CURRICULUM VITA

Peretz Peter Friedmann
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AREAS OF INTEREST

Helicopter and fixed-wing aeroelasticity, on blade control for vibration and noise reduction in rotorcraft, aeroelasticity and aerothermoelasticity of hypersonic vehicles, structural optimization with aeroelastic constraints; structural dynamics, rotary-wing unsteady aerodynamics, coaxial rotor aeromechanics and aeroelasticity, aeroservoelasticity.

EDUCATION

B.Sc. Aeronautical Engineering, Technion-Israel Institute of Technology, June 1961
M.Sc. Aeronautical Engineering, Technion-Israel Institute of Technology, June 1968
D.Sc. Aeronautics & Astronautics, Massachusetts Institute of Technology, May 1972

HONORS AND AWARDS

- 2022 Reed Aeronautics Award, the highest award given by AIAA, one award per year since 1934.
- 2019 Vertical Flight Society (VFS, previously AHS) Honorary Fellow Award
- 2017 Dr. Alexander Klemin Award, American Helicopter Society (AHS), the Klemin Award is the highest honor the AHS bestows on an individual for notable achievement in advancing the field of vertical flight aeronautics.
- 2016 Meir Hanin International Aerospace Prize, awarded by the Technion – Israel Institute of Technology.
- Nikolsky Honorary Lectureship, American Helicopter Society (AHS), May 2013.
- 2009 AIAA Ashley Award for Aeroelasticity (inaugural recipient).
- 2009 Dryden Lectureship in Research, given by AIAA, title of Dryden Lecture, "Aeronautics Research at Two Frontiers of Vehicle Development – Vibration Control in Rotorcraft and Hypersonic Aeroelasticity"
- American Helicopter Society (AHS) Fellow Award, 2004
- Spirit of St. Louis Medal, awarded by the American Society of Mechanical Engineers (ASME), 2003 – citation, " For outstanding seminal contributions to aeroelasticity

and structural dynamics, particularly as applied to analysis, design optimization and vibration reduction in helicopters which have had an exceptional impact on the understanding of aeromechanical behavior and design of rotorcraft systems”.

- American Institute of Aeronautics and Astronautics (AIAA) Structures, Structural Dynamics, and Materials Award, 1996.
- AIAA Structures, Structural Dynamics and Materials Lecture Award, 1997
- AIAA Fellow, 1991
- ASME Structures and Materials Award, (1984, 2004, 2010), this is the best paper award for the best paper at the previous year’s SDM Conference, selected from among over 500 papers.
- Royal Aeronautical Society Silver Award, 2011
- The Aerospace Engineering Award for Outstanding Accomplishment, awarded by the College of Engineering, University of Michigan, April 2003
- Recipient, Lester Gardner Fellowship, MIT, 1969-70;

PROFESSIONAL EXPERIENCE

1999 – Present, François-Xavier Bagnoud Professor and Director of the FXB Center for Rotary and Fixed Wing Air Vehicle Design, Department of Aerospace Engineering, University of Michigan, Ann Arbor.

1972 – 1998, Professor, Associate Professor (1977-1980), and Assistant Professor (1972-1977), Mechanical and Aerospace Engineering Department, University of California, Los Angeles,

1988 – 91 Chairman, Mechanical and Aerospace Engineering Department, UCLA.

1978 - 1979 Visiting Associate Professor of Aeronautics, (Sabbatical) Graduate Aeronautical Laboratories, California Institute of Technology, Pasadena, California

1969 - 1972 Research Assistant, MIT, Aeroelastic and Structures Research Laboratory.

1965 – 1969 Senior Engineer, Head of Loads Group, Israel Aircraft Industries,

1961 – 1964 Engineering Officer, First Lieutenant, Israel Defense Forces, Air Force

PERSONAL – Naturalized U.S. Citizen since 1977, married.

ACADEMIC EXPERIENCE

A. COURSES TAUGHT AND DEVELOPED AT UCLA

MAE 102	Mechanics of Particles and Rigid Bodies (Taught)
MAE 154A	Preliminary Design of Aircraft (Developed, taught)
MAE 154B	Design of Aerospace Structures (Developed, taught)
MAE 166A	Analysis of Flight Structures (Taught)
MAE 254B	Helicopter Dynamics and Aeromechanics (Developed, taught)

MAE 263B	Topics in Modeling and Dynamics of Aerospace Vehicles (Developed, taught)
MAE 269A	Dynamics of Structures (Developed, taught)
MAE 269B	Advanced Dynamics of Structures (Developed, taught)
MAE 269C	Introduction to Probabilistic Dynamics (Taught)
MAE 269D	Aeroelastic Effects in Structures (Developed, taught)

B. COURSES TAUGHT AND DEVELOPED AT THE UNIVERSITY OF MICHIGAN

AE 315	Aircraft and Spacecraft Structures (Taught)
AE 481	Aircraft Design, (Revised, taught)
AE 543	Structural Dynamics, (Developed, taught)
AE 544	Aeroelasticity, (Developed, taught)
AE 545	Aeromechanics of Rotary Wing Vehicles, (Developed, taught)
AE585	Aerospace Seminars (Developed jointly with G. Faeth, taught)

C. Ph. D. STUDENTS GRADUATED AND ADVANCED TO CANDIDACY

Note: Ph. D. students who hold faculty or leadership positions identified in partial bold type

1. Shamie, J., A Study of the Aeroelastic Stability of Complete Rotors with Application to a Teetering Helicopter Rotor in Hover and in Forward Flight, graduated from UCLA, 7/76.
2. Patrickson, C. P., A Study of the Coupled Lateral and Torsional Response of Tall Buildings to Wind Loadings, graduated from UCLA, 12/76.
3. Reyna-Allende, M., The Coupled Flap-Lag-Torsional Aeroelastic Stability of Helicopter rotor Blades in Forward Flight, graduated, graduated from UCLA 12/76.
4. Warmbrodt, W., Aeroelastic Stability of Coupled Rotor/Support System with Application to Large Horizontal Axis Wind Turbines, graduated from UCLA 8/78.**(Chief, Rotorcraft Aeromechanics Branch, NASA Ames Research Center)**
5. Bendiksen, O. O., Coupled Bending-Torsion Flutter in Cascades with Application to Fan and Compressor Blade Flutter, graduated from UCLA, 3/80. **(Professor Emeritus, Mechanical and Aerospace Engineering Department, UCLA)**
6. Straub, F., Application of the Finite Element Method to Rotary-Wing Aeroelasticity, graduated from UCLA, 4/80. **(Chief of Dynamics, Boeing Helicopters, Mesa, AZ, deceased 2016)**
7. Shanthakumaran, P., Optimum Design of Rotor Blades for Vibration Reduction in Forward Flight, graduated from UCLA, 12/82.
8. Dinyavari, Mehran, Unsteady Aerodynamics in Time and Frequency Domains for Finite-Time Arbitrary Motion of Rotary-Wings in Hover and in Forward Flight, graduated from UCLA, 3/84.

9. Kosmatka, J., Structural Dynamic Modeling of Nonisotropic Blades by the Finite Element Method, graduated from UCLA, 7/86. **(Professor of Composite and Aerospace Structures, and Callaway Professor of Structural Mechanics, Department of Structural Engineering, University of California, San Diego).**
10. Celi, R., Aeroelasticity and Structural Optimization of Rotor Blades with Swept Tips, graduated from UCLA, 7/87. **(Professor, Aerospace Engineering Department, University of Maryland).**
11. Takahashi, M., Active Control of Helicopter Aeromechanical and Aeroelastic Instabilities, graduated from UCLA, 6/88.
12. Robinson, L., Aeroelastic Simulation of Higher Harmonic Control, graduated from UCLA, 9/90.
13. Livne, E., Integrated Multidisciplinary Optimization of Actively Controlled, Fiber Composite Wings, (co-chair with Professor L. A. Schmit), graduated from UCLA, 9/90. **(Boeing Endowed Chair Professor, Department of Aeronautics and Astronautics, University of Washington, Seattle)**
14. Papavassiliou, I., Nonlinear Coupled Rotor/Fuselage Vibration Analysis and Higher Harmonic Control Studies for Vibration reduction in Helicopters, graduated from UCLA, 1/91.
15. Lust, S., Free and Forced Response of Disordered Periodic Beam and Truss Structures, (co-chair with Professor O. O. Bendiksen), graduated from UCLA, 6/91.
16. Pak, C. G., Adaptive Active Flutter Suppression of a Wing under Transonic and Subsonic Flight Conditions, graduated from UCLA, 6/91.
17. Millott, T. A, Vibration Reduction in Helicopter Rotors Using a Trailing Edge Actively Controlled Surface, graduated from UCLA, 9/93. **(Chief of Dynamics and Acoustics, Sikorsky).**
18. Yuan, K., Aeroelasticity and Structural Optimization of Composite Helicopter Rotor Blades with Swept Tips, graduated from UCLA, 12/94.
19. Chiu, T., A Fundamental Study of Vibration reduction in Rotorcraft Using the ACSR Approach, graduated from UCLA, 9/96.
20. Myrtle, T., Development of an Improved Aeroelastic Model for the Investigation of Vibration Reduction in Helicopter Rotors Using Trailing Edge Flaps, graduated from UCLA, 5/98.
21. Presente, E. H., Innovative Scaling Laws for Nonlinear Aeroelastic and Aeroservoelastic Problems, graduated from UCLA, 3/99.
22. de Terlizzi, Marino, Blade Vortex Interaction and Its Alleviation Using Passive and Active Approaches, graduated from UCLA, 6/99.
23. Cribbs, R. C., Vibration Reduction in Helicopters Using Active Control of Structural Response (ACSR) with Improved Aerodynamic Modeling, graduated from UCLA, 9/99.
24. Nydick Ira, Studies in Hypersonic Aeroelasticity, Graduated from UCLA, 1/2000.
25. Depailler, G., Reduction of Vibrations Due to Dynamic Stall in Helicopter Rotors Using Actively Controlled Trailing Edge Flaps, graduated from the **University of Michigan,** 10/2002.

