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OBJECTIVES: To obtain a position which exploits my extensive experience in Mathematical Analysis, Engineering Mechanics and Scientific Programming.

CLEARANCE: DOD Top secret clearance based on current SSBI with various special accesses.

EXPERIENCE

Nov. 2005 – Nov. 2014 *Boeing Satellite Development Center*, *Los Angles, CA*.

- Modeling of complex flexible multibody spacecraft utilizing commercial codes and analytical techniques.
- Derivation of spacecraft steering laws and optimal slewing algorithms.
- Development and application of spacecraft environmental disturbance models.
- Preparation of Verification and Validation reports on Space Based Surveillance System for Air Force: orbital mechanics, assessment of risk due to orbital debris, impact of jitter on optical instruments.

July 1996 – Oct. 2005 *The Aerospace Corporation*, *Los Angles, CA*.

- Wrote proposal and awarded NASA contract to investigate flutter of solar arrays impinged by rarefied jet flows. Analysis utilized for planning Shuttle-Station docking missions.
- Authored report for Air Force-SMSC analyzing aerodynamic disturbances on rapidly rotating bodies in free-molecular flow.
- Developed innovative method to calculate feed-forward torques for a multibody spacecraft which allowed contractor to overcome serious bottleneck in flight software.
- Performed detailed structural dynamic analyses for solar array deployment

Jan. 1991– July 1996 *Charles Stark Draper Laboratory. Cambridge, MA*.

- Principal investigator for dynamics modeling of Space Station robotic manipulator.
- Utilized sparse matrix techniques and recursive dynamics algorithms to develop real time training simulators at NASA/JSC.
- Developed techniques to account for spin stiffening in multibody codes.

Jan. 1989 – Jan. *1991 Jet Propulsion Laboratory-California Institute of Technology. Pasadena, CA*.

- Developed analytical/empirical models of flexible tires in rolling contact with soil for Mars Rover.
- Incorporated tire-terrain interaction models with general purpose multibody codes.
- Developed dynamic and kinematic models for the Cassini Attitude & Articulation Control System.

Mar. 1978 – Dec. 1988 *Charles Stark Draper* Laboratory, Cambridge, *MA*.

- Principal investigator for structural dynamics modeling and path planning of Space Shuttle Remote Manipulator System.
- Coordinated above activities between NASA, Canadian Space Agency, and several universities.
- Interfaced with System Avionics Integration Lab at NASA/JSC to implement above models in a real-time simulator for astronaut training.
- Dynamic stability analysis for orbiter deployed payloads
- Extensive use of finite element methods and component mode synthesis.

Jan. 1976– Mar. 1978 *Brookhaven National Laboratory. Long Island, New York.*

- Developed 3-D computer code for dispersion of atmospheric pollutants including chemical kinetics and absorbing boundary conditions.
- Modeling of atmospheric boundary layers.
- Comparative studies of computational methods for compressible flow with regard to stability considerations.

June. 1972 – Jan. 1976 *N.A.S.A. Goddard Institute for Space Studies. New York, N.Y.*

- Investigated gravity and drag effects on the orbital motion of the Earth Resources Technology Satellite by an analytical representation of the air density in the variational equations.
- Implemented numerical methods for inverting radiative heat transfer equation with application to satellite temperature retrievals.
- Developed fourth order conservative finite difference schemes for atmospheric pressure, density and wind velocity. Implemented these algorithms in general circulation model.

Programming Languages: FORTRAN, MATLAB/SIMULINK, MATHEMATICA.

TEACHING EXPERIENCE

- *California State University-Northridge,* Department of Mechanical Engineering (Aug. 20013-present) Linear Dynamic Systems, Ordinary Differential Equations & Partial Differential Equations.
- *University of Southern California,* Graduate School of Engineering (Aug. 2008-Dec. 2008) Linear Vibrations
- *Touro College of Los Angeles* (Sept. 2005 – June 2008). Introductory College Mathematics, Precalculus.
- *Northeastern University*, Graduate School of Engineering (Sept. 1984-June 1988). Complex Variables, Linear Algebra, Mechanical Vibrations
- *City College of New York* (Sept. 1974-June 1978). Algebra, Calculus, Numerical Analysis, Differential Equations
- *Columbia University* (Jan. 1976-Mar. 1978). Numerical Solutions to Partial Differential Equations, Perturbation Methods.

EDUCATION

Massachusetts Institute of Technology
Coursework in Applied Mathematics & Mechanics

School of Engineering and Applied Science, Columbia University
M.S. - Applied Mathematics (June 1972)
Concentration in Numerical Analysis and Mechanical Vibrations.

The City College Of New York
B.S. - Physics and Mathematics (June 1971)

HONORS

N.A.S.A. citation for work on Space Shuttle Remote Manipulator.
N.A.S.A. citation for Technical Innovation
N.A.S.A. Group Achievement Award for work on Cassini Attitude Control System
Deans list, Magna Cum Laude, Phi Beta Kappa.
Recipient of Ward Medal in Physics (top student in graduating class)
Full fellowship for graduate work.

PUBLICATIONS

"Numerical Experiments with the 4th Order GISS General Circulation Model", *Annalen der Meterologie*, No. 11 pp 25-27, (1976) (with E.K. Rivas)

"High-Latitude Truncation Errors of Box-Type Primitive Equation Models", *Monthly Weather Review*, Vol.104, pp. 1066-1069, (1976) (with E.K. Rivas)

"The Fourth Order GISS model of the Global Atmosphere", *Contributions to Atmospheric Physics* vol.50, no.3, (1977), pp.299-311 (with E.K. Rivas)

"A Scheme for Computing Surface Layer Turbulent Fluxes from Mean Flow Surface Observations" *NASA-CR-157308*, Aug 78, 34p

"A Scheme for Computing Surface Fluxes from Mean Flow Observations", *Boundary Layer Meteorology*, **17** (1979) pp. 429-442 (with M. Hoffert).

