CURRICULUM VITAE

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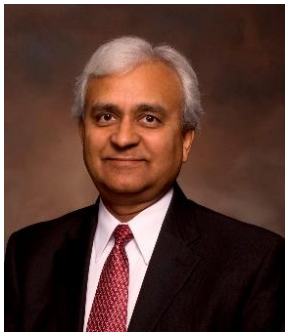

I. EDUCATION

Science & Engineering

1976 **Doctor of Philosophy (Ph.D.), Aerospace Engineering**
Georgia Institute of Technology, Atlanta, Georgia, USA
Dissertation: *A Method of Computing the Potential Flow on Thick Wing Tips*
Advisor: Dr. Robin B. Gray

1972 **Master of Engineering (with Distinction), Aeronautical Engineering**
Indian Institute of Science, Bangalore, India
Project: *Numerical Determination of Periodic Solutions for Gravity Gradient Stabilized Satellites*
Advisor: Dr. Suresh M. Deshpande

1970 **Bachelor of Engineering (with Distinction), Electrical Technology**
Indian Institute of Science, Bangalore, India
Graduated at the top of the class; awarded Hay medal.

1967 **Bachelor of Science (with Honors)**
Meerut University, Meerut, India
Graduated at the top of the class; awarded Chancellor's medal.

Leadership & Management

2007 **Senior Leadership Development Program** (one-week course)
Lockheed Martin Institute for Leadership Excellence, Bethesda, MD

2007 **Capturing New Business Institute** (one-week course)
Lockheed Martin Institute for Leadership Excellence, Bethesda, MD

2004/05 **Leadership & Executive Assessment and Development (LEAD)**, one-year program
Lockheed Martin Institute for Leadership Excellence, Bethesda, MD

2004 **Executive Program Manager's Course** (four-week course)
Defense Systems Management College, Defense Acquisition University, Fort Belvoir, VA

2004 **Managing System Development Projects** (one-week short course)
UCLA Extension, University of California, Los Angles, CA

2001/02 Lockheed Martin **Excellence through Development and Growth Enhancement (EDGE)**, one-year program

2001 **Management Strategies Program II** (one-week course)
Institute for Leadership Excellence, Lockheed Martin, Bethesda, MD

2000 **Management Strategies Program I** (one-week course)
Carnegie Mellon University, Pittsburg, PA, and Institute for Leadership Excellence, Lockheed Martin, Bethesda, MD

II. PROFESSIONAL EXPERIENCE

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY 2012-2024

Collegiate Professor, **Aerospace and Ocean Engineering 2017-2024**
Professor, Aerospace and Ocean Engineering 2012–2017

Primary responsibilities include (a) teaching undergraduate senior Capstone Air Vehicle Design courses in the AOE department, and (b) pursuing collaborative research in multidisciplinary analysis, design, and optimization (MADO) methodologies, with emphasis on applied aerodynamics, to enable simulation-based design of affordable flight vehicles.

- Teaching the design course has offered an excellent opportunity to help shape the next generation of engineers by sharing with them extensive engineering and leadership experiences from a 32-year-long professional career with Lockheed Martin. Since 2012, served as faculty advisor for 91 student design teams (730 seniors) working on a wide variety of aircraft design projects sponsored by AIAA, NASA, and industry and succeeding as shown in Section III; advised many students on career options and writing impactful resumes; and served as a reference for graduate school admission or employment.
- MADO research has focused on developing novel approaches for timely and affordable delivery of high-fidelity aerodynamic data to meet flight vehicle conceptual design needs. Judicious use of additive manufacturing and rapid prototype testing to complement computational methods is one such approach. Another key initiative is to facilitate close collaboration among leading researchers in aerospace engineering, mechanical engineering, and electrical and computer engineering under the auspices of the *Center for Aerospace Systems Integration and Multidisciplinary Optimization (CASIMO)*. The primary mission of the center is to conduct pioneering, breakthrough multidisciplinary research for optimal design and integration of aerospace systems to enable innovative flight vehicles.