26. Patt, D., Simultaneous BVI Noise and Vibration Reduction in Rotorcraft Using Actively Controlled Flaps and Including Performance Considerations, graduated from the **University of Michigan**, 10/2004.**(CEO Vecna Robotics, Boston)**
27. Thuruthimattam Biju, Fundamental Studies in Hypersonic Aeroelasticity Using Computational Methods, graduated from the **University of Michigan**, 12/2004.
28. Li Liu, BVI Induced Vibration and Noise Alleviation by Active and Passive Approaches, graduated from the **University of Michiga**n 5/2005.
29. McNamara, J. J., Aeroelastic and Aerothermoelastic Behavior of Two and Three Dimensional Lifting Surfaces in Hypersonic Flow, graduated from the **University of Michigan** 10/2005 (Professor Ken Powell, co-chair). **(Professor, Department of Aerospace Engineering, Ohio State University).**
30. Wei Ng, Thermomechanical Behavior of a Damaged Thermal Protection System, graduated from the **University of Michigan**, 12/2007 (Professor A. Waas, co-chair).
31. Bryan Glaz, Optimization of Helicopter Rotor Blades for Simultaneous Reduction of Noise and Vibration in Forward Flight, graduated from the **University of Michigan** in May, 2008. **(Chief Scientist, U.S. Army Research Lab, Aberdeen).**
32. Abhijit Gogulapati, Nonlinear Approximate Aeroelastic Analysis of Flapping Wings in Hover and Forward Flight, graduated from the **University of Michiga**n, 5/2011. **(Assistant Professor Aerospace Eng., I.I.T. Bombay).**
33. Ashwani Padthe, Active Vibration and Noise Alleviation in Rotorcraft Using Microflaps, graduated from the **University of Michiga**n, 1/2011.
34. Nicolas Lamorte, Uncertainty Characterization in Hypersonic Aeroelasticity and Aerothermoelasticity, graduated from the **University of Michigan,** 7/2013.
35. Eric Muir, Aeroelastic Behavior of Bird-Damaged Fan Blades Using a Coupled CFD/CSD Framework, graduated from the **University of Michiga**n 5/2014.
36. Michael Chia, Rotorcraft in-plane Noise Reduction Using Active/Passive Approaches with Vibration Tracking, graduated from the **University of Michigan**, 5/2017.
37. Puneet Singh, advanced to candidacy 2014, thesis topic: Aeromechanics of Coaxial Rotor Helicopters using the Viscous Vortex Particle Method, graduated from the **University of Michigan**, 6/2020.
38. Daning Huang, advanced to candidacy 2014, thesis topic: An Aerothermoelastic Analysis Framework Enhanced by Model Order Reduction with Application to Aerothermoelastic Scaling, graduated from the **University of Michigan** 5/2019 **(Assistant Professor, Dept. of Aerospace Engineering, Penn State)**.
39. Ryan Patterson, advanced to candidacy May 2017, thesis topic: Vibration Reduction on Helicopter Rotors using Active Flow Control, graduated from the **University of Michigan** in 11/2021.
40. Abhinav Sharma, advanced to candidacy January 2017, thesis topic: Development and Application of a Comprehensive Simulation for Modeling Helicopter Ship Landing, Graduated from the **University of Michigan** 9/2019.
41. Elliot Kimmel, started 9/2020, admitted to Ph.D. program 1/2021, advanced to candidacy, May 2021, thesis topic – Hypersonic Aerothermoelasticity.

D. M. S. STUDENTS GRADUATED AT UCLA

1. Andrew W. Chow, 1973, (no thesis plan)
2. Louis J. Silverthorn, 1973, (thesis plan)
3. Oddvar O. Bendiksen, 1975, (no thesis plan)
4. Richard Powers, 1976, (thesis plan)
5. Richard Curtiss, 1976, (no thesis plan)
6. John R. Scattergood, 1978, (no thesis plan)
7. Yitzchak Ben-Harush, 1978, (no thesis plan)
8. Paolo R. Roberti, 1980, (no thesis plan)
9. Josh Levin, 1981, (thesis plan)
10. Roberto Celi, 1981, (no thesis plan)
11. John Kosmatka, 1982, (no thesis plan)
12. Paul A. Blelloch, 1984, (no thesis plan)
13. Robert S. Day, 1984 (no thesis plan)
14. Linda Voce, 1984, (no thesis plan)
15. Steve Burke, 1986, (no thesis plan)
16. Richard Weisenburger, 1986, (no thesis plan)
17. Linda Davis, 1987, (no thesis plan)
18. D. J. Petersen, 1987, (no thesis plan)
19. Francis Hu, 1987, (no thesis plan)
20. Mark Hitz, 1989, (no thesis plan)
21. Krishnan Hoffman, 1989, (no thesis plan)
22. David Stephens, 1989, (no thesis plan)
23. Verghese Nallengara, 1993, (no thesis plan)
24. C. Pointras, 1994, (no thesis plan)

E. POST-DOCTORAL SCHOLARS

AT UCLA

1. Dr. Aviv Rosen, 9/1975-77
2. Dr. Takashi Yamane, 1989-90

AT THE UNIVERSITY OF MICHIGAN

1. Dr. Marino de Terlizzi, 6/1999 – 12/1999
2. Dr. Richard Cribbs, 9/1999 – 8/2000
3. Dr. Li Liu, 5/2005 – 4/2010
4. Dr. Jack McNamara, 10/2005 – 7/2006
5. Dr. Wei Ng, 9/2007 – 2/2008 (jointly with Professor A. Waas)
6. Dr. Bryan Glaz, 5/2008 – 9/2010
7. Dr. Abhijit Gogulapati, 5/2008 – 2/2011
8. Dr. Ashwani Padthe, 12/2011 –7/2015

9. Dr. Nicolas Lamorte, 8/2012 – 2/2013
10. Dr. Tomer Rokita, 8/2016- present.

F. VISITING FACULTY AT THE UNIVERSITY OF MICHIGAN

1. Professor Moti Karpel, Sanford Kaplan Chair, Faculty of Aerospace Engineering, Technion – Israel Institute of Technology, Haifa, Israel, 10/11 – 1/12.
2. Professor Ranjan Ganguli, Professor, Department of Aerospace Engineering, Indian Institute of Science, Bengaluru, India, Visiting Fulbright Scholar, 2/2011 – 9/2011.

G. RESEARCH STAFF AT THE UNIVERSITY OF MICHGAN

1. Dr. Ashwani Padthe, Assistant Research Scientist 2018-present, Research Investigator 2015-18, Assistant Research Scientist 2018-5/2020

H. UNIVERSITY OF MICHIGAN SERVICE

1999-2001, Chair, Departmental Recruitment Committee
1999, Chair Casebook Committee
2000-2003 Member, COE Undergraduate Committee
2000-2006 Member, SACUA, Tenure Committee
2001-2002 Member, Departmental Committee to stablish AE585 Graduate Seminars Course, course initiated in fall 2002
2003-present Director, FXB Center for Rotary and Fixed Wing Air Vehicle Design (FXB-CRFWAD)
2003-2008 Member, Departmental Graduate Committee
2007-2018 Member, Departmental Teaching Planning Committee
2008-2011 Member, COE Nominating Committee
2008-2010 Chair, Departmental Faculty Search Committee
2009 Chair, Casebook Committee
2010-2011 Member, COE Research Advisory Committee
2011 Member, COE Committee for DTE Professorship in Advance Energy Research
2011 Chair, Casebook Committee
2012-2013 Member, Departmental Faculty Search Committee
2013 Member, Casebook Committee
2015 Member, Casebook Committee
2015-2018 Member, Departmental Graduate Committee
2016-2017 Member, Departmental Strategic Planning Committee
2016 Member, Casebook Committee
2016 Member, Casebook Committee, Nuclear Engineering & Radiological Sciences.
2018-present Member, Departmental Teaching Coordination Committee
2021-present, Member, Departmental Graduate Committee

EXTRAMURAL FUNDING

A. GRANTS AND CONTRACTS AT UCLA

1. Investigation of the Aeroelastic Stability of Helicopter Blades in Hover and in Forward Flight Using Various Unsteady Aerodynamics Theories, NASA Langley Research Center ($211,907; 7/73-11/78).

