Meeting, November 17-22, 2002, New Orleans, Louisiana.
19. "Effect of Interference Fits on Threshold Speeds of Rotordynamic Instability", Paper No. 2007, *Proceedings of the International Symposium on Stability Control of Rotating Machinery*, August 20-24, 2001, South Lake Tahoe, California. This paper received one of five awards (out of 63 papers) for excellence at the symposium.
20. "Experimental Evaluation Of A Metal Mesh Bearing Damper In Parallel With A Structural Support", ASME Paper No. 2001-GT-0247, *Proceedings of the 46th International Gas Turbine and Aeroengine Congress*, June 4-7, 2001, New Orleans, Louisiana.

21. “Experimental Evaluation Of Hybrid Damper Seals With Brush Elements – Effect of the Bristles on Power Dissipation and Rotordynamics”, ASME Paper No. 2001-GT-0248, Proceedings of the 46th International Gas Turbine and Aeroengine Congress, June 4-7, 2001, New Orleans, Louisiana.
22. “Hybrid Brush Pocket Damper Seals for Turbomachinery”, ASME Paper No. 99-GT-16, presented at the IGTI/ASME Congress in Indianapolis, Indiana, June 7 – June 10, 1999.
23. “Experimental Evaluation of a Metal Mesh Bearing Damper”, ASME Paper No. 99-GT-15, presented at the IGTI/ASME Congress in Indianapolis, Indiana, June 7 – June 10, 1999.
24. “Actively Controlled Bearing Dampers for Aircraft Engine Applications”, ASME Paper No. 99-GT-18, presented at the IGTI/ASME Congress in Indianapolis, Indiana, June 7 – June 10, 1999.
25. “Experimental Measurements of Actively Controlled Bearing Damping With An Electrorheological Fluid”, ASME Paper No. 99-GT-17, presented at the IGTI/ASME Congress in Indianapolis, Indiana, June 7 – June 10, 1999.
26. “Analysis of Actively Controlled Coulomb Damping For Rotating Machinery”, ASME Paper No. 99-GT-175, presented at the IGTI/ASME Congress in Indianapolis, Indiana, June 7 – June 10, 1999.
27. “Rotordynamic Instability From An Anti-Swirl Device”, ASME Paper No. 97-GT-498, International Gas Turbine & Aeroengine Congress & Exhibition, Orlando, Florida, June 1997.
28. “Experimental Determination of Rotor Foundation Parameters For Improved Critical Speed Predictions”, ASME Paper No. 97-GT-449, International Gas Turbine & Aeroengine Congress & Exhibition, Orlando, Florida, June 1997.
29. “Design and Application of Squeeze Film Dampers in Rotating Machinery”, Proceedings of the 25th Turbomachinery Symposium, Houston, Texas, September 17-19, 1996, pp. 169-188.
30. “Rotordynamic Instability From An Antiswirl Device”, Proceedings of the 8th Workshop on Rotordynamic Instability Problems in High Performance Turbomachinery, Texas A&M University, May 6-8, 1996.

31. "Using a Damper Seal to Eliminate Subsynchronous Vibrations in Three Back to Back Compressors", Proceedings of the 24th Turbomachinery Symposium, Houston, Texas, September 26-28, 1995, pp. 59-71.
32. "Test Results of a New Damper Seal for Vibration Reduction in Turbomachinery", ASME Paper No. 95-GT-36, presented at the International Gas Turbine and Aeroengine Congress & Exposition, Houston, Texas June 5-8, 1995.
33. "Annular Seals as Tools to Control Rotordynamic Response of Future Gas Turbine Engines", AIAA paper 94-2804, 30th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, June 1994.
34. "A New Damper Seal for Turbomachinery", DE-Vol. 60, Vibration of Rotating Systems, ASME 14th Biennial Conference on Mechanical Vibration and Noise, September 19-22, 1993, Albuquerque, New Mexico, pp 139-148.
35. "Effect of Straight Through Labyrinth Seals on Rotordynamics", DE-Vol. 60, Vibration of Rotating Systems, ASME 14th Biennial Conference on Mechanical Vibration and Noise, September 19-22, 1993, Albuquerque, New Mexico, pp159-171.
36. "A Theoretical and Experimental Investigation of a Gas-Operated Bearing Damper for Turbomachinery - Part I: Theoretical Model and Predictions", DE-Vol. 60, Vibration of Rotating Systems, ASME 14th Biennial Conference on Mechanical Vibration and Noise, September 19-22, 1993, Albuquerque, New Mexico, pp 67-83.
37. "A Theoretical and Experimental Investigation of a Gas-Operated Bearing Damper for Turbomachinery - Part II: Experimental Results and Comparison With Theory", DE-Vol. 60, Vibration of Rotating Systems, ASME 14th Biennial Conference on Mechanical Vibration and Noise, September 19-22, 1993, Albuquerque, New Mexico, pp 85-119.
38. "Virtual Instability in a Rotor-Bearing System, Part 1: Measurements", Proceedings, Fourth International Symposium on Transport Phenomena and Dynamics of Rotating Machinery (ISROMAC-4), Honolulu, Hawaii, Vol. B, pp 50-58, April 1992.
39. "Virtual Instability in a Rotor-Bearing System, Part II: Analysis", Proceedings, Fourth International Symposium on Transport Phenomena and Dynamics of Rotating Machinery (ISROMAC-4), Honolulu, Hawaii, Vol. B, pp 379-388, April 1992.

40. "Experimental Measurement of the Dynamic Pressure and Force Response of a Partially Sealed Squeeze Film Damper", Rotating Machinery and Vehicle Dynamics, ASME DE-Vol. 35, pp 251-256, 1991.
41. "A Density Correlation for a Two-Phase Lubricant and its Effect on the Pressure Distribution", presented at the 35th STLE/ASME Joint Tribology Conference in Fort Lauderdale, Florida, October 16-19, 1989, STLE Preprint No. 89-TC-IB-2.
42. "Experimental Investigation of Cavitation Effects on Squeeze Film Force Coefficients", presented at the 12th Biennial ASME Conference on Mechanical Vibration and Noise, Montreal, Canada, September 17-20, 1989, and published in Rotating Machinery Dynamics, DE-Vol. 18-1, ASME, 1989, pp. 237-242.
43. "Failure Analysis and Expert Witness for Products Liability - A Responsibility for the Engineering Profession", ASME Paper No. 80-WA/Mgt-6, ASME Winter Annual Meeting, Chicago, Ill., November 16-21, 1980. Also published in ASME - A Decade of Progress, 1985 Volume.
44. "Labyrinth Seal Effects on Rotor Whirl Stability", Proceedings of the Second International Conference on Vibrations in Rotating Machinery, Cambridge, England, September 2-4, 1980.
45. "Analysis of Complex Rotordynamic Systems Using a Programmable Calculator", Proceedings of the International Computer Technology Conference, San Francisco, California, August 12-15, 1980.
46. "Analysis and Interpretation of Nonsynchronous Whirling in Turbomachinery", ASME Paper No. 78-Pet-26, Energy Technology Conference, Houston, Texas, November 5-9, 1978.
47. "Equilibrium Motion of Unbalanced Dual-Spin Spacecraft", Developments in Mechanics, Vol. 8, Proceedings of the 14th Midwestern Mechanics Conference, March 1975.