"Modeling Sulfur Oxide Concentrations in the Eastern United States: Model Sensitivity, Verification, and Applications", *Bulletin Of The American Meteorological Society* , 1978 , Vol. 59 , N0.9 , P 1239
AMS Fourth Symposium on Turbulence, Diffusion and Air Pollution. Reno, Nevada. Jan. 15-18, 1979

"Equations of Motion for a Flexible Spacecraft - Lumped Parameter Idealization", *NASA–CR–188727*, Sept. 1982

"Planar Dynamics of a Uniform Beam With Rigid Bodies Affixed to the Ends", *NASA–CR–175566*, May, 1983

"Transverse Vibration and Buckling of a Cantilevered Beam with Tip Body Under Constant Axial Base Acceleration", *NASA-CR*- 175567, Oct 83, 65p

"The Dynamics Of a Uniform Tether with Tip Mass Subject to Gravitational Body Forces", *CSDL R-1791*, June 1985

"Transverse Vibration and Buckling of a Cantilevered Beam with Tip Body Under Axial Acceleration", *Journal of Sound and Vibration*, **99**(1), (1985) pp. 43-52

PUBLICATIONS (cont.)

"An Atlas of Functions", Book Review-*Bulletin of the American Meteorological Society*. Oct. 1987

"Control Of Flexible Structures (COFS-2) flight control, structure and gimbal system interaction study". *NASA-CR-172095*, Sep. 1988, 205P.

"Natural Boundary Conditions in the Ritz-Galerkin Method", *International Journal for Numerical Methods in Engineering*, **26**(10), (1988) pp. 2255-2266

"Motivating Kane's Method for Obtaining Equations of Motion for Dynamic Systems", *AIAA Journal of Guidance, Control and Dynamics* **12**(4), 1989

"A Geometric Derivation of Kane's Equations", *Proceedings of the 3oth AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*. April 3-5, 1989.

"Significance of Norms and Completeness in Variationally Based Methods", *Proceedings of the 3rd Annual Conference on Aerospace Computational Control*. Dec. 1989, Volume 2, pp 831-842.

"Dynamics of a Flexible Manipulator with General Joint Displacements", *CSDL R-2365,* Oct. 1991

"Sparse Matrix Methods for Multibody Dynamics", *NASA TR 1211*, April 1992.

"Applications of Computer Algebra to Distributed Parameter Systems", *Proceedings of the Fifth NASA/NSF/DOD Workshop on Aerospace Computational Control*. Feb. 1993, p 77-90.

"Evaluation of Inertial Integrals for Multibody Dynamics", *AIAA Journal of Guidance, Control and Dynamics* **17**(3), 1994 (with A. Messac)

"Flutter of Solar Arrays in Rarefied Jet Plumes", *Advances in the Astronautical Sciences*. 1996, Vol. 93, Part I, p.511

"Modal Integral Evaluation for Flexible Multibody Systems", AIAA paper 98-4443, AIAA Guidance, Navigation and Control Conference, Boston, MA., Aug. 10-12, 1998.

"Aerodynamic Disturbances on Spacecraft in Free-Molecular Flow"
Aerospace Report No. TR-2003(3397)-1, Oct., 2002

"Aerodynamic Disturbances on Rapidly Rotating Spacecraft in Free-Molecular Flow",
Proceedings of the Ninth Biennial ASCE Aerospace Division International, March 7-10, 2004,

"Apparently First Closed-form Solutions of Inhomogeneous Circular Plates in 200 Years After Chaladni", *Journal of Sound and Vibration*, **276**(3-5), (2004) pp. 1108-1114

Major contributor to the book "Eigenvalues of Inhomogeneous Structures-Unusual Closed Form Solutions", I. Elishakoff, CRC Press, 2004.

"An Unusual Exact, Closed-Form Solution for Axisymmetric Vibration of Inhomogeneous Simply Supported Circular Plates" (with I. Elishakoff)
Journal of Sound and Vibration, **284** (3-5), (2005), pp.1217-1228

"Lumped and Distributed Parameter Models of a Spacecraft with Elastic Appendages: Exact Frequencies and Mode Shapes", *Proceedings of the 10th Biennial ASCE Aerospace Division International Conference*, March 5-8, 2006.

PUBLICATIONS (cont.)

"On Gap Closure in a Double-Walled Carbon Nanotube", *Advanced Science Letters*, Vol.4, No.11/12, (2011), pp.549-553.

"Carbon Nanotubes and Nanosensors: Vibrations, Buckling, and Ballistic Impact", ISTE-Wiley(2012)-book coauthor.

"Analytical Solutions to the Free Vibration of a Double-Walled Carbon Nanotube Carrying a Bacterium at its Tip", *Journal of Applied Physics* **114**, 174309 (2013)

"Variational Methods with Applications in Science and Engineering ", Book Review-*IEEE Control Systems Magazine*. April 2015.

"A First Course in the Calculus of Variations", Book Review-*IEEE Control Systems Magazine*. Oct. 2016.

"Vibration of Functionally Graded Rotating Beams Including the Effects of Nonlocal Elasticity", *AIAA Journal* Vol. 55 No.4, April 2017