LOCKHEED MARTIN (32 years) 1979-2011

Joined Lockheed (now Lockheed Martin) in 1979 as Aerodynamics Engineer-Senior and retired in 2011 as Director, Advanced Development Programs--commonly known as the Skunk Works® and widely recognized for creating breakthrough technologies and landmark aircraft. Held many positions of increasing responsibilities in technical areas for the first 20 years and leadership/management for the last 12 as summarized below.

Program Management Director, Advanced Development Programs 2006–2011

Served as the Deputy Director, Technology Development & Integration, Advanced Development Programs (the Skunk Works®), Lockheed Martin Aeronautics Company, Palmdale, California.

- Successfully led a high-caliber leadership team to (a) formulate and implement cost-effective strategies to deliver critical technologies that enable leap-ahead capabilities for all product lines of the company; and (b) pursue total customer satisfaction by ensuring that all projects employ appropriate tools and processes to meet cost, schedule and performance targets.
- Developed and implemented efficient procedures to assign right engineering personnel at the right time to *all* active projects in a highly dynamic and volatile Skunk Works® environment.

- Instrumental in fostering a culture of excellence, innovation, and cross-domain collaboration where highly motivated engineers could achieve their maximum potential.

Senior Manager, Vehicle Science & Systems **2000–2006**
Responsible for planning and execution of company-funded and sponsored research & development (R&D) projects aimed at technology maturation in Aerodynamics, Acoustics, Computational Fluid Dynamics, Airframe Propulsion Integration, Flight Control, Mass Properties, Vehicle Management System, Utility Systems Integration, and Electrical Power Distribution.

- Successfully led multidisciplinary teams of high caliber engineers assigned to the Skunk Works® across three sites (California, Texas, and Georgia) to conduct R&D projects. Initiated and nurtured R&D projects in key technology areas including computational aero-sciences, active flow control, and software verification & validation (V&V) relevant to the company products and services.
- Effectively managed people and resources to ensure on-time, on-budget execution of projects to best meet customer expectations.
- Served as the focal point for interactions with internal and external customers in VS&S disciplines.

Department Manager, Aerodynamics **1999–2000**
Managed technical staff, technology base, tools and processes of the Aerodynamics Department, Lockheed Martin Aeronautical Systems, Marietta, Georgia, to effectively meet the needs of Line-of-Business programs (C-130J, C-27J, F-22, P-3, C-5M), Advanced Design projects (ATT, KC-X), and both contract R&D (CRAD) and company-funded independent R&D (IRAD) efforts. Scope of activities covered flight performance analysis, aerodynamic configuration design, and flow simulation using computational fluid dynamics (CFD) and wind tunnels.

Technical Fellow **1992–1999**
Selected to the then highest level of technical leadership career path reporting to VP-Engineering, Lockheed Martin Aeronautical Systems, Marietta, Georgia.

- Served as *technical advisor* to all levels of management in the areas of CFD (computational fluid dynamics), CAS (computational aero-sciences encompassing interdisciplinary extensions of CFD such as aero-structures), high-performance computing, and multidisciplinary design optimization.
- Provided *leadership* for solving problems of critical importance to company product lines. Ensured *technical competence* through planning and implementation of strategies to maintain state-of-the-art tools, processes, and expertise.
- Served as *focal point* for interaction with customers in CRAD pursuits, and with researchers in universities and government labs for technology transition. Participated in *technology planning* and served as *mentor* in Engineering.

Technical Leader, Applied Computational Aerodynamics **1989–1992**
Planning and execution of all activities related to development, validation, and implementation of computational aerodynamic methods to support lines-of-business needs of the Lockheed Aeronautical Systems Company, Burbank, California (’89-’91), and Marietta, Georgia (’91-’92).