#### **REPORTS, PRESENTATIONS, AND UNREVIEWED CONFERENCE PUBLICATIONS**

1. "Despin Analysis", TRACOR Document No. 67-490-U, 1967.
2. "Plume Heating of Antiparallel Rounds", TRACOR Document No. 68-622-U.
3. "Computer Analysis of the Transient Dynamics of Rigid and Flexible Rotors with Bearing Dampers", Pratt & Whitney Aircraft FTDM-301, September 15, 1969.

4. "Influence of Squeeze Film Dampers on the Transient Dynamics of Turbine Engine Rotors", Pratt & Whitney Aircraft FTDM-372, September 15, 1970.
5. "Dynamic Compatibility of Helicopter Propulsion Components", USAAMRDL Tech. Report 72-39, September 1972.
6. "Feasibility Investigation of Zero-Torsional-Stiffness Couplings for Suppression of Resonance and Instability in Helicopter Drive Trains", USAAMRDL Tech. Report 73-103, June 1974.
7. "Design Analysis of Helicopter Automatic and Semi-Automatic Airborne Precision Pointing and Tracking Systems", University of Florida Final Report under Contract DAAM H01-73-C-0978, July 1974.
8. "High Speed Rotor Dynamics - An Assessment of Current Technology for Small Turboshaft Engines", USAAMRDL Tech. Report 74-66, July 1974.
9. "Preliminary Investigation of the Dynamic Force Resonance Coefficients for Squeeze Film Bearing Dampers", University of Florida, Final Report for Grant No. DAHC-4-74-FOO048, U.S. Army Research Office, November 1974.
10. "Rotor Dynamics Research - Summer 1975", SWRI Internal Report, Southwest Research Institute, September 12, 1976.
11. "Rotor Dynamics Research - Summer 1976", SWRI Internal Report, Southwest Research Institute, September 17, 1976.
12. "Program DAMPER", Final Report for Pratt & Whitney Aircraft, P. O. No. F 1 12977 (Consulting Contract for Squeeze Film Damper Analysis), June 1976.
13. "Program FASDAMP", Final Report for Pratt & Whitney Aircraft, Summer 1978.
14. "Nonsynchronous Whirling in Rotating Machinery", Seminar, Department of Mechanical and Aerospace Engineering, University of Virginia, November 29, 1978. Also presented at Shell Development, Inc., Westhollow Research Center, Houston, Texas, November 9, 1978.
15. "Failure Analysis and Expert Witness for Products Liability - The Unique Role of Engineering Faculty", presented at the Gulf-Southwest Annual Meeting of the ASEE, Corpus Christi, Texas, March 29, 1980.
16. "Research and Development for Inertial Energy Storage Based on a Flexible Flywheel", Sandia Laboratories Final Report for Contract No. 07-3693, March 1980.



17. "Centrifuge Capsule Dynamics Analysis", Final Report for Contract No. F33615-78-D-0629, Task No. 18, USAF/AFSC, Aeronautical Systems Command, Wright-Patterson AFB, Ohio, September 1980.
18. "Rotordynamic Instabilities in Turbomachinery", lecture given at United Technologies Research Laboratories, East Hartford, Connecticut, September 24, 1981.
19. "An Improved Method for Computing Rotordynamic Instability", and "New Developments in Rotordynamic Stability Analysis", lectures presented at the 19th Meeting of the Industrially Supported Program on Turbomachinery Dynamics Research (TUDYR), University of Virginia, Charlottesville, Virginia, August 8-11, 1983.
20. "Drill Pipe Vibration - What Conditions Favor the Use of A Shock Sub?", Transactions of the 1972 IACD Rotary Drilling Conference, Dallas, Texas. February 23-25, 1972, pp. 21-24.
21. "Dynamic Compatibility of Helicopter Propulsion Components", Transactions of the 1972 Army Science Conference, West Point, N.Y. June 1972.
22. Influence of Coupling Properties on the Dynamics of High Speed Power Transmission Shafts", ASME Paper No. 72-PTG-3697 International Symposium on Gearing and Transmissions, San Francisco, California, October 8-12, 1972.
23. "Vibratory Compatibility of Rotary-Wing Aircraft Propulsion Components", 29th Annual National Forum of the American Helicopter Society, Washington, D.C., May 1973.
24. A Flexible Flywheel Concept", Proceedings of the 1977 Flywheel Technology Symposium, October 5-7, 1977, San Francisco, California.
25. "Energy Storage of Flywheels; A New Flywheel Concept", Proceedings of the 1977 International Conference on Alternative Energy Sources, December 4-7, 1977, Miami, Florida. Also published in Veziroglu, Alternative Energy Sources: An International Compendium, Volumes Hemisphere Publishing Corp., Washington, D.C., 1978.
26. "A Concept for Suppressing Nonsynchronous Whirl in a Flexible Flywheel", Proceedings of the 1978 Magnetic and Flywheel Energy Storage Contractor's Conference, Luray, Virginia, October 24-26, 1978.
27. "A Current Review of Rotordynamics Problems in High Speed Lightweight Turbomachinery and Power Shafting", Proceedings of the Workshop on Stability

and Dynamic Response of Rotors with Squeeze Film Bearing Supports, sponsored by the U.S. Army Research Office, May 8-10, 1979, Charlottesville, Va.