2. An Experimental and Theoretical Study of the Aeroelastic Response of Tall Buildings to Wind Loading, National Science Foundation ($101,429; 3/75-11/78; P. Friedmann PI, A. Charwat & G. Hart co-PI's).

3. Investigation of Aeroelastic Effects in Wind Turbines, NASA Lewis Research Center ($68,273; 12/78-11/82).

4. Response Studies of Rotors and Rotor Blades with Applications to Aeroelastic Tailoring, NASA Langley Research Center ($231,177; 12/78-11/82).

5. A Study of Aeroelastic and Structural Dynamic Effects in Multi-Rotor Systems with Application to Hybrid Heavy Lift Vehicles, NASA Ames Research Center ($107,000; 5/81-12/83).

6. Study of Unsteady Aerodynamics for Finite-Time Arbitrary Motion of Rotor Blades in Frequency and Time Domain, NASA Ames Research Center ($340,548: 9/82-8/88).

7. Optimum Design of Rotor Blades for Vibration Reduction in Forward Flight, NASA Ames Research Center ($130,900: 4/83-6/88).

8. A Study of Two Topics in Aeromechanics, McDonnell Douglas Helicopter Co. ($70,000; 1/85—12/86)

9. Aeromechanical Problems of Helicopters in Maneuvering Flight, Army Research Office ($114,000; 7/86-9/90).

10. Control Augmented Structural Optimization of Aeroelastically Tailored Fiber Composite Wings and Lifting Surfaces, Air Force Office of Scientific Research (407,754; 11/86-9/90; P. Friedmann & L. Schmit, joint PI's).

11. A Study of Aeromechanical Problems with Active Controls, NASA Ames Research Center ($266,140; 8/87-8/93).

12. Optimal Structural Design of Composite Rotor Blades with Straight and Swept Tips, NASA Langley Research Center ($317,294; 11/87-11/93).

15. A Study of Mode Localization in Periodic Structures, Jet Propulsion Laboratory, Pasadena ($71,420; 1/89-1/93; P. Friedmann, PI & O. Bendiksen, co-PI).

14. NASA Graduate Student Researcher Program, NASA Headquarters ($94,000 7/89-12/93).

15. Studies in Transonic Aeroservoelasticity, NASA Dryden Research Center ($419,012; 3/90-3/98; P. Friedmann, PI & O. Bendiksen, co-PI).

16. Aerothermoelasticity and Aeroservoelasticity of a Generic Hypersonic Vehicle, NASA Dryden Research Center ($338,141; 1/92-12/98; P. Friedmann, PI & X. Zhong, co-PI).

17. A Fundamental Study of Active Vibration Control in Rotorcraft Using ACSR, U.S. Army Research Office ($301,727; 10/92-10/96).

18. Working Group Meeting on Fluid Structure Interaction and Aeroelasticity, Air Force Office of Scientific Research ($12,000; 11/92-6/93).

19. NASA Graduate Student Researcher Program, NASA Headquarters ($66,000; 9/94-12/97).

20. Innovative Scaling Laws for the Study of Nonlinear Aeroelastic and Aeroservoelastic Problems, Air Force Office of Scientific Research ($185,525; 8/94-12/97).

21. Fundamental Validation Studies and Expansion of Capabilities of the 2GCHAS Computer Code at UCLA, NASA Ames Research Center ($24,932; 2/95-10/95).

22. Sixth International Workshop on Dynamics and Aeroelastic Stability modeling of Rotorcraft Systems, U. S. Army Research Office ($15,000; 4/95-4/96).

23. Vibration Reduction in Rotorcraft Using the ACSR Approach with Enhanced Aerodynamic Modeling ($90,000; 6/95-5/98).

24. Developing Innovative Mesoscale Actuator Devices for Use in Rotorcraft Systems, MURI, U. S. Army Research Office ($3,125,000; 6/95-5/2000; G. Carman, PI, P. Friedmann, co-PI, together with four other faculty: B. Dunn, T Hahn, C. M. Ho and C. J. Kim).

25. Aeroservoelastic Problems Associated with External Stores and Innovative Scaling Laws for such Problems, Air Force Office of Scientific Research ($93,413; 7/95-6/98).

26. Aeroelasticity and Aeroservoelasticity of Uninhabited Long-Endurance Aircraft, Air Force Office of Scientific Research ($60,000; 1/98-8/98).

27. Control of Aero-Structural Interactions in Highly Flexible Aircraft, Air Force Office of Scientific Research ($99,093; 3/98-8/98; O. Bendiksen, PI & P. Friedmann, co-PI).

28. A Unique High Frequency Facility for Evaluating Active Materials, U. S. Army Research Office, Equipment Grant ($299,901, July 1998; G. Carman PI, P. Friedmann & R. M'Closkey, co-PI's).

B. GRANTS AND CONTRACTS AT THE UNIVERSITY OF MICHIGAN

1. Aeroelasticity, Aerothermoelasticity and Aeroelastic Scaling of hypersonic Vehicles, Air force Office of Scientific Research ($197,000; 2/12001-12/31/2003; P. Friedmann PI, K. Powell co-PI).

2. Application of Nanotubes to Weight Reduction of Rotorcraft Drive Systems, NASA Glenn Research Center ($60,000, 3/16/2001-9/31/2001; P. Friedmann PI, A. Waas co-PI).

3. Ninth International Workshop on Aeroelasticity of Rotorcraft Systems, U. S. Army Research Office ($10,000; 3/1/2001-12/31/2001).

4. NASA Graduate Researcher Program, Vibration Reduction in Rotorcraft, NASA Ames Research Center ($68,000; 9/1/2000-8/31/2003).

5. NASA Graduate Student Researcher Program, Aeroelasticity and Aeroelastic Scaling of Hypersonic Vehicles, NASA Dryden Research Center, ($68,000; 9/1/2001-8/31/2004).

6. Research Funding Augmentation from the FXB Foundation, for the FXB-Center for Rotary and Fixed Wing Air Vehicle Design (CRFWAD), $35,000/year, for a five-year period starting, 4/1/2001. First four installments have been deposited ($140,000).

7. "Active Control for Simultaneous Noise and Vibration Reduction in Rotorcraft Employing Active Materials Based Actuation", funded by ARO, PI: P. P. Friedmann, Co-PI: D. Bernstein (6/2002-5/2006, for $220,035).

8. "NASA URETI (University Research and Education Technology Institute) –On 3rd Generation Reusable Launch Vehicles", $5,977,916 from NASA and $1,657,024 matching funds from the University of Michigan, period 9/1/02-8/31/07, PI for Michigan- P. Friedmann, co-PI's: I. Boyd, C. Cesnik, W. Dahm, J. Driscoll, A. Gallimore, K. Powell, P. Roe and A. Waas. This is a partnership between the University of Maryland (the lead institution), University of Michigan, University of Washington, Seattle; John Hopkins University, and North Carolina State A&T, total funding $15,000,000 for the period 9/1/2002-8/31/2007.

9. DURIP Grant for "Basic Main Rotor Test Stand (MRTS) for Active Control of Vibration and Noise", $221,900, Army Research Office, 7/1/2003-6/30/2004.

10. "Rotorcraft Vibration Reduction and Performance Enhancement by Active Control with Noise Constraints", funded by NASA National Rotorcraft Technology Center/RITA, $22,000, 6/25/03-6/24/04.

11. "Rotorcraft Vibration Reduction and Performance Enhancement by Active Control with Noise Constraints", funded by RITA/Boeing (Rotorcraft Industry Technology Association), $28,000, 2/11/03-6/30/04.

12. "Rotorcraft Vibration Reduction and Performance Enhancement by Active Control with Noise Constraints", funded by NASA National Rotorcraft Technology Center/RITA, $35,000, 2/04-12/04.

13. "Rotorcraft Vibration Reduction and Performance Enhancement by Active Control with Noise Constraints", funded by RITA/Boeing (Rotorcraft Industry Technology Association), $30,000, 2/04-12/04.

14. "Rotorcraft Vibration Reduction and Performance Enhancement by Active Control with Noise Constraints", funded by RITA/Boeing (Rotorcraft Industry Technology Association), $35,000, 1/05-12/05.

15. "Vibration Reduction and Performance Enhancement in Rotors Using a Combined Active Passive Approach", funded by NRTC/RITA/CRI, $150K, 1/2006-12/2008.

16. "A Fundamental Study of Nonlinear Aeroelastic Phenomena in Flapping Wing Micro Air Vehicles", PI: P. Friedmann, co-PI: W. Shyy, funded by AFOSR, $180K, 5/2006-4/2009.