R&D Engineer **1985–1989**
Research Specialist **1983–1985**
Aerodynamics Engineer Sr. **1979–1983**

Directed and conducted IRAD and CRAD activities related to CFD development and application to solve aerodynamic and aero-propulsion problems of importance to the diverse lines of business of the Lockheed-California Company, Burbank, California.
Instructor for

- Introductory and advanced CFD courses at the Lockheed Technical Institute.
- *Aerodynamics for Designers* under the Lockheed Employee Education Program.
- *Introduction to Aerodynamics* Continuing Education course at University of California, Los Angeles.

UNIVERSITY OF MISSOURI-ROLLA (1 year) **1978–1979**

Assistant Professor, Mechanical and Aerospace Engineering

Taught undergraduate courses in fluid mechanics, thermodynamics, and heat transfer.
Performed independent research on computational simulation of vortex interactions.

IOWA STATE UNIVERSITY (2 years) **1976–1978**

Research Assistant Professor, Aerospace Engineering

Supported NASA-sponsored research in wake-vortex hazard alleviation by developing and applying the-then state-of-the-art computational fluid dynamics (CFD) methods using zero-, one- and two-equation turbulence models to simulate co-rotational vortex merger.

GEORGIA INSTITUTE OF TECHNOLOGY (4 years) **1972–1976**

Graduate Research Assistant, Aerospace Engineering

Developed an efficient computational method to compute potential flow on thick wing tips. Supported hovering helicopter rotor tests.

III. TEACHING @ VT

Capstone (Senior) Air Vehicle Design Courses (AOE 4065 & 4066; 3 credits each)

Lead Instructor, Faculty Advisor, Coach, and Mentor for 90+ student teams (700+ seniors) since 2012. For each academic year (AY), the number of teams, number of students, and winning teams and their entries in national and international competitions are highlighted below:

- AY 2012-2013: 8 teams, 72 students
  - ✓ **Two winners** in SAE Aerodesign®
    - ***1st place (tie)*** *for Oral Presentation in SAE Aerodesign®-East* **(Lead: Josh Keys)**
    - ***2nd place*** *for Written Report in SAE Aerodesign®-West* **(Lead: Ed Rooney)**
- AY 2013-2014: 10 teams, 82 students
  - ✓ **One winner** in NASA University Engineering Design Challenge: *"High Altitude, Long Endurance Un-crewed Aerial System (HALE UAS)"*
    - ***1st place*** VT entry: ***Gobble Hawk*** **(Lead: Matt Schmit)**
- AY 2014-2015: 13 teams, 92 students
  - ✓ **One winner** in NASA University Engineering Design Challenge: *"2020 Electric General Aviation Aircraft"*
    - ***3rd place*** VT entry: ***BEAMTREE PH-10*** **(Lead: Drew Sullivan*)***
- AY 2015-2016: 9 teams, 66 students
  - ✓ **Two winners** in NASA University Engineering Design Challenge: *"Distributed Electric Propulsion Commuter Aircraft"*
    - ***2nd place*** VT entry: ***Ion*** *by Blitz* **(Lead: Sam McKinley)**
    - ***3rd place*** VT entry: ***Q-1*** *by Partior* **(Lead: Graham McLaughlin)**
- AY 2016-2017: 9 teams, 71 students
  - ✓ **One winner** in NASA University Engineering Design Challenge: *"Supersonic Business Jet"*
    - ***1st place*** VT entry: ***Nimbus*** *by Prime Flux* **(Lead: Matthew Hain)**