28. "Inertial Energy Storage for Home or Farm Use Using A Flexible Flywheel", Proceedings of the 1980 Flywheel Technology Symposium, co-sponsored by ASME and DOE, Scottsdale, Arizona, October 1980.
29. "Experimental Results Concerning Centrifugal Impeller Excitations", Proceedings of the 1980 Workshop on Rotordynamic Instability Problems in High-Performance Turbomachinery ; NASA CP-2133, May 12-14, 1980.
30. "Instabilities in Turbomachinery", Proceedings of The 5th Annual Seminar on Machinery Vibration Analysis, The Vibration Institute, New Orleans, La., April 7-9, 1981.
31. "Experimental Measurement of Alford's Force in Axial-Flow Turbomachinery", Proceedings of the 1982 Workshop on Rotordynamic Instability Problems in High-Performance Turbomachinery, NASA CP-2250, May 10-12, 1982.
32. "Effects of Fluid Inertia and Turbulence on Squeeze-Film Damper Forces", presented at the Third Workshop on Rotordynamic Instability in High-Performance Turbomachinery, May 28-30, 1984, Texas A&M University, NASA CP 2338, September 1984.
33. "Critical Speeds of Turbomachinery: Computer Predictions vs. Experimental Measurements", Proceedings of the 13th Turbomachinery Symposium, Houston, TX, November 13-15, 1984, pp. 105-130.
34. Resource Leader for "Vibrations in Compressors", Gulf South Compression Conference, August 7-9, 1984, Baton Rouge, La.
35. "Experimental Verification and Practical Application of the Torquewhirl Theory of Rotordynamic Instability", presented and published in the Proceedings of the Symposium on Instability in Rotating Machinery, June 10-14,--1985, Carson City, Nevada. Also published as NASA CP- , 1985.
36. Exhibit of The Texas A&M University Flexible Flywheel for Energy Storage in Homes and Farms, 20th Intersociety Energy Conversion Engineering Conference, August 18-23, 1985, Miami Beach, Florida.
37. "Experimental Measurement of the Dynamic Pressure Distribution in a Squeeze-Film Bearing Damper Executing Circular Centered Orbits", Proceedings of the Fourth Workshop on Rotordynamic Instability Problems in High-Performance Turbomachinery, Texas A&M University, June 2-4, 1986.

38. "Case Study of a Vibration Instability", presented to the Vibration Institute, Houston Chapter Meeting, May 8, 1986.
39. "Cavitation Effects on The Pressure Distribution of a Squeeze Film Damper", Proceedings of the Fifth Workshop on Rotordynamic Instability Problems In High Performance Turbomachinery, May 16-18, 1988.
40. "Balancing and Its Effect on Vibration in Rotating Machinery", presented at the Power Machinery and Compression Conference at the University of Houston, March 21, 1989.
41. "Rotordynamics and the KGB", a Seminar presented at the University of Texas in Austin, February 21, 1989, and at Texas A&M University, Fall 1992.
42. "Rotordynamics in Downhole Pumps", a lecture presented at REDA Pumps, Tulsa, Oklahoma, June 25, 1992.
43. "Rotordynamic Effects of Damper Seals," TRC-SEAL-6-94, #381, Turbomachinery Research Consortium, April 1994.
44. "Rotordynamics of Rub Rings and Bumpers", TRC-RD-6-94, #239, Turbomachinery Research Consortium, April '94.
45. "Effect of Press Fits on Threshold Speeds of Rotordynamic Instability", TRC-RD-5-94, #238, Turbomachinery Research Consortium, April '94.
46. "A Measurement Method for Determining the Internal Damping of Built-Up Rotors with Press or Interference Fits", TRC-RD-7-95, April 1995.
47. "Effects of Clearance and Clearance Ratio on Two and Three-Bladed TAMSEALS", TRC-SEAL-4-95, April 1995.
48. "Rotordynamics of Circular Rub Rings of Various Materials - Test Results and Computer Simulations", TRC-RD-6-95, April 1995.
49. "Rotordynamic Effects of Damper Seals," TRC-SEAL-3-96, Turbomachinery Research Consortium, April 1996.
50. "Rotordynamics of Rub Rings and Bumpers", TRC-RD-3-96, Turbomachinery Research Consortium, April 1996.
51. "Effect of Press Fits on Threshold speeds of Rotordynamic Instability", TRC-RD-2-96, Turbomachinery Research Consortium, April 1996.

- 52 “Experimental Evaluation of a Metal Mesh As A Bearing Damper Material”, TRC-RD-2-99, Annual Report to the Turbomachinery Research Consortium, May 1999.
- 53 "Rotordynamics of Rub Rings and Bumpers", TRC-RD-3-99, Annual Report to the Turbomachinery Research Consortium, May 1999.
- 54 "Rotordynamic Effects of Damper Seals," TRC-SEAL-9-99, Annual Report to the Turbomachinery Research Consortium, May 1999.
- 55 “Torsional Vibration Computer Codes”, TRC-RD-4-99, Annual Report to the Turbomachinery Research Consortium, May 1999.
- 56 “Effect of Shrink Fits on Threshold Speeds of Rotordynamic Instability”, TRC-RD-5-99, Annual Report to the Turbomachinery Research Consortium, May 1999.
- 57 "Metal Mesh Damper Seals for Aircraft Engines", Advanced Technology Program Interim Report, August, 1999.
- 58 "Metal Mesh Damper Seals for Aircraft Engines", Advanced Technology Program Final Report, ATP Project 000512-0116-1997, January 2001.
- 59 “High Pressure TAMSEAL Research Progress Report”, TEES Project 32500-33940, January 2001.
- 60 “Experimental Evaluation of a Metal Mesh as a Bearing Damper Material”, TRC-B&C-1-01, Annual Report to the Turbomachinery Research Consortium, May 2001.
- 61 “Hybrid Damper Seals With Metal Mesh Elements”, TRC-Seal-4-01, Annual Report to the Turbomachinery Research Consortium, May 2001.
- 62 “Hybrid Damper Seals With Brush Elements”, TRC-Seal-3-01, Annual Report to the Turbomachinery Research Consortium, May 2001."Rotordynamics of Rub Rings and Bumpers", TRC-RD-3-01, Annual Report to the Turbomachinery Research Consortium, May 2001.
- 63 "Rotordynamic Effects of Pocket Damper Seals," TRC-SEAL-2-01, Annual Report to the Turbomachinery Research Consortium, May 2001.
- 64 “Torsional Vibration Analysis Computer Code”, TRC-RD-5-00, Annual Report to the Turbomachinery Research Consortium, May 2001.