17. "Vertical Lift Research Center of Excellence", Georgia Tech/Michigan Team, funded by the National Rotorcraft Technology Center (NRTC), August 2006-July 2011, $900,000/year, University of Michigan share $230,000/year plus $70,000/year matching funds from the college, P. Friedmann is the Associate

Director of the Center and the PI for Michigan, co-P. I's are C. Cesnik and D. Bernstein.

18. "Multidisciplinary Passive/Active Optimization of Helicopter Rotors for Vibration and Noise Reduction", NASA Graduate Student Researcher Training Grant (for Bryan Glaz), 9/1/2006-8/31/2009, $72,000.

19. "Aero-Servo-Thermo-Elastic-Propulsion Modeling and Uncertainty Characterization for the Guidance, Navigation, and Control of Highly Reliable Reusable Launch Systems," funded by NASA (Michigan is subcontractor to Ohio State University), $735,000, January 2008 - August 31, 2012, PI-C. Cesnik, co-PI's J. Driscoll, P.P. Friedmann

20. "Michigan/ AFRL/Boeing Collaborative Center in Aeronautical Sciences (MABCCAS)", P. I. Wei Shyy, co-P. I.'s I. Boyd, C. Cesnik, P. Friedmann, H. Im, K. Powell, P. Roe, B. van Leer, $4,836,538, 4/1/2006- 7/31/2013.

21. "Biologically – Inspired, Anisotropic Flexible Wings for Optimal Flapping Flight, ", AFOSR MURI, Wei Shyy P.I., co- PI's at Michigan, L. Bernal, C. Cesnik and P. Friedmann, joint with the University of Florida and Maryland, $3,744,999.00, 8/1/2007-2/28/2013.

22. "A New Dynamic Stall Model based on a Hybrid Computational Approach", $270,000 for the period 1/1/2009-12/31/2011, Center for Rotorcraft Innovation (CRI)/National Rotorcraft Technology Center, PA, joint with L. Sankar, co-PI, Georgia Tech.

23. "Vertical Lift Research Center of Excellence", subcontract to Georgia Tech, P. Friedmann, P.I. with C. Cesnik as co-P.I.'s, for $732, 250, for the period 9/15/2011-9/14/2017, funded by National Rotorcraft Technology Center (NRTC), Moffett Field, CA, also additional UM cost share $159,437.

24. "High Fidelity Surrogate Based Approximation of Nonlinear Unsteady Aerodynamic
Loading on Fan Blades and Blade Assemblies after Bird Strike and Its Effect on Blade and Fan Response", funded by Pratt & Whitney, A United Technology Company, $461,757, for the period 10/1/2010-12/31/2014.

25. "Studies of Hypersonic Aeroelasticity and Aerothermoelasticity Emphasizing real Gas and Non Equilibrium Effects," funded by the State of Israel, $400,083, for the period 5/9/2013 – 7/31/2017.

26. "Study of the Implementation of Individual Blade Control on a Stiff Co-Axial Rotor with Hingeless Blades," funded by Sikorsky, $223,791, for the

period11/1/2014-9/30/2017, due to the sale of Sikorsky to Lockheed Martin C., it was funded partially, $50,000.

27. "A Surrogate Based Framework for Helicopter/Ship Dynamic Interface," PI: P. P. Friedmann, co-PI: K. Duraisamy, for $555,000, period 3/1/16-2/28/19, funded by Office of Naval Research.

28. "Vertical Lift Research Center of Excellence", subcontract to Georgia Tech, P. Friedmann, P.I., Task: Active Flow Control of Rotorcraft Vibration Alleviation and Performance Enhancement using a Combined Modeling/Experimental Approach, for $300,000 augmented by cost share from the university of Michigan for $300,000, for the period 10/1/2016-9/30/2021, funded by National Rotorcraft Technology Center (NRTC), Moffett Field, CA.

29. "Aerothermoelastic Analysis and Scaling of Hypersonic Vehicle Components Including Shock Boundary Layer Interaction", for the period 10/1/2020-12/31/2022 $268,498, funded by the State of Israel.

EXTERNAL PROFESSIONAL ACTIVITIES

A. JOURNAL EDITORSHIPS AND REVIEWING

Associate Editor, Journal of Fluid and Structures (1997-2004)
Associate Editor, Journal of the American Helicopter Society (2004-2009), NOTE – the name of AHS was changed to Vertical Flight Society (VFS) in 2018
Associate Editor, Journal of Aircraft (published by AIAA) 2005-2009.
Editor in Chief, Vertica – The International Journal of Rotorcraft & Powered Lift Aircraft (1980-1990), NOTE – the Journal ceased publication when Pergamon Press went out of business.
Editor-in- Chief, AIAA Journal, (2009-20124), two 3-year terms, this is the flagship journal of AIAA.
Member Advisory Editorial Board, AIAA Journal (2015-present)
Member Advisory Editorial Board, Journal of Vibration and Control (1995-2005)
Paper reviewer for AIAA Journal
Paper reviewer for Journal of Aircraft
Paper reviewer for Journal of Guidance Control and Dynamics
Paper reviewer for the Journal of Spacecraft and Rockets
Paper reviewer for the Journal of Propulsion and Power
Paper reviewer for the Journal of the American Helicopter Society
Paper reviewer for the Journal of Fluid Mechanics
Paper reviewer for the International Journal of Structural Engineering and Mechanics
Paper reviewer for IEEE Transactions on Control Systems Technology
Paper reviewer for the Journal of Applied Mechanics
Paper reviewer for the Journal of Sound and Vibration

Paper reviewer for the Aeronautical Journal
Paper reviewer for the international Journal of Numerical Methods in Engineering
Paper reviewer for Aerospace Science and Technology
Paper reviewer for the Journal of Fluids and Structures
Paper reviewer for Vertica, the International Journal of Rotorcraft & Powered Lift Aircraft
Paper reviewer for the ASCE Journal of Structural Engineering
Paper reviewer for the Mathematical and Computer Modeling

Proposal reviewer for Army Research Office
Proposal reviewer for Air Force Office of Scientific Research
Proposal reviewer for the National Science Foundation
Proposal Reviewer for the Israel Bi-National Fund

B. BOARD AND COMMITTEE ACTIVITIES

Member, Aeronautics & Space Engineering Board, the National Academies (2013-2016)
Member, Guggenheim Medal Board of Award (1997-present), Chair (2002-3)
Member, ASME Environmental and Transportation Board (1998-2001)
Member, ASME Aerospace Division Executive Committee (1995-2000)
Chair, ASME Aerospace Division Executive Committee (1997-98)
Member, ASME Spirit of St. Louis Medal Committee (1990-1996)
Chair, ASME Spirit of St. Louis Medal Committee (2004-2011)
Member, ASME Structures and Materials Committee (Aerospace Division), (1988-2018)
Chair, ASME Structures and Materials Committee (Aerospace Division), (1993-1995)
Member, AIAA Structural Dynamics Technical Committee (1977-80, 1994-2014)
Chair, Strategic Planning Committee, AIAA Structures, Structural Dynamics and Materials Conference (SDM), (2001- 2013).
Member, Organizing and Program Committees, CEAS/AIAA International Symposium on Aeroelasticity and Structural Dynamics (1996-2013)
Member, AHS Education committee (1990-present)
Member, AHS Dynamics Committee (1195-2000, 2005-8, 2009-12, 2018-present)
Member, Presidential Appointee, to MIT Corporation Visiting Committee for the Department of Aeronautics and Astronautics (2005-9)
Chair, International Review Committee, for the Dept. of Aerospace Engineering, appointed by the President of the Technion, review held on May 17-21, 2015, at the Technion, committee members from Georgia Tech, Cornell and University of Tel Aviv.
Member, Visiting Committee, University of Washington William E. Boeing Department of Aeronautics and Astronautics (2015-present)
AIAA Publications Committee (2015-present), Chair of the Journals Subcommittee (2016-present)

C. CONFERENCE ORGANIZATION

Technical Chair, 34th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, La Jolla, CA. April 19-22, 1993.
General Chair, 39th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, Long Beach, CA. April 20-23, 1998.
Chair, Sixth International Workshop on Dynamics and Aeroelastic Stability Modeling of Rotorcraft Systems Sponsored by ARO, held at UCLA, November 8-10, 1995.
Chair, Ninth International Workshop on Aeroelasticity in Rotorcraft Systems Sponsored by ARO, held at the University of Michigan, Ann Arbor, October 22-24, 2001.
Chaired and organized numerous sessions at many conferences, the details are not very significant.

D. MEMBERSHIP OF PROFESSIONAL SOCIETIES

American Institute of Aeronautics and Astronautics, Fellow
American Helicopter Society, Honorary Fellow
American Society of Mechanical Engineers, Member

E. CONSULTING EXPERIENCE

Institute for Defense Analyses, Alexandria, Virginia
Department of the Army, TACOM/ARDEC, Picatinny Arsenal, NJ
TRW Space Systems Group, Redondo Beach, CA
Boeing Helicopters, Mesa, AZ (previously McDonnell Douglas Helicopters, Culver City, CA)
Agusta Helicopters, Italy (company name was changed to Leonardo Helicopters).
Yamaha, Japan
Ichikawajima-Harima, Japan

F. PERSONAL

Naturalized U.S. Citizen since 1977, married.