- AY 2017-2018: 7 teams, 52 students
  - ✓ **Two winners** in AIAA Undergraduate Team Aircraft Design: *"Hybrid Electric General Aviation Aircraft (HEGAA)"*
    2nd place (tie) VT entry: ***HEGAAsus*** *by Hamster Works* **(Lead: Sammi Rocker)**
    3rd place VT entry: ***HEAT*** *by Hawken General Aviation* **(Lead: Sean Berger)**
  - ✓ **One winner** in AIAA Design/Build/Fly (DBF): *"Regional and Business Aircraft"*
    2nd place *VT entry:* ***Atlas*** **(Leads: Sapna Rao & JP Stewart)**
  - ✓ **One winner** in SAE Aerodesign®-West
    3rd place *for Oral Presentation* **(Lead: Juan Bolinaga)**
- AY 2018-2019: 8 teams, 67 students
  - ✓ **One winner** in NASA University Engineering Design Challenge: *"Self-Piloted Aircraft for Critical Rural/Suburban Needs"*
    2nd place VT entry: ***STORC*** *by Aerospace STOLutions* **(Lead: James Stanley)**
- AY 2019-2020: 6 teams, 52 students
  - ✓ **One winner** in NASA University Engineering Design Challenge: *"Urban Air Mobility"*
    1st place *VT entry:* ***RAAVEN*** *by AVIATE* **(Lead: Matt Criss)**
  - ✓ **One winner** in AIAA Undergraduate Team Aircraft Design: *"High Capacity Short Range Transport Aircraft"*
    2nd place *VT entry:* ***EXO*** *by Over-the-Pond* **(Lead: Amanda Butynes)**
- AY 2020-2021: 8 teams, 68 students
  - ✓ **One winner** in NASA University Engineering Design Challenge: *"Urban Air Mobility (UAM) Weather Tolerant Operations (WTO)"*
    2nd place (tie) *VT entry:* ***Stratos*** *by StratosFleet* **(Lead: Sarah Cartee)**
- AY 2021-2022: 8 teams, 65 students
  - ✓ Three top spots swept by three VT teams in NASA University Engineering Design Challenge: *"Extending Aviation's Public Benefits"*
    1st place *VT entry:* ***WATR RAM*** *by H2AERO* **(Lead: Colin Fischer)**
    2nd place *VT entry:* ***Iris Water Tanker*** *by Project Iris* **(Lead: Benjamin Judelson)**
    3rd place *VT entry:* ***Pelican*** *by Firefighting Gobbler* **(Lead: Michael Deitch)**
- AY 2023-2024: 5 teams, 48 students

Teaching Effectiveness—Proven record of teaching effectiveness based on formal Student Perception of Teaching (SPOT) surveys, and informal feedback from students. (Section XII includes examples of student comments—all unsolicited—from anonymous SPOT surveys, emails, and hand-written notes.) To increase effectiveness, updated course material and lectures every year by incorporating student feedback and my own self-assessment.

International Collaborative Design Projects—In order to further enhance the learning experience of VT students, established partnerships with two international universities to conduct virtual, collaborative undergraduate aircraft design projects:

- ***Loughborough University, Loughborough, UK***, since AY 2014-2015
  Students collaborate remotely, but VT hosts LU students for a week during the spring semester in odd years, and VT students spend a week in Loughborough during even years.
- ***HAW, Hamburg, Germany*** (*Hochschule für Angewandte Wissenschaften or* Hamburg University of Applied Sciences), since AY 2013-2014
  Students spend the fall semester in Blacksburg and then some, if not all, continue remote collaboration in the spring semester.

ASDI@VT—Assisted AOE department head in creating *AOE Studio for Design Innovation @ VT* (ASDI@VT). Inaugurated in March 2015, the studio offers an environment in a state-of-the-art

facility where undergraduate design teams (air vehicles, space vehicle, and ocean vehicles) can excel through highly effective collaborative teamwork.