- 65 "Effect of Shrink Fits on Threshold Speeds of Rotordynamic Instability", TRC-RD-4-01, Annual Report to the Turbomachinery Research Consortium, May 2001.
- 66 "Experimental determination of Foundation Dynamic Properties Without Shaker Tests", TRC-RD-5-01, Annual Report to the Turbomachinery Research Consortium, May 2001.
- 67 "The Effects of Cryogenic Temperatures on Metal Mesh Damping and Rotordynamic Simulations of the RL10 Fuel Turbopump", Final Report to Pratt & Whitney on TEES Project 32500-33800, June 29, 2001.
- 68 "Stiffness and Damping of Monel Metal Mesh as an Auxiliary Bearing Damper", Summer Research Report to the Dresser-Rand Company, August 2001.
- 69 "Experimental Evaluation of a Metal Mesh as a Bearing Damper Material", TRC-RD-2-02, Annual Report to the Turbomachinery Research Consortium, May 2002.
- 70 "Hybrid Damper Seals With Metal Mesh Elements", TRC-Seal-3-02, Annual Report to the Turbomachinery Research Consortium, May 2002.
- 71 "Rotordynamics of Rub Rings and Bumpers", TRC-RD-3-01, Annual Report to the Turbomachinery Research Consortium, May 2001.
- 72 "Rotordynamic Effects of Damper Seals," TRC-SEAL-2-02, Annual Report to the Turbomachinery Research Consortium, May 2002.
- 73 "Torsional Vibration Analysis Computer Code", TRC-RD-3-02, Annual Report to the Turbomachinery Research Consortium, May 2002.
- 74 "Effect of Shrink Fits on Threshold Speeds of Rotordynamic Instability", TRC-RD-4-02, Annual Report to the Turbomachinery Research Consortium, May 2002.
- 75 "Experimental Evaluation of Wire Mesh as a Bearing Damper Material", TRC-RD-2-03, Annual Report to the Turbomachinery Research Consortium, May 2003.
- 76 "Torsional Vibration Analysis Computer Code", TRC-RD-3-03, Annual Report to the Turbomachinery Research Consortium, May 2003.
- 77 "The Influence of Internal Friction on Rotordynamic Instability", TRC-RD-1-03, Annual Report to the Turbomachinery Research Consortium, May 2003.

- 78 Choudhary, V., and Vance, J.M., “Experiments to Support a Design Procedure for Wire Mesh Bearing Damper”, TRC-RD-4-04, Annual Report to the Turbomachinery Research Consortium, May 2004.
- 79 Agarwal, M., Avijit Bhattacharya, and Vance, J.M., “Torsional Vibration Analysis Computer Code”, TRC-RD-5-04, Annual Report to the Turbomachinery Research Consortium, May 2004.
- 80 Srinivasan, A. and Vance, J., “Effect Of Shrink Fits On Threshold Speeds Of Rotordynamic Instability”, TRC-RD-1-04, Annual Report to the Turbomachinery Research Consortium, May 2004.
- 81 Kar, R., and Vance J.M., "Investigation of LabVIEW™ as a Tool for Rotordynamic Measurements and Diagnostics", TRC-RD-3-04, Annual Report to the Turbomachinery Research Consortium, May 2004.
- 82 Ertas, B., Kar, R., and Vance, J.M., " Diagnosing Subsynchronous Vibration: Unstable Or Benign?", TRC-RD-2-04, Annual Report to the Turbomachinery Research Consortium, May 2004.

#### **THESES AND DISSERTATIONS DIRECTED**

1. “Leakage And Rotordynamic Effects Of Pocket Damper Seals And See-Through Labyrinth Seals”, Ahmed Gamal Eldin, Doctor of Philosophy Dissertation in Mechanical Engineering, December 2007, Texas A&M University.
2. “Pocket Damper Seal Coefficients at High Pressure”, Bugra Ertas, Doctor of Philosophy Dissertation in Mechanical Engineering, May 2005, Texas A&M University.
3. “Experimental Determination of Wire Mesh Stiffness and Damping”, Vivek Choudhary, Master of Science Thesis in Mechanical Engineering, August 2004, Texas A&M University.
4. “ Damping and Leakage of Hybrid Pocket Damper Seals”, Laxmi Bhamidipati, Master of Science Thesis in Mechanical Engineering, May 2003, Texas A&M University.
5. “Experiments and Analysis to Improve Damper Seal Predictions”, Srinivas Kannan, Master of Science Thesis in Mechanical Engineering, May 2003, Texas A&M University.

6. "Design of Interference Fits for Rotordynamic Stability", Anand Srinivasan, Master of Science Thesis in Mechanical Engineering, May 2003, Texas A&M University.
7. "Modeling of Impact Dynamics of a Tennis Ball With a Flat Surface", Syed Jafri, Master of Science Thesis in Mechanical Engineering, December 2003, Texas A&M University.
8. "Pressure Phase Lag Effects in High Pressure Damper Seals", Ahmed Gamal, Master of Science Thesis in Mechanical Engineering, December 2003, Texas A&M University.
9. "Torsional Vibration Computations", Nirmal Ganatra, Master of Science Thesis in Mechanical Engineering, May 2003, Texas A&M University.
10. "Pocket Damper Seal Forces With Large Amplitude Orbits", Ramon Aquilar, Doctor of Philosophy Dissertation in Mechanical Engineering, December 2002.
11. "Experiments to Identify Metal Mesh Damper Parameters", Eyad Al-Khateeb, Doctor of Philosophy Dissertation in Mechanical Engineering, August 2002.
12. "Experiments With Metal Mesh Hybrid Pocket Damper Seals", Nauman Ahmad, Master of Science Thesis in Mechanical Engineering, December 2001, Texas A&M University.
13. "Identification of Foundation Modal Impedance Parameters Without a Direct Force Measurement", Varadharajan Sampathkumar, Master of Science Thesis in Mechanical Engineering, December 2001, Texas A&M University.
14. "Experiments to Measure Internal Friction in Rotor Assemblies", Mohammed Mir, Master of Science Thesis in Mechanical Engineering, August 2001, Texas A&M University.
15. "Pocket Damper Seal Measurements at High Frequency", Ashish Sharma, Master of Science Thesis in Mechanical Engineering, August 2001, Texas A&M University.
16. "Experimental Measurement of Ball Bearing Stiffness As a Function of Axial Thrust", Brent Schmidt, Master of Science Thesis in Mechanical Engineering, May 2001, Texas A&M University.