KEYNOTE, PLENARY AND SPECIAL LECTURES

1. Friedmann, P. “Recent Developments in Rotary-Wing Aeroelasticity,” Paper no. 11, Second European Rotorcraft and Powered Lift Aircraft Forum, Buckeburg, Federal Republic of Germany, September 20-22, 1976.

2. Friedmann, P. “Formulation and Solution of Rotary-Wing Aeroelastic Stability and Response Problems,” Paper No. 3.2, Eighth European Rotorcraft Forum, Aix-en-Provence, France, August 31-September 3, 1982.

3. Friedmann, P., “A New Look at Arbitrary Motion Unsteady Aerodynamics and its Application to Rotary-Wing Aeroelasticity,” Presented at the Second International

Symposium on Aeroelasticity and Structural Dynamics, Aachen, West Germany, April 103, 1985.

4. Friedmann, P.P., “Numerical Methods for Determining the Stability and Response of Periodic Systems with Applications,” presented at a Workshop on Lasers, Molecules and Methods, Los Alamos, New Mexico, July 7-11, 1986.

5. Friedmann, P.P., “Helicopter Blade Dynamics: Some Key Ideas and Insights,” Presented at the Second International Conference on Rotorcraft Basic Research, University of Maryland, College Park, MD, February 16-18, 1988.

6. Friedmann, P.P., “Helicopter Aeroelastic Stability and Response – Current Topics and Future Trends,” Keynote Lecture at the 28th Aircraft Symposium, Nov. 8-9, 1990, Tokyo, Japan.

7. Friedmann, P. P., “Aeroelastic, Aeromechanical and Vibration Problems in Helicopters”, Plenary Lecture at the 33rd Israel Annual Conference on Aviation and Astronautics, Israel, February 24-25, 1993.

8. Friedmann, P.P., “Vibration Reduction in Helicopters Using Active Control,” Keynote Lecture, Proc. of International Conference on Structural Dynamics, Vibration, Noise and Control, Hong Kong, December 5-7, 1995, Vol. 1, pp. 18-43.

9. Friedmann, P.P., “The Renaissance of Aeroelasticity and its Future,” SDM Lecture presented at the 38th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, Kissimmee, FL, April 1997.

10. Friedmann, P.P., “The Renaissance of Aeroelasticity and its Future,” Keynote Lecture, International Forum on Aeroelasticity and Structural Dynamics, Rome, Italy, June 17-20, 1997.

11. Friedmann, P.P., “The Promise of Adaptive Materials for Alleviating Aeroelastic Problems and Some Concerns,” Plenary Lecture, Conference on Innovation in Rotorcraft Technology, Sponsored by the Royal Aeronautical Society, June 24-25, 1997, London, U.K.

12. Friedmann, P. P., “Vibration Reduction Helicopter Rotors Using Actively Controlled Trailing Edge Flaps”, Keynote Lecture, 8th ARO Workshop on Aeroelasticity of Rotorcraft Systems, October 18-20, 1999, Penn State, State College, PA.

13. Friedmann, P. P., “Rotary -Wing Aeroelasticity- Current Status and Future Trends”, Plenary Lecture, AIAA Paper 2001-0427, 39th AIAA Aerospace Sciences Meeting & Exhibit, Reno, NV, January 8-11, 2001, pp. 1-29.

14. Friedmann, P. P., “Rotary -Wing Aeroelasticity- Current Status and Future Trends”, Plenary Lecture, at the CEAS/AIAA International Symposium on Aeroelasticity and Structural Dynamics, Madrid, Spain, June 5-7, 2001.

15. Friedmann, P. P., “Rotary -Wing Aeroelasticity- Current Status and Future Trends”, Keynote Lecture, at the 9th International Workshop on Aeroelasticity in Rotorcraft Systems, University of Michigan, Ann Arbor, October 22-24, 2001.

16. The Paul Hemke Lecture, this is a special endowed Lecture given annually by a distinguished lecturer at RPI; lecture on March 1, 2002-“Rotary-Wing Aeroelasticity – Current Status and Future Trends”.

17. Friedmann, P. P., “Vibration Reduction in Helicopter Rotors Using Actively Controlled Flaps,” Keynote Lecture, US National Congress of Theoretical and Applied Mechanics, Blacksburg, VA, June 24-28. 2002.

18. Friedmann, P. P., “Rotary Wing Aeroelasticity a Historical Perspective”, AIAA Paper No. 2003-1817, Proceedings 44th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, April 2003, Norfolk, VA. (Special 1 hour invited Paper-in the Dynamics Specialist part of the Conference).

19. Friedmann, P. P, “Rotary Wing Aeroelasticity a Historical Perspective”, <u>Tenth International Workshop on Aeroelasticity in Rotorcraft Systems</u>, ARO/Georgia Institute of Technology, Atlanta, GA, November 3-4, 2003.

20. Friedmann, P. P., “Aeroelastic and Aerothermoelastic Analysis of Hypersonic Vehicles – A Multidisciplinary Challenge”, Plenary Lecture at the 48th Israel Annual Conference on Aerospace Sciences, February 27-28, 2008, Israel.

21. Friedmann, P. P., “Aeronautics Research at Two Frontiers of Vehicle Development – Vibration Control in Rotorcraft and Hypersonic Aeroelasticity”, 2009 Dryden Lectureship in Research, 47th AIAA Aerospace Sciences Meeting, 5-8 January 2009, Orlando World Center Marriott, Orlando, FL.

22. Friedmann, P. P., “Aeronautics Research at Two Frontiers of Vehicle Development – Vibration Control in Rotorcraft and Hypersonic Aeroelasticity”, Plenary Lecture at the International Symposium on Aeroelasticity and Structural Dynamics, June 21-25, 2009, Seattle, WA.

23. Friedmann, P. P., “Vibration and Noise reduction in Rotorcraft Using Active Flaps – Simulation, Experiments and Applications”, Keynote Lecture, Third International Basic Research Conference on Rotorcraft Technology, October 14-16, 2009, Nanjing, China.

24. Friedmann, P. P., “Aeronautics Research at Two Frontiers of Vehicle Development – Vibration Control in Rotorcraft and Hypersonic Aeroelasticity”, Annual Librescu Lecture, Department of Engineering Science and Mechanics, Virginia Polytechnic Institute and State University, April 28, 2010.

25. Friedmann, P. P., "On Blade Control of Rotorcraft Vibration, Noise and Performance – Just Around the Corner?", **Nikolsky Honorary Lecture** (Keynote Lecture, at the AHS Forum), 69th Annual Forum of the American Helicopter Society, May 21, 2013, Phoenix, AZ., by tradition this lecture was repeated at several institutions: September 19, 2013, in the Aerospace Department at the University of Michigan; September 26, 2013, in the Mechanical, Aerospace and Nuclear Engineering Dept., at Rensselaer Polytechnic Institute, Troy, NY; October 25, 2013, Aerospace Engineering Dept., at Penn State; November 8, 2013, Aerospace Engineering Department University of Maryland; November 12, 2013, Dept. of Aeronautics and Astronautics, University of Washington, Seattle; November 15, School of Aerospace Engineering, Georgia Tech; November 21, 2013 NASA Ames Research Center, Moffett Field, CA.

26. Friedmann, P. P., "On Blade Control of Rotorcraft Vibration, Noise and Performance – Just Around the Corner?", Plenary Lecture, 40th European Rotorcraft Forum, Southampton, U.K. September 2-5, 2014.

27. Friedmann, P. O., "Hypersonic Aeroelasticity and Aerothermoelasticity – a Multiphysics Challenge", Meir Hanin Memorial Lecture, Faculty of Aerospace Engineering, Technion – Israel Institute of Technology, March 7, Haifa, Israel, 2016.

28. Friedmann, P. P., "Vibration and Noise Reduction in Rotorcraft Using On Blade Control: from Theoretical Concept to Flight Ready Hardware", **Meir Hanin International Aerospace Prize Lecture**, 56th Israel Annual Conference on Aerospace Sciences, March 9, 2016, Tel Aviv, Israel.

PUBLICATIONS

A. BOOKS, CHAPTER IN BOOKS AND EDITORSHIPS

1. Friedmann, P., ed., Special issue of Vertica - The Intl. J. of Rotorcraft and Powered Lift Aircraft devoted to Coupled Rotor Fuselage Dynamics, 3-3:187-271, December 1979.

2. Friedmann, P., ed., (with W. Johnson), Special issue of Vertica, Recent Trends in Helicopter Technology, A Special Issue to mark Vertica's 10th Anniversary, Jan. 1987.

3. Friedmann, P. P., "Numerical Treatment of Linear and Nonlinear Periodic Systems with Applications," Chapter IV, <u>Lasers, Molecules and Methods</u>, Edited by J. O. Hirschfelder, R. E. Wyatt and R. D. Coalson, Advances in Chemical Physics, Vol. LXXIII, John Wiley Interscience, 1989, pp. 197-230.