Design of Projects Course (AOE Special Study: 4984-5984; 1 credit)

Co-instructor with Profs. Grossmann (VT) and Moser (MIT)

- Fall 2014: 12 students, 4 teams
- Fall 2015: 8 students, 4 teams

Principles of Project Design Course (AOE Special Study: 4984; 1 credit)

Co-instructor with Profs. Grossmann (VT) and Moser (MIT)

- Fall 2016: 19 students, 4 teams

Principles of Project Design and Management Course (AOE Special Study: 4984; 3 credits)

Co-instructor with Profs. Grossmann (VT), Carlson (VT), and Moser (MIT)

- Fall 2020: 24 students, 6 teams
- Fall 2021: 30 students, 7 teams

Principles of Project Design and Management Course (AOE 3564; 3 credits)

Onsite Coordinator for instructors: Profs. Grossmann (VT), Carlson (VT), and Moser (MIT)

- Fall 2022: 40 students, 8 teams
- Fall 2023: 37 students, 8 teams

Applied Computational Aerodynamics (AOE 4114; 3 credits)

Co-instructor with Prof. Coutier-Delgosha (2020–23), and Prof. Brizzolara, 2024

- Spring 2020: 21 students
- Spring 2021: 17 students
- Spring 2022: 13 students
- Spring 2023: 15 students
- Spring 2024: 15 students

[Graduate] Seminar (AOE 5944; 1 credit)

Course Coordinator

- Fall 2022: 205 students
- Spring 2023: 183 students
- Fall 2023: 186 students
- Spring 2024: 95 students

IV. ACADEMIC ADVISING and MENTORING

Served as co-advisor and/or committee member for 13 Ph.D. students, all graduated; 16 M.S. (Thesis) students, 15 graduated; 19 M.S. Project (Non-thesis) students, all graduated; and 8 undergraduates in Independent Research or Undergraduate Research program. *All in AOE at Virginia Tech unless noted otherwise.*

Ph.D.

Graduated

Co-advisor

- 2019: J. Park (July)
  Dissertation: *"Multidisciplinary Efficient Global Optimization Using Variable Fidelity Analysis"*
- 2016: P. Sudalagunta (July)
  Dissertation: "*Control-oriented Modeling of an Air-breathing Hypersonic Vehicle"*

Committee Member

- 2024: X. Zhao [ECE] (February)
  Dissertation: *Power Density Optimization of SiC-based DC/AC Converter for High-Speed Electric Machine in More/All-electric Aircraft*
- 2023: M. Khan (October)
  Dissertation: *"Software for Multidisciplinary Design Optimization of Truss-Braced Wing Aircraft with Deep Learning based Transonic Flutter Prediction Model"*
- 2023: Q. Li [ECE] (September)
  Dissertation: "Designing Power Converter-Based Energy Management Systems with Hierarchical Optimization Methods"
- 2023: J-Y. Choi (May)
  Dissertation: *"Data-driven Target Tracking and Hybrid Path Planning Methods for Autonomous Operation of UAS"*
- 2022: M. Kara (May)
  Dissertation: *"Development and Application of Dynamic Architecture Flow Optimization to Assess the Impact of Energy Storage on Naval Ship Mission Effectiveness, System Vulnerability and Recoverability"*
- 2021: M. Parsons (July)
  Dissertation: *"Network-Based Naval Ship Distributed System Design and Mission Effectiveness using Dynamic Architecture Flow Optimization"*
- 2019: N. Blaesser (December)
  Dissertation: "*Interference Drag Due to Engine Nacelle Location for a Single-Aisle, Transonic Aircraft"*
- 2019: H. Kim (August)
  Dissertation: "*Coupled Adjoint-based Rotor Design Using a Time Spectral Fluid Structural Interaction Analysis"*
- 2018: Q. Wang [ECE] (May)
  Dissertation: *"Form-Factor-Constrained, High Power Density, Extreme Efficiency And Modular Power Converters"*
- 2000: P-A Tétrault [External Committee Member] (January)
  Dissertation: "*Numerical Prediction of the Interference Drag of a Streamlined Strut Intersecting a Surface in Transonic Flow"*
- 1995: R. Weed [External Committee Member] (AE, Georgia Tech)
  Dissertation: "*Computational Strategies for Three-dimensional Flow Simulations on Distributed Computing Systems"*

M.S. (Thesis)