17. "Radial Stiffness of Ball Bearings as Affected by Misalignment", Bugra Ertas, Master of Science Thesis in Mechanical Engineering, August 2001, Texas A&M University.
18. "Experimental Investigation of Metal Mesh Pocket Damper Seals", Steve Buchanan, Master of Science Thesis in Mechanical Engineering, May 1999, Texas A&M University.
19. "A Bulk Flow Model of Multiple-Blade, Multiple-Pocket Gas Damper Seals", Jiming Li, Ph.D. Dissertation in Mechanical Engineering, May 1999, Texas A&M University.
20. "Experimental Investigations of Damper Seal Performance", Hector Laos, Ph.D. Dissertation in Mechanical Engineering, December 1999, Texas A&M University.
21. "Experimental Measurement of Metal Mesh Damper Performance", Mark Zarzour, Master of Science Thesis in Mechanical Engineering, May 1999, Texas A&M University.
22. "Computational Analysis of Transient Torsional Vibration", Asit Singhal, Master of Science in Mechanical Engineering, December 1999, Texas A&M University.
23. "Experimental Evaluation of Rotordynamic Coefficients for Hybrid Metal Mesh Pocket Damper Seals in Turbomachinery", Sami Burshid, December 1999, Texas A&M University.
24. "Analysis and Measurements of Damping From A New Type of Labyrinth Seal", Richard Shultz, Master of Science Thesis in Mechanical Engineering, May 1997, Texas A&M University.
25. "Experimental Study of Rotordynamic Coefficients in Squeeze Film Dampers of an Aircraft Engine", Uhn Joo Na, Master of Science Thesis in Mechanical Engineering, December 1996, Texas A&M University.
26. "The Effect of Imbalance Distribution and Measurement Locations on Critical speeds in a Turboprop Engine Rotor", Manuel Marin, Master of Science Thesis in Mechanical Engineering, August 1996, Texas A&M University.
27. "Rotordynamic Analysis of Rub Rings and Impact Dampers", Jeff Sinclair, Master of Science Thesis in Mechanical Engineering, August 1995, Texas A&M University.



28. "The Effect of a New Damper Seal on Rotordynamics", Jiming Li, Master of Science Thesis in Mechanical Engineering, May 1995, Texas A&M University.
29. "Rotordynamic Testing of a New Turboprop Engine", Zahroof Mohamed, Master of Engineering Project in Mechanical Engineering, August 1994, Texas A&M University.
30. "Experimental Study of an Electro Rheological Bearing Damper With a Parametric Control System", D. Ying, Master of Science Thesis in Mechanical Engineering, May 1993, Texas A&M University.
31. "Rotor Instability Induced By Dead Band Clearance in Bearing Supports", Y.Q. Lin, Ph.D. Dissertation in Mechanical Engineering, May 1993, Texas A&M University.
32. "Development of an Aerostatic Pocket Damper For Aircraft Engines", B.P. Cardon, Master of Science Thesis in Mechanical Engineering, December 1992, Texas A&M University.
33. "An Experimental Investigation of a Swirl Gas Damper For Turbomachinery", S.B. Handy, Master of Science Thesis in Mechanical Engineering, December 1992, Texas A&M University.
34. "A Theoretical and Experimental Investigation of Gas-Operated Bearing Dampers For Turbomachinery", P. Sundararajan, Master of Science Thesis in Mechanical Engineering, May 1992, Texas A&M University.
35. "Effect of Straight Teeth-On-Rotor Labyrinth Seals on Rotordynamics", J.J. Zierer, Master of Science Thesis in Mechanical Engineering, December 1991, Texas A&M University.
36. "Effect of Teeth on Stator Labyrinth Seals on Rotor Imbalance Response", E.M. Conway, Master of Science Thesis in Mechanical Engineering, August 1991, Texas A&M University.
37. "Rotordynamic Analysis of Multi-Line Systems Using the Polynomial Transfer Matrix Method", P.J. Troxler, Master of Science Thesis in Mechanical Engineering, August 1990, Texas A&M University.
38. "Experimental Measurements and Methods for Data Analysis to Determine the Rotordynamic Coefficients of a Labyrinth Seal", S.K. Choi, Master of Science Thesis in Mechanical Engineering, August 1988, Texas A&M University.
39. "Effects of Fluid Inertia and Cavitation on the Force Coefficients of a Squeeze Film Damper", S.Y. Jung, Ph.D. Dissertation, January 1990, Texas A&M University.

40. "Cavitation Effects on the Performance of Squeeze Film Damper Bearings", F. Y. Zeidan, Ph.D. Dissertation, August 1989, Texas A&M University.
41. "Experiments and Analysis for Optimal Design of Squeeze Film Bearing Dampers with High Reynolds Numbers", Luis San Andres, Ph.D Dissertation, December 1985, Texas A&M University.
42. "Computer Simulation of Transient Torsional Vibration During Startups of Machinery Drive Trains", S. Y. Jung, Master's Thesis, August 1986, Texas A&M University.
43. "Calculation of Rotordynamic Unbalance Response Including Torque and Cross-Coupled Stiffness and Damping Effects", Henry Kleespies, Master of Science Thesis in Mechanical Engineering, December 1986, Texas A&M University.
44. "Load-Induced Rotordynamic Instabilities in Turbomachinery", K. B. Yim, Ph.D. Dissertation, December 1984, Texas A&M University.
45. "Eigenvalues of Rotating Machinery", Brian T. Murphy, Ph.D. Dissertation, May, 1984, Texas A&M University.
46. "An Experimental Study of Torsional Vibration Measurement", Robert French, Master's Thesis, August 1981, Texas A&M University.
47. "Experimental Verification of Alford's Theory of Rotordynamic Excitation in Axial Flow Turbomachinery ", Frank Laudadio, Master's Thesis, December 1981, Texas A&M University.
48. "Dynamic Stability Analysis of Overhung Rotors with High Load Torque", James D. Tison, 1977, Master's Thesis, University of Florida.
49. "A Preliminary Study on the Effects of Foundation Parameters on Rotor System Critical Speeds." Master of Engineering Project Report, James F. Walton II, 1977, University of Florida.
50. "Design Optimization of an Automatic Speed Governor for Turbo-Shaft Engines in Helicopters with Zero Torsional Stiffness Couplings", Michael G. Veno, 1975, Master's Thesis, University of Florida.
51. "Experimental Determination of the Pressure Distribution in a Squeeze Film Bearing Damper", Alan J. Kirton, 1974, Master's Thesis, University of Florida.
52. "Torsional Stability Analysis of a Helicopter Drive System", Mark S. Darlow, 1973, Master's Thesis, University of Florida.

53. "Reduction of Torsional Vibrations through the Use of Zero Torsional -Stiffness Couplings", Roger A. Brown, 1973, Master's Thesis, University of Florida.
54. "On Stability of High Speed Rotors with Internal Friction", Jack C. Lee, 1972, Master's Thesis, University of Florida.
55. "Problems in Attitude Stability of Dual-Spin Spacecraft", Amnon Sitchin, 1970, Ph.D. Dissertation, University of Florida.

## **RESEARCH CONTRACTS AND GRANTS**

Note: Unless stated otherwise, the following contracts and grants were received through the Texas Engineering Experiment Station (TEES) at Texas A&M University. Some were administered by the Texas A&M Research Foundation. John M. Vance is the Principal or Co-Principal Investigator on all contracts and grants listed here.