4. Friedmann, P.P. and Kosmatka, J. B., Editors - Recent Advances in Structural Dynamic Modeling of Composite Rotor Blades and Thick Composites, AD-Vol. 30, ASME Winter Annual Meeting, November 1992.

5. Friedmann, P.P. and Hodges, D. H., "Rotary-Wing Aeroelasticity with Application to VTOL Vehicles," Chapter 6, in Flight-Vehicle Materials, Structures and Dynamics, Assessment and Future Directions, A. K. Noor and S. L. Venneri, Editors, Vol. 5 Structural Dynamics and Aeroelasticity, published by ASME, 1993, pp. 299-391.

6. Friedmann, P. P. and Chang, J. C. I., Editors - Aeroelasticity and Fluid Structure Interaction Problems, AD-Vol. 44, ASME Winter Annual Meeting, November 1994.

7. Chang, J. C. I., Coulter, J. Brei, D., Martinez, D., Ng, W. and Friedmann, P. P., “Proceedings of the ASME Aerospace Division,” AD-Vol. 52, ASME International Mechanical Engineering Congress and Exposition, New York, November 1996.

8. Friedmann, P. P. and Paidoussis, M. P., Editors, 4th International Symposium on Fluid-Structure Interactions, Aeroelasticity, Flow-Induced Vibration and Noise, Vol. III, AD-Vol. 53-3, ASME, 1997 ASME International Mechanical Engineering Congress and Exposition, Dallas, TX, November 16-21, 1997.

9. Friedmann, P. P., Subject Editor, Part 13 – Structural Mechanics, in Encyclopedia of Aerospace Engineering, Volume 3, Structural Technology, pg 1393-1526, Published by John Wiley, 2010, Editors-in-Chief Richard Brockley and Wei Shyy.

10. Friedmann, P. P., Subject Editor, Part 14 – Aeroelasticity and Aeroservoelasticity, in Encyclopedia of Aerospace Engineering, Volume 3, Structural Technology, pg 1527-1670, Published by John Wiley, 2010, Editors-in-Chief Richard Brockley and Wei Shyy.

11. McNamara, J. J. and Friedmann, P. P., ”Hypersonic Aeroelasticity and Aerothermoelasticity,” Article 135, pg. 1593-1606, in Encyclopedia of Aerospace Engineering, Volume 3, Structural Technology, Published by John Wiley, 2010, Editors-in-Chief Richard Brockley and Wei Shyy.

12. Friedmann, P. P., “Rotorcraft Aeroelasticity,” Article 139, pg. 1653-1670, in Encyclopedia of Aerospace Engineering, Volume 3, Structural Technology, Published by John Wiley, 2010, Editors-in-Chief Richard Brockley and Wei Shyy.

B. PAPERS PUBLISHED IN PROFESSIONAL AND SCHOLARLY JOURNALS

1. Friedmann, P., Hanin, M., "Supersonic Non-Linear Flutter of Orthotropic or Isotropic Panels with Arbitrary Flow Direction," Israel J. of Technology, 6:46-57, No. 1-2, 1968.

2. Friedmann, P., Tong, P., "Nonlinear Flap-Lag Stability of Hingeless Helicopter Blades," Israel J. of Technology, 10:133-143, No. 1-2, 1972.

3. Friedmann, P., Tong, P., "Nonlinear Flap-Lag Dynamics of Hingeless Helicopter Blades in Hover and in Forward Flight," J. of Sound and Vibration, 30-1:9-31, August 1973.

4. Friedmann, P., "Aeroelastic Instabilities of Hingeless Helicopter Blades," AIAA J. of Aircraft, 10-10:623-631, October 1973.

5. Friedmann, P., "Some Conclusions Regarding the Aeroelastic Stability of Hingeless Helicopter Blades in Hover and in Forward Flight," J. of the American Helicopter Society, pp. 13-23, October 1973.

6. Friedmann, P., Silverthorn, L. J., "Aeroelastic Stability of Periodic Systems with Application to Rotor Blade Flutter," AIAA Journal, 12-11:1559-1565, November 1974.

7. Friedmann, P., Silverthorn, L. J., "Aeroelastic Stability of Coupled Flap-Lag Motion of Hingeless Helicopter Blades at Arbitrary Advance Ratios," J. of Sound and Vibration, 39(4), p. 409-428, April 1975.

8. Friedmann, P., "Aeroelastic Modeling of Large Wind Turbines," J. of the Amer. Helicopter Society, p. 17-27, October 1976.

9. Friedmann, P., "Influence of Modeling and Blade Parameters on the Aeroelastic Stability of a Cantilevered Rotor," AIAA Journal, 15-2:149-158, February 1977.

10. Friedmann, P., Shamie, J., "Aeroelastic Stability of Trimmed Helicopter Blades in Forward Flight," Vertica-International J. of Rotorcraft and Powered Lift Aircraft, 1-3:189-211, July 1977.

11. Friedmann, P., Yuan, C., "Effect of Modified Aerodynamic Strip Theories on Rotor Blade Aeroelastic Stability," AIAA Journal, 15-7:932-940, July 1977.

12. Friedmann, P., Hammond, C. E., Woo, T., "Efficient Numerical Treatment of Periodic Systems with Application to Stability Problems," International J. of Numerical Methods in Engineering, 11-7:1117-1136, July 1977.

13. Shamie, J., Friedmann, P., “Aeroelastic Stability of Complete Rotors with Application to a Teetering Rotor in Forward Flight,” J. of Sound and Vibration, (53)4, p.559-584, August 1977.

14. Friedmann, P., “Recent Developments in Rotary-Wing Aeroelasticity,” AIAA J. of Aircraft,
14-11:1027-1041, November 1977.

15. Rosen, A., Friedmann, P., “The Nonlinear Behavior of Elastic Slender Straight Beams Undergoing Small Strains and Moderate Rotations,” ASME J. of Applied Mechanics, 46:161-168, March 1979.

16. Kottapalli, S. B. R., Friedmann, P., Rosen A., “Aeroelastic Stability and Response of Horizontal Axis Wind Turbine Blades,” AIAA Journal, 14-12:1381-1389, December 1979.

17. Patrickson, C. P., Friedmann, P., “Deterministic Torsional Building Response to Winds,” ASCE J. of the Structural Division, 105-ST12:2621-2637, December 1979.

18. Warmbrodt, W., Friedmann, P., “Formulation of Coupled Rotor/Fuselage Equations of Motion,” Vertica - The International J. of Rotorcraft and Powered Lift Aircraft, 3:245-271, December 1979.

19. Friedmann, P., Straub, F., “Application of the Finite Element Method to Rotary-Wing Aeroelasticity,” J. of the American Helicopter Society, 25-1:36-44, January 1980.

20. Bendiksen, O., Friedmann, P., “Coupled Bending - Torsion Flutter in Cascades,” AIAA Journal, 18-2:194-201, February 1980.

21. Friedmann, P., “Aeroelastic Stability and Response Analysis of Large Horizontal-Axis Wind Turbines,” J. of Industrial Aerodynamics, 5:373-401, May 1980. (Invited paper for a special issue of the Journal devoted to wind energy conversion systems).

22. Warmbrodt, W., Friedmann, P., “Coupled Rotor/Tower Aeroelastic Analysis of Large Horizontal Axis Wind Turbines,” AIAA Journal, 18-9:1118-1124, September 1980.

23. Bendiksen, O. O., Friedmann, P., “Coupled Bending-Torsion Flutter in a Supersonic Cascade,” AIAA Journal, Vol. 19, No. 6, June 1981.

24. Straub, F. K., Friedmann, P. P., "A Galerkin Type Finite Element Method for Rotary-Wing Aeroelasticity in Hover and Forward Flight," Vertica, Vol. 5, No. 1, 1981, pp. 75-98.

25. Bendiksen, O. O., Friedmann, P., "The Effect of Bending-Torsion Coupling on Fan and Compressor Blade Flutter," ASME Journal of Engineering for Power, Vol. 104, July 1982, pp. 617-623.

26. Friedmann, P., Kottapalli, S. B. R., "Coupled Flap-Lag-Torsional Dynamics of Hingeless Rotor Blades in Forward Flight," J. of the American Helicopter Society, Vol. 27, No. 4, October 1982, pp. 28-36.

27. Friedmann, P., "Formulation and Solution of Rotary-Wing Aeroelastic Stability and Response Problems," Vertica, Vol. 7, No. 2, June 1983, pp. 101-141.

28. Friedmann, P., Shanthakumaran, P., "Optimum Design of Rotor Blades for Vibration Reduction in Forward Flight," Journal of the American Helicopter Society, Vol. 29, No. 4, October 1984.

29. Friedmann, P. P., Venkatesan, C., "Coupled Rotor/Body Aeromechanical Stability Comparison of Theoretical and Experimental Results," Journal of Aircraft, Vol. 22, No. 2, February 1985, pp. 148-155.

30. Friedmann, P. P., "Application of Modern Structural Optimization to Vibration Reduction in Rotorcraft," Vertica, Vol. 9, No. 4, 1985, pp. 363-373.