Graduated

Advisor and Committee Co-Chair

- 2023: L. Edwards [ME] (May); J. Arbolino [ME] (July)
- 2022: V. Polepeddi (May)
- 2020: H. Shah (May)
- 2018: V. Ganesh (May); Z. Standridge (May)
- 2015: W. Reed (May); A. Friedman (May)

Committee Member

- 2022: R. Fisher (May)
- 2018:; S. Parsons (May); B. Simmons (May)
- 2016: C. Kevorkian (August); M. Segee (May)
- 2015: B. Riggins (May)
- 2014: K. Antcliff (December)

M.S. – Project (Non-thesis)

Graduated

Committee Member

- 2023: E. Frew (May); M. Deitch* (May); K. Moncure (May)
- 2021: M. Riedel* [ME] (May); Z. Stockwell (May); M. Criss (May); A. Balac (May); J. Verniel (May)
- 2020: K. D'Souza (May)
- 2019: J. Cisneros* (July); S. Edelmann (May); J. Brand (May); A. Arora (May)
- 2018: V. Gunduboina (May); C. Lipscombe (May)
- 2015: I. Voyles (December)
- 2014: C. Ocheltree (May); B. Michalowski (May)
- 2013: A. Carra (May)

*also served as Project Advisor

Undergraduate Research

- 2022: (Fall Semester) S. Madden (Senior)
- 2018: (Spring Semester) B. Morris (Senior); Z. Luce (Senior)
- 2016: (Spring Semester) N. Hause (Senior); R. Dixon (Junior); A. Kumar (Freshman)
- 2015: (Fall Semester) T. Holder (Senior); M. Paydar (Senior)

Student Mentoring

- Discussed career options with numerous students at their request, and worked with students to make their resumes more impactful.
- Prepared and submitted many letters of recommendation requested by students for their employment applications or graduate school admission applications.
- Led a group of 4 students on a 10-day overseas trip to China in June 2016 to participate in the Boeing Leadership Conference.

V. PROFESSIONAL LEADERSHIP

- Appointed in Feb 2022 by the AIAA Executive Director and the SciTech Executive Producer to serve as a member of the 2023 SciTech Forum Guiding Coalition (SciTech GC) committee; reappointed in April 2023 to serve on the 2024 SciTech GC committee.
  - The committee, consisting of thought leaders from throughout academia, industry, and government, is tasked to provide a high-level vision and guidance for the continued development of this annual event.

  (Note: American Institute of Aeronautics and Astronautics, AIAA, is a premier technical society for aerospace engineering with nearly 30,000 individual members from 85 countries.)
- Invited by the organizers of the *Vaishvik Bhartiya Vaigyanik* (*VAIBHAV*) Summit–a global summit of overseas and resident Indian scientists and academicians–to participate as an

Esteemed Aerospace Expert in deliberations aimed at identifying collaboration and cooperation instruments in AEROSPACE TECHNOLOGIES to further enhance the knowledge-base of Indian Research and Academic Institutions. The summit, held in Oct-Nov 2020, invited select experts from the large Indian Diaspora working in top universities and R&D organizations across the world. I participated as a Panelist in the following two areas of the *Aerospace Systems and Design* stream:

  - Regional Transport Aircraft, 8 Oct 2020
  - Blended Design and Multi-disciplinary Optimization, 16 Oct 2020