1. "Experiments to Determine the Leakage and Force Coefficients of Pocket Damper Seals at High Pressures", Bearings Plus, Inc., P.I. John M. Vance, 9/1/00 – 5/31/06, \$249,290.
2. "Labyrinth Seal Leakage Experiments With Different Blade Profiles", P.I.: John Vance, 1 graduate student supported, June 1, 2004 to May 31, 2007, Turbomachinery Research Consortium, \$22,000 each year to 2006, \$28,000 for 2007.
3. Diagnosing Subsynchronous Vibration: Unstable or Benign, P.I.: John Vance, 1 graduate student supported, June 1, 2003 to May 31, 2007, Turbomachinery Research Consortium, , \$22,000 each year to 2006, \$28,000 for 2007.
4. Investigation of Labview™ as a Tool for Rotordynamic Measurement and Diagnostics, P.I.: John Vance, 1 graduate student supported, June 1, 2003 to May 31, 2007, Turbomachinery Research Consortium, , \$22,000 each year to 2006, \$28,000 for 2007.
5. Experimental Evaluation of Wire Mesh As A Bearing Damper Material", Turbomachinery Research Consortium, P.I.: John Vance, 1 graduate student supported, June 1, 2002 to May 31, 2003 and renewed by proposal for June 1, 2002 to May 31, 2004, \$20,000 each year, and for 2006-2007, \$28,000.
6. "Effect of Shrink Fits on Threshold Speeds of Rotordynamic Instability", Turbomachinery Research Consortium , P.I.: John Vance, 1 graduate student supported, , June 1, 2001 to May 31, 2002 and renewed to June 1, 2002 to May 31, 2004, \$20,000 each year, and to May 31, 2006, \$22,000 each year.

7. "Torsional Vibration Computer Codes", Turbomachinery Research Consortium, P.I.: John Vance, 1 graduate student supported, , June 1, 2001 to May 31, 2002 and renewed to June 1, 2002 to May 31, 2003, \$20,000 each year.
8. "Rotordynamic Effects of Damper Seals", Turbomachinery Research Consortium, P.I.: John Vance, 1 graduate student supported, June 1, 2002 to May 31, 2003, \$20,000.
9. "Evaluation of GRTS 1408 Turbocharger Rotordynamics", General Electric Co., P.I. John Vance, 9/1/00 – 8/31/01, \$173,514.
10. "Evaluation of RL10 Fuel Turbopump Bearing", Lockheed Martin, P.I. John M. Vance, 2 graduate students budgeted, 10/15/98 – 8/31/01, \$159,957.
11. "Rotordynamic Analysis of a Turbine-Generator Drive Train", Tennessee Valley Authority, P.I. John M. Vance, 1/20/99 – 4/30/99, \$16,364.
12. "Experimental Determination of Foundation Dynamic Properties Without Shaker Tests", 1 graduate student supported, Turbomachinery Research Consortium (TRC), June 1, 1999 to May 31, 2000, \$20,000 and renewed for June 1, 2000 to May 31, 2001, \$20,000 each year.
13. "Experimental Evaluation of Metal Mesh As A Bearing Damper Material", Turbomachinery Research Consortium, P.I.: John Vance, 1 graduate student supported, June 1, 1999 to May 31, 2000, \$20,000 and renewed for June 1, 2000 to May 31, 2002, \$20,000 each year.
14. "Rotordynamic Effects of Damper Seals", Turbomachinery Research Consortium, P.I.: John Vance, 1 graduate student supported, June 1, 1999 to May 31, 2000, \$20,000 and renewed for June 1, 2000 to May 31, 2002, \$20,000 each year.
15. "Rotordynamics of Rub Rings and Bumpers", Turbomachinery Research Consortium, P.I.: John Vance, 1 graduate student supported, June 1, 1999 to May 31, 2000, \$20,000 and renewed for June 1, 2000 to May 31, 2001, \$20,000 each year.
16. "Effect of Shrink Fits on Threshold Speeds of Rotordynamic Instability", Turbomachinery Research Consortium , P.I.: John Vance, 1 graduate student supported, June 1, 1999 to May 31, 2000, \$20,000 and renewed for June 1, 2000 to May 31, 2002, \$20,000 each year.
17. "Metal Mesh Damper Seals For Aircraft Engines", Texas Higher Education Coordinating Board, ATP Grant, January 1, 1998 - December 31, 2001, \$58,608.

18. "Damper Seals For Aircraft Engines", Texas Higher Education Coordinating Board, ATP Grant #999903-073, January 1, 1996 - December 31, 1997, \$132,869.00
19. "Research For Advanced Aircraft Engine Structures", Air Force AFOSR-910157, January 1, 1991 - September 30, 1994, \$403,889 (graduate student support only, no P.I. support).
20. "Rotordynamic Testing of the TP900 Rotor-Bearing System", Propulsion Research Inc., September 1993 - December 1993, \$41,182 (5% P.I. time).
21. "Dampers For Advanced Engines", General Electric Aircraft Engines, Contract #200-14-S92771, March 1988 - January 1992, \$75,000 per year.
22. "Active Rotor System Dampers", General Electric Aircraft Engines, Contract #200-14-S92818, November 1988 - December 1990, \$114,500.
23. "Rotordynamic Effects of Damper Seals", Turbomachinery Research Consortium (TRC), 1992-93 and 1993-94, \$15,000 per year, (no P.I. support).
24. "Effect of Press Fits on Threshold Speeds of Rotordynamic Instability", TRC, 1992-93 and 1993-94, \$15,000 per year (no P.I. support).
25. "Rotordynamics of Rub Rings and Bumpers", TRC, 1993-94, \$15,000 (no P.I. support).
26. "Effect of Labyrinth Seals on Rotordynamics", TRC, 1988-1991, \$15,000 per year (no P.I. support).
27. "Experimental Measurement of Squeeze Film Damper Coefficients", TRC, 1988-1990, \$15,000 per year (no P.I. support).
28. "Research for Advanced Aircraft Engine Structures", Grant No. AFOSR-86-0297, Air Force Office of Scientific Research, September 1, 1987 to present, \$89,000 for '87-'88, \$83,740 for '88-'89, \$150,651 for '89-'90, \$138,723 for '90-'91.
29. "Rotordynamics of Submersible Borehole Pumps", Reda Pump Co., January 1, 1990 to May 31, 1991, \$19,000.
30. "Modification and Improvement of Program JAZZ for a PC Computer", TRC, October 1, 1989 to December 31, 1990, \$6,000.
31. "High Performance Damper Analysis and Test Program", Contract # 1-4-G-45481, General Electric Co., June 1, 1985 through March 31, 1986, \$65,000, and Contract