31. Venkatesan, C., Friedmann, P. P., "Aeromechanical Stability Analysis of a Hybrid Heavy Lift Multirotor Vehicle in Hover," Journal of Aircraft, Vol. 22, No. 11, November 1985, pp. 965-972.

32. Friedmann, P. P., Venkatesan, C., "Influence of Unsteady Aerodynamic Models on Aeromechanical Stability in Ground Resonance," Journal of the American Helicopter Society, Vol. 31, January 1986, pp. 65-74.

33. Friedmann, P. P., "Numerical Methods for Determining the Stability and Response of Periodic Systems with Application to Helicopter Rotor Dynamics and Aeroelasticity," Computers and Mathematics with Applications, Vol. 12A, No. 1, 1986, pp. 131-148.

34. Dinyavari, M. A. H., Friedmann, P. P., "Application of Time-Domain Unsteady Aerodynamics to Rotary-Wing Aeroelasticity," AIAA Journal, Vol. 24, No. 9, September 1986, pp. 1424-1432.

35. Venkatesan, C., Friedmann, P. P., "A New Approach to Finite State Modeling of Unsteady Aerodynamics," AIAA Journal, Vol. 24, No. 10, December 1986, pp. 1889 -1897.

36. Blelloch, P., and Friedmann, P. P., "A Study of Some Approximations in the Modeling of a Coupled Rotor/Fuselage Aeromechanical System," Vertica, Vol. 11, No. 3, 1987, pp. 525-540.

37. Friedmann, P. P., "Arbitrary Motion Unsteady Aerodynamics and Its Application to Rotary-Wing Aeroelasticity," Journal of Fluids and Structures, Vol. 1, No. 1, 1987, pp. 71-93.

38. Friedmann, P. P., "Recent Trends in Rotary-Wing Aeroelasticity," Vertica, Vol. 11, No. 1/2, 1987, pp. 139-170.

39. Celi, R., and Friedmann, P. P., "Aeroelastic Modeling of Swept Tip Rotor Blades Using Finite Elements," Journal of the American Helicopter Society, Vol. 33, No. 2, April 1988, pp. 43-52.

40. Celi, R., and Friedmann, P. P., "Rotor Blade Aeroelasticity in Forward Flight with an Implicit Aerodynamic Formulation," AIAA Journal, Vol. 26, No. 12, December 1988, pp. 1425-1433.

41. Dinyavari, M. A. H., and Friedmann, P. P., "Time Domain Unsteady Incompressible Cascade Airfoil Theory for Helicopter Rotors in Hover," AIAA Journal, Vol. 27, No. 3, March 1989, pp. 257-267.

42. Kosmatka, J. B., and Friedmann, P. P., "Vibration Analysis of Composite Turbopropellers Using a Nonlinear Beam-Type Finite Element Approach," AIAA Journal, Vol. 27, No. 11, November 1989, pp. 1606-1614.

43. Friedmann, P. P., "Helicopter Rotor Dynamics and Aeroelasticity: Some Key Ideas and Insights," Vertica, Vol. 14, No. 1, pp. 101-121, 1990.

44. Celi, R., and Friedmann, P. P., "Structural Optimization with Aeroelastic Constraints of Rotor Blades with Straight and Swept Tips," AIAA Journal, Vol. 28, No. 5, May 1990, pp. 928-936.

45. Friedmann, P. P., and Robinson, L., "Influence of Unsteady Aerodynamics on Rotor Blade Aeroelastic Stability and Response," AIAA Journal, Vol. 28, No. 10, October, 1990, pp. 1806-1812.

46. Friedmann, P. P., “Numerical Methods for the Treatment of Periodic Systems with Applications to Structural Dynamics and Helicopter Rotor Dynamics,” Computers and Structures, Vol. 35, No. 4, 1990, pp. 329-347.

47. Livne, E., Schmit, L. A., Friedmann, P. P., “Towards an Integrated Approach to the Optimum Design of Actively Controlled Composite Wings,” AIAA Journal of Aircraft, Vol. 27, No. 12, December, 1990, pp. 979-992.

48. Friedmann, P. P., “Helicopter Vibration Reduction Using Structural Optimization with Aeroelastic/Multidisciplinary Constraints - A Survey,” AIAA Journal of Aircraft, Vol. 28, No. 1, January 1991, pp. 8-21.

49. Robinson, L. H., and Friedmann, P. P., “A Study of Fundamental Issues in Higher Harmonic Control Using Aeroelastic Simulation,” Journal of the American Helicopter Society, Vol. 36, No. 2, April 1991, pp. 32-43.

50. Takahashi, M.D., and Friedmann, P.P., "Helicopter Air Resonance Modeling and Suppression Using Active Control," AIAA J. Guidance, Control and Dynamics, Vol. 14, No. 6, Nov./Dec. 91, pp. 1294-1300.

51. Livne, E., Schmit, L. A., and Friedmann, P.P., "Exploratory Design Studies of Actively Controlled Wings Using Integrated Multidisciplinary Synthesis," AIAA Journal, Vol. 30, No. 5, May 1992, pp. 1171-1179.

52. Livne, E., Friedmann, P.P., and Schmit, L. A., "Integrated Aeroservoelastic Wing Analysis by Nonlinear Programming/Approximation Concepts," AIAA Journal of Guidance, Control, and Dynamics, Vol. 15, No. 4, July-August 1992, pp. 985-993.

53. Yamane, T., and Friedmann, P.P., "Aeroelastic Tailoring Analysis for Preliminary Design of Advanced Propellers with Composite Blades," AIAA Journal of Aircraft, Vol. 30, No. 1, January-February 1993, pp. 119-126.

54. Lust, S.D., Friedmann, P.P., and Bendiksen, O.O., "Mode Localization in Multispan Beams," AIAA Journal, Vol. 31, No. 2, February 1993, pp. 348-355.

55 Livne, E., Schmit, L. A., and Friedmann, P.P., "Integrated Structure/Control/Aerodynamic Synthesis of Actively Controlled Composite Wings," Journal of Aircraft, May-June, 1993, pp. 387-394.

56. Papavassiliou, I., Friedmann, P.P., and Venkatesan, C.," Coupled Rotor-Fuselage Vibration Reduction Using Open-Loop Blade Pitch Control", Mathematical and Computer Modeling, Vol. 18, No. 3/4, pp. 131-156, 1993.

57. Venkatesan, C., Friedmann, P.P., and Yuan, K. A. "A New Sensitivity Analysis for Structural Optimization of Composite Rotor Blades," Mathematical and Computer Modeling, Vol. 19, No. 1/2, 1994.

58. Lust, S.D., Friedmann, P.P. and Bendiksen, O. O., "Free and Forced Response of Multi-Span Beams and Multi-Bay Trusses with Localized Modes," Journal of Sound and Vibration, Vol. 120, No. 2, 16 February 1995, pp. 313-332.

59. Friedmann, P. P. and Millott, T., "Vibration Reduction in Rotorcraft Using Active Control - A Comparison of Various Approaches," AIAA J. of Guidance, Control, and Dynamics, Vol. 18, No. 4, July-August, 1995, pp. 664-675.

60. Pak, C., Friedmann, P. P. and Livne, E., "Digital Adaptive Flutter Suppression and Simulation Using Approximate Transonic Aerodynamics," J. of Vibration and Control, Vol. 1, pp. 363-388, 1995.

61. Friedmann, P. P., Guillott, D., and Presente, E., "Adaptive Control of Aeroelastic Instabilities in Transonic Flow and Its Scaling", Journal of Guidance, Control and Dynamics, Vol. 20, No. 6, November – December 1997, pp. 1190-1199.

62. Chiu, T. and Friedmann, P. P., "An Analytical Model for ACSR Approach to Vibration Reduction in Helicopter Rotor-Flexible Fuselage System", the Aeronautical Journal, Vol. 101, No. 1009, November 1997, pp. 399-408.

63. Yuan, K. A. and Friedmann, P. P., "Structural Optimization for Vibratory Loads Reduction of Composite Helicopter Rotor Blades with Advanced Geometry Tips", Journal of the American Helicopter Society Vol. 43, No. 3, July 1998, pp. 246-256.

64. Millott, T. A., Friedmann, P. P. and Yuan, K. A., "Correlation Studies for Hingeless Rotors on Forward Flight Using 2GCHAS", Journal of the American Helicopter Society, Vol. 43, No. 3, July 1998, pp. 257-262.

65. Friedmann, P. P., "The Renaissance of Aeroelasticity and Its Future", Journal of Aircraft, Vol. 36, No. 1, January-February 1999, pp. 105-121.

66. Cribbs, R. C. Friedmann, P. P. and Chiu, T., "Coupled Helicopter Rotor/Flexible Fuselage Aeroelastic Model for Control of Structural Response", AIAA Journal, Vol. 38, No. 10, October 2000, pp. 1777-1788.

67. Guillot, D. and Friedmann, P. P., "Fundamental Aeroservoelastic Study Combining Unsteady Computational Fluid Mechanics with Adaptive Control", Journal of Guidance Control and Dynamics, Vol. 23, No. 6, November-December 2000, pp. 1117-1126.