- #14J9991 1, April 1, 1986, through November 30, 1986, \$85,000, then \$60,000 per year through December 31, 1989.
32. "Workshop on Rotordynamic Instability Problems in High-Performance Turbomachinery", U.S. Army Research office, 1984 Contract No. D M G29-84-H-0127, funded in 1980, 1982, 1984, 1986 and 1988, \$15,000 each year held.
  33. "Investigation of Load-Induced Rotordynamic Instability in Turbomachinery", National Science Foundation Grant, September 1, 1981 to April 31, 1984. \$182,719.
  34. "Measurement and Analysis of Electromagnetic Currents in Turbomachinery", 1982-1988, TRC, \$20,000 per year.
  35. "Experimental Measurement of the Effect of Labyrinth Seals on Rotordynamics", TRC, 1982-1992, \$30,000 per year to 1986, \$15,000 per year thereafter.
  36. "Experimental Measurement of Squeeze Film Bearing Damper Coefficients", TRC, 1983-present. \$20,000 per year to 1986, \$15,000 per year thereafter.
  37. "Research and Development for Inertial Energy Storage Based on a Flexible Flywheel", U.S. Department of Energy Contract No. 07-3693, Sandia Laboratories, September 1, 1978 to September 1, 1979. \$39,708.
  38. 32. Research Director on Grant from Nicolet Scientific Corporation to investigate methods for spectrum analysis of machinery vibrations, 1979-1980. \$21,000 (Equipment Grant), plus \$7,200 to support graduate research.
  39. EIES, University of Florida, U. S. Army Research Grant for "Investigation of Load-Induced Non-synchronous Whirl Instabilities in Rotating Machinery", Grant No. DAAG29-77-0217, USARO, Durham, North Carolina, September 1977 to September 1979. \$70,469.
  40. EIES, University of Florida, U. S. Army Research Grant for "Optimization of Governor Design in helicopter Propulsion Systems with Zero Torsional Stiffness Couplings", Grant No. DAHCO4-74-G-0048, USARO, Durham, North Carolina, January 1974 to June 1975. \$14,165.
  41. EIES, University of Florida, U. S. Army Research Grant for "Preliminary Investigation of the Dynamic Force Response Coefficients for Squeeze Film Bearing Dampers", November 1973 - July 1974. \$12,224.
  42. EIES, University of Florida, U. S. Army Research Contract for "Accurate Modeling Design Analysis & Sensitivity Investigation of Helicopter Automatic and Semi-Automatic Airborne Laser Designator System", February 1973 through February 1974.

43. 37. EIES, University of Florida, U. S. Army Research contract for "Feasibility Investigation of Zero Torsional Stiffness Couplings for Suppression of Resonance and Instability in Helicopter Drive Trains, Contract No. DAA J02-72-C-0076, USAAMRDL, Ft. Eustis, Virginia, May 1972 - May 1973. \$30,794.

## **LABORATORY DEVELOPMENT**

The rotordynamics laboratory at Texas A&M University was started by Dr. John Vance in 1978. It supported a very active and well equipped research group in the Turbomachinery Program at Texas A&M University. After 1990 this laboratory was jointly developed with Dr. Luis San Andres, and several years later Dr. Vance moved his experimental equipment to the new Turbomachinery Laboratory Building. Dr. Vance's laboratory was located in two large and modern test cells in the Turbomachinery Laboratory Building. The Director of the Turbomachinery Laboratory is Dr. Dara Childs. Dr. Vance's overall objective was to advance rotordynamics technology and perform research that will be valuable to users and manufacturers of rotating machinery. Specifically, the laboratory concentrated on innovative design and development of bearing dampers and damper seals, and also supported the TurboLab's development of a complete set of computer codes for rotordynamic stability and imbalance response analysis, critical speeds, and torsional vibration analysis. These codes became part of the package of benefits received by members of the Turbomachinery Research Consortium (TRC). Dr. Vance's laboratory attracted over two million dollars in external research support and supported the research of sixty graduate students. Most of the equipment and instrumentation was obtained from external sources of funding. There was no other comparable rotordynamics laboratory at any U.S. University.

Some research projects directed by John Vance in the laboratory were:

### **1. Gas Damper for High Temperature Applications**

Large increases in the thrust/weight ratio of future aircraft gas engines will require higher operating temperatures, so high that the conventional lubrication system may be eliminated. One requirement to allow this advance in engine technology will be a bearing damper which can operate without a liquid lubricant, e.g. a gas damper using air as the working fluid. Two design concepts were analyzed and tested in 1988-1990. The best performing design from that effort was developed further in 1991. Several variations of the gas damper were successfully tested in 1992.

### **2. Effect of Labyrinth Seals on Rotordynamics**

An instrumented test rig was developed for investigation of the effect of various labyrinth seal designs on rotordynamic response to imbalance and whirl stability. Based on previous analytical studies, it was postulated that some seal designs would have a more favorable effect on rotordynamics. Computer programs were written to simulate the imbalance response and logarithmic decrement of the test rig, thus allowing indirect computation of seal force coefficients from rotordynamic test data.

### **3. Development of a Damper Seal for Turbomachinery**

A rotating seal for compressible fluids (gases) was invented with a graduate student (Richard Shultz) which has direct damping orders of magnitude larger than that of conventional labyrinth seals. Research continued to optimize the design and determine its full effect on rotordynamics. It has been licensed by a manufacturer and has stabilized a number of high pressure compressors in the field.

### **4. Active Vibration Control Using an ER-Fluid**

A study related to active vibration control was focused on using an electrorheological fluid to allow control of the damping coefficient. The measured rotor vibration comprises part of the feedback signal to a high speed digital algorithm which determines the voltage applied to the ER fluid.

### **5. Design Methodology for Rotordynamic Bumpers**

Impact dampers (rotordynamic bumpers, or rub rings) use contact forces between rotor and stator to suppress vibration when traversing critical speeds. These contact forces can also induce violent and destructive rotordynamic instability. This research program aimed to develop a unified and coherent methodology for the design of impact dampers to insure successful operation and avoidance of instability.

### **6. Measurement of Internal Friction in Rotors**

The objective of this research was to develop a universally applicable test procedure for a built-up rotor, the results of which can assess the stability quality due to internal friction. A scheme was conceived in which the rotor is suspended free-free with weights added at the ends and excited by impact. Once the mode shape on bearings has been achieved free-free, the damping is quantified by logarithmic decrements or by impedance curve-fitting on a signal analyzer. A method was developed to combine the measured modal dampings at each free-free eigenvalue into a single number representing the modal damping on bearings. The devised test procedure is theoretically sound but turned out to be impractical in the field. A Master's Thesis was completed on this project.