68. Myrtle, T. F, and Friedmann, P. P., “Application of a New Compressible Time Domain Aerodynamic Model to Vibration Reduction in Helicopters Using an Actively Controlled Flap”, Journal of the American Helicopter Society, Vol. 46, No. 1 January 2001, pp. 32-43.

69. Friedmann, P. P. and Presente, E., “Active Control of Flutter in Compressible Flow and Its Aeroelastic Scaling”, Journal of Guidance, Control and Dynamics, Vol. 24, No. 1, January-February 2001, pp. 167-175.

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D. REPORTS

1. Friedmann, P., Tong, P., "Dynamic Nonlinear Elastic Stability of Helicopter Rotor Blades in Hover and in Forward Flight," NASA CR-114485, May 1972 (also MIT Aeroelastic and Structures Research Lab TR 166-3).

2. Friedmann, P., “Investigation of Some Parameters Affecting the Stability of a Hingeless Helicopter Blade in Hover,” NASA CR-114525, August 1972 (also MIT Aeroelastic and Structures Research Lab TR 166-4).

3. Friedmann, P., Silverthorn, L. J., “Aeroelastic Stability of Coupled Flap-Lag Motion of Hingeless Helicopter Blades at Arbitrary Advance Ratios,” NASA CR-132431 (also UCLA-ENG-7406), February 1974.

4. Patrickson, C. P., Friedmann, P., “A Study of the Coupled Lateral and Torsional Response of Tall Buildings to Wind Loadings,” UCLA-ENG-76126, December 1976.

5. Yuan, C., Friedmann, P. P., “A Study of the Effect of Unsteady Aerodynamics on the Aeroelastic Stability of Rotor Blades in Hover,” UCLA-ENG-7721, February 1977.

6. Warmbrodt, W., Friedmann, P., “Aeroelastic Response and Stability of a Coupled Rotor/Support System with Application to Large Horizontal Axis Wind Turbines,” UCLA-ENG-7881, August 1978.

7. Kottapalli, S. B. R., Friedmann, P., Rosen, A., “Aeroelastic Stability and Response of Horizontal Axis Wind Turbine Blades,” UCLA-ENG-7880, August 1978.

8. Rosen, A., Friedmann, P., “Nonlinear Equations of Equilibrium for Elastic Helicopter and Wind Turbine Blades Undergoing Moderate Deformation,” UCLA-ENG-7718, January 1977 (revised June 1977), also published as NASA CR-159478, December 1978.

9. Bendiksen, O. O., Friedmann, P. P., “Coupled Bending-Torsion Flutter in Cascades with Application to Fan and Compressor Blades,” UCLA-ENG-80-72, August 1980.

10. Straub, F. K., Friedmann, P. P., “Application of the Finite Element Method to Rotary Wing Aeroelasticity,” NASA CR-165854, February 1982.

11. Venkatesan, C, Friedmann, P. P., “Aeroelastic Effects in Multi-Rotor Vehicles with Application to a Hybrid Heavy Lift System, Part I: Formulation of Equations of Motion,” NASA CR-3822, August 1984.

12. Venkatesan, C., Friedmann, P. P., “Finite State Modeling of Unsteady Aerodynamics and Its Application to a Rotor Dynamic Problem,” UCLA-ENG--85-10, March 1985.

13. Venkatesan, C., Friedmann, P. P., “Aeroelastic Effects in Multirotor Vehicles, Part II: Method of Solution and Results Illustrating Coupled Rotor/Body Aeromechanical Stability,” NASA CR-4009, February 1987.

14. Livne, E., Schmit, L. A., and Friedmann, P. P., “Design Oriented Structural Analysis for Fiber Composite Wings,” UCLA-ENG-88-36, November 1988.

15. Lust, S.D., Friedmann, P.P. and Bendiksen, O.O., "Free and Forced Response of Nearly Periodic Multi-Span Beams and Multi-Bay Trusses", JPL Report D-11460, December 1993.

16. Millott, T.A. and Friedmann, P.P., "Vibration Reduction in Helicopters Rotors Using and Actively Controlled Partial Span Trailing Edge Flap Located on the Blade", NASA CR-4611, June 1994.

17. Robinson, L.H. and Friedmann, P.P. "Aeroelastic Simulation of Higher Harmonic Control", NASA CR-4623, August 1994.

18. Yuan, K. A. and Friedmann, P. P., "Aeroelasticity and Structural Optimization of Composite Helicopter Rotor Blades with Swept Tips", NASA CR-4665, May 1995.

E. INVITED RESEARCH SEMINARS (Given after 1/1999 – start at UM)

1. Fundamental Challenges in Hypersonic Aeroelasticity and Aerothermoelasticity", AFOSR/AFRL Workshop on Nonlinear Aspects of Aeroelasticity and Related Structural Dynamics, March 6-7, 2003, University of Florida graduate Research Center, Shalimar, FL.
2. Vibration and Noise Reduction Using Actively Controlled Flaps- Their Evolution and Potential for Improving Rotorcraft Performance, Department of Aeronautics and Astronautics, Stanford University, February 23, 2005.
3. Vibration and Noise Reduction Using Actively Controlled Flaps- Their Evolution and Potential for Improving Rotorcraft Performance, Rotorcraft Aeromechanics Branch, NASA Ames Research Center and AFDD- U. S. Army Research and Development and Engineering Command, February 25, 2005.
4. High Temperature Structures Research at the Aerospace Department of the University of Michigan, DLR Institute of Aerospace Structures, Stuttgart, Germany, June 27, 2005.
5. Vibration and Noise Reduction Using Actively Controlled Flaps- their Evolution and Potential for Improving Rotorcraft Technology, Department of Aerospace Engineering, Technion- Israel Institute of Technology, Haifa, Israel, July 6, 2005.
6. Vibration and Noise Reduction Using Actively Controlled Flaps- their Evolution and Potential for Improving Rotorcraft Technology, JAXA, Tokyo, August 29, 2005.
7. A Computational Study of Vehicle Aeroelastic and Aerothermoelastic Behavior in Hypersonic Flow, JAXA, Tokyo, August 29, 2005.

8. Vibration and Noise Reduction Using Actively Controlled Flaps- their Evolution and Potential for Improving Rotorcraft Technology, Fuji Heavy Industries Utsunomiya, Japan, August 30, 2005.

9. Vibration and Noise Reduction in Helicopters- Practical Implementation Issues, Fuji Heavy Industries, Utsunomiya, Japan, August 30, 2005.

10. Vibration and Noise Reduction Using Actively Controlled Flaps- their Evolution and Potential for Improving Rotorcraft Technology, Mitsubishi Heavy Industries in Shinaqawa (Tokyo) and AHS International Japan Section, Japan, August 31, 2005.

11. Vibration and Noise Reduction in Helicopters- Practical Implementation Issues, Mitsubishi Heavy Industries in Shinaqawa (Tokyo) and AHS International Japan Section, Japan, August 31, 2005.

12. Active Control of Vibration and Noise Reduction an Imminent Major Improvement in Rotorcraft Technology, Department of Mechanical Engineering University of Michigan, December 2, 2005.

13. Active Control of Vibration and Noise Reduction a Major Improvement in Rotorcraft Technology, Department of Aeronautics and Astronautics, University of Washington, Seattle, February 27, 2006.

14. Active Control for Vibration Reduction, Noise Alleviation and Performance Enhancement in Rotorcraft, Mechanical and Aerospace Engineering Department, Arizona State University, Tempe, AZ, November 7, 2008.

15. Aeronautics Research at Two Frontiers of Vehicle Development - Vibration Control in Rotorcraft and Hypersonic Aeroelasticity, GALCIT Colloquium at Caltech, April 24, 2009.

16. Reduced Order Nonlinear Unsteady Aerodynamic Modeling for Rotary and Fixed Wing Aeroelastic Applications, DLR Institute for Aeroelasticity, Gottingen, Germany, October 4, 2011.

17. Active/Passive Optimization of Helicopter Rotor Blades for Improved Vibration, Noise, and Performance Characteristics, DLR Institute for Aeroelasticity, Gottingen, Germany, October 5, 2011.

18. Vibration and Noise Reduction in Rotorcraft Using Active Control - Simulation, Experiments and Applications, Dept. of Aerospace Engineering, University of Illinois, Champaign, May 2, 2011.

19. On-blade Control of Vibration and Noise in Rotorcraft - Aeroelastic Simulation and Tests", New Trends in Aerospace Seminar Series, MIT Department of Aeronautics and Astronautics, May 2, 2013.

20. On Blade Control of Rotorcraft Vibration, Noise and Performance – Just Around the Corner? Department of Aerospace Sciences, University of Colorado, Boulder, April 17, 2015.

21. Vibration and Noise Reduction in Rotorcraft Using On-Blade Control: from Theoretical Concept to Flight Ready Hardware, Department of Aerospace Engineering, Texas A & M University, October 25, 2018.