### **7. Experimental Evaluation Of A Metal Mesh Bearing Damper In A High Speed Test Rig**

Rotordynamic tests of a metal mesh bearing damper were made through a critical speed in the aircraft engine test cell at the Turbomachinery Laboratory (TL). The metal mesh damper performed better than the squeeze film bearing damper originally installed. Research on this continues in 2008 at GE Global Labs under the direction of Dr. Bugra Ertas.

### **8. Experimental Determination Of Rotor Foundation Parameters For Improved Critical Speed Predictions**

An Excel<sup>TM</sup> Workbook was developed to calculate a set of modified frequency-dependent stiffness and damping coefficients (for the bearings) from the rotor foundation mobility measured with an impulse hammer. This eliminates the need for finite element modeling of the



foundation. Guidelines were established for deciding under what conditions the rotor can be left in place for the foundation mobility measurements that are required for this modeling method.

9. **Measurement of Ball Bearing Stiffness With Variable Thrust and Misalignment**

A test apparatus was constructed to measure the radial stiffness of ball bearings with variable axial thrust and misalignment. The results are valuable to the designers of cryogenic turbopumps where bearing supports traditionally have been made stiff due to the lack of damping.

## COLLEGE COURSES TAUGHT

The following courses were taught at the Texas A&M University (TAMU) and the University of Florida (UF):

1. "Design of Machine Components and Systems", Undergraduate, 3 credits, (TAMU).
2. "Vibration Measurements in Rotating Machinery and Machine Structures", Graduate, 3 credits, (TAMU).
3. "Dynamics of Rotating Machinery", Graduate, 3 credits, (TAMU).
4. "Dynamics of Rotating Machinery", Undergraduate, 3 credits, (UF).
5. "Dynamics of Machine Systems", Graduate, 3 credits, (UF).
6. "Design and Analysis of Oil Film Bearings", Graduate, 3 credits, (UF).
7. "Similitude in Mechanical Engineering Design", Graduate, 3 credits, (UF).
8. "Design of Machine Components and Systems", senior elective, 3 credits, (TAMU).
9. "Mechanical Vibrations", senior, 3 credits, (TAMU).
10. "Case Studies of Mechanical Vibration", senior-graduate, 3 credits, (TAMU).
11. "Dynamics", sophomore, 3 credits. Lecturer and Course Coordinator for 14 sections at TAMU, 1984-1985.

12. "Engineering Laboratory", (Projects on instrumentation for machinery vibration and noise), senior, 2 credits, (TAMU).
13. "Advanced Dynamics", graduate, 3 credits, (TAMU).
14. "Strength Analysis in Design", senior-graduate, 3 credits, (TAMU).
15. "Engineering Analysis in Design", senior, 3 credits, (TAMU).
16. "Machine Analysis and Design I", senior, 3 credits, (TAMU).
17. "Machine Analysis and Design II", senior, 3 credits, (TAMU).
18. "Mechanical Design Projects", senior, 3 credits, (TAMU).
19. "Theories of Engineering Experimentation", graduate, 3 credits, (TAMU).
20. "Mechanical Systems I", junior, 4 credits, (TAMU).

#### **SERVICE TO THE UNIVERSITY, THE PROFESSION, AND CONTINUING EDUCATION**

1. Member of the Advisory Committee for the Turbomachinery Symposium, typically 1200 attendees each year, served on this committee to design and develop the program, 1983-2007.
2. Organized, directed, and taught a short course for industry on "Rotordynamics of Turbomachinery", almost every year annually 1981-2004, now sponsored by Bearings Plus 2005-2009.
3. Session chairman for Rotordynamics at the ASME Gas Turbine Conference in Orlando, Florida, June 12-15, 1997.
4. Session chairman at the ASME Biennial Conference on Mechanical Vibration and Noise, Albuquerque, New Mexico, September 19-22, 1993.

5. Conducted the EIT review of dynamics for the TAMU College of Engineering four times: Spring and Fall 1991, Spring and Fall 1992.
6. Served as a TAMU Mentor 1990 to 2000. (Available on call to help students with academic or personal problems).
7. Served as the Faculty Advisor to the Christian Science Organization on the TAMU campus, 1990-1992.
8. Evaluated an invention for RV trailers at the request of the Technology Business Development Group in the Texas Engineering Experiment Station (TEES) at Texas A&M University, January - March 1991.
9. Session Chairman for Hydrodynamics, ASME/ASLE 1986 Tribology Conference. Oct. 20-22, 1986, Pittsburgh, Pennsylvania.
10. Session Co-Chairman for Rotordynamics, ASME Vibrations Conference, Sept. 10-13, 1985, Cincinnati, Ohio.
11. Session Chairman for Symposium on Instability in Rotating Machinery, June 10-14, 1985, Carson City, Nevada.
12. Session Chairman for Rotating Machinery Vibrations, ASME Vibrations Conference, Sept. 26-30, 1977, Chicago, Illinois.
13. Co-organized and taught a short course on "Mechanics of Sailing", Fall, 1980, Texas A&M University. This course was also taught as a non-technical elective in the Department of Mechanical Engineering, University of Florida, 1976-1977.
14. Co-organized and obtained U.S. Army funding for the biennial "Workshop on Rotordynamic Instability Problems in High Performance Turbomachinery", Texas A&M University, May 12-14, 1980, May 10-12, 1982, May 28-30, 1984, June 2-4, and May 16-18, 1988 attended by representatives from over twenty-five industrial organizations research laboratories, and universities in the U.S. and seven foreign countries.
15. Taught a short course, "Machine Analysis and Design", for NASA Engineering Refresher Training, Cape Kennedy, June 1970.
16. Served on a number of college-wide and departmental committees at the University of Florida and Texas A&M, including a committee to investigate the possibility of offering the Doctor of Engineering degree to emphasize design and practice over basic research, University of Florida, 1969-1978, the Graduate Admissions Committee at Texas A&M, 1980 to 1984, the Faculty Development Committee, Texas A&M, 1981 to 1988, The Honors and Awards Committee,

Texas A&M, 1986 to 1988, and The Wyatt Chair Committee, Texas A&M 1990 to 1991.

17. Elected to serve on the University Senate, 1974, University of Florida.
18. Elected to serve on the University Administrative Council, a body composed of Deans and higher administrators plus one elected member from each College, 1972, University of Florida.