- Invited by NASA-Langley Research Center to serve on the External Review Team of the Comprehensive Digital Transformation (CDT) program, 2016-2018
- Invited by Air Force Research Lab (AFRL) to serve on the Advisory Committee for the Engineered Surfaces, Materials, and Coatings (ESMC) for Aircraft Drag Reduction program, 2015-2017
- Invited Guest Speaker, 5th Symposium on Integrating CFD and Experiments in Aerodynamics (Integration'12), Tokyo, Japan, 2012
- Invited Guest Speaker at CD-adapco Customer Advisory Council meeting, New Orleans, 2011
- Elected by peers to the prestigious Fellow grade in the American Institute of Aeronautics & Astronautics (AIAA), 2011
- Invited Keynote Speaker at RAeS Aerodynamics Conference, Bristol, U.K., 2010
- Served as the Lockheed Martin representative, by invitation, on the Industrial Advisory Board, Michigan/ Air Force Research Laboratory/ Boeing Collaborative Center in Aeronautical Sciences (CCAS), 2007–2011
- Served as Lockheed Martin representative, by invitation, on the Strategic Advisory Committee, Air Force Research Laboratory/ Virginia Tech/ Wright State University Collaborative Center for Multidisciplinary Sciences (CCMS), 2008–2011
- Invited Keynote Speaker at the NATO/RTO Air Vehicle Technology Symposium on Computational Uncertainty in Military Vehicle Design, Athens, Greece, 2007
- Selected by LM to attend Executive Program Manager's course, Defense Systems Management College, Defense Acquisition University, Fort Belvoir, VA, 2004
- Selected by the LM Aeronautics Company President for the Lockheed Martin Leadership & Executive Assessment and Development (LEAD) program, 2004–2005
- Invited to serve on the National Advisory Committee of High Performance Computing Initiative of the Council on Competitiveness, Washington DC, 2003–2011
- Appointed to serve as Leader of the LM Corporate Technology Focus Group on Aero-sciences from its inception in 2002 through 2011
- Appointed to lead the Lockheed Martin Corporate Task Force on Advanced Computing, 1994-2000
- Selected to participate in the Lockheed Martin Excellence through Development and Growth Enhancement (EDGE) program, 2001–2002
- Invited to represent Lockheed Martin on a panel of Distinguished Leaders to outline their vision of the Future of CFD at the AIAA Fluids 2000 Conference and Exhibit, Denver, CO, June 2000
- Represented Lockheed Martin on the Flight Research Subcommittee (FRS) of NASA Aero-Space Technology Advisory Committee (ASTAC), 1999–2001

- Invited to serve on Peer Review panels by
  - NASA-Langley Research Center, Aerodynamics Research Programs, 2015
  - Sandia National Laboratory, Compressible Fluid Mechanics and Aerothermodynamics Programs, 1999
  - Air Force Research Laboratory, Computational Sciences Research Branch, 1999
  - NASA-Langley Research Center, High-Lift Aerodynamics Program, 1999
  - NASA-Langley Research Center, Computational Algorithms Program, 1997
  - NASA-Langley Research Center, High Alpha Research Program, 1991
- Invited to serve as Aerodynamics Team Captain, Aero-Structure-Control Interaction Workshop, Cleveland, Ohio, 1997
- Served, by invitation, on National Research Council's Aeronautics and Space Engineering Board Fluids Panel to evaluate AFOSR proposals, 1996–2002
- Invited to serve on American Institute of Aeronautics & Astronautics (AIAA) Progress Series Review Panel in 1999, and Journal of Aircraft Review Committee, 1997
- Invited by NASA-Ames to serve as a Panel Member on "How Can NASA Better Advance High Performance Computing?" at the Computational Aero-Sciences Workshop, 1995
- Invited to give a lecture on Modern Methods for Aerodynamic Analysis, AIAA Short Course on Aerodynamic Analysis and Design, 1992
- Invited to present papers at national and international conferences including
  - "CFD for Aerodynamic Flight Performance Prediction: From Irrational Exuberance to Sobering Reality," 5th Symposium on Integration of CFD and Experiments in Aerodynamics, Tokyo, Japan, Oct 3-5, 2012
  - "Overarching Challenges and Opportunities for the Development of Future Air Platforms," 2010 Royal Aeronautical Society Aerodynamics Conference, Bristol, UK, July 27-28, 2010
  - "Computational Uncertainty: *Achilles' Heel* of Simulation Based Aircraft Design," NATO/RTO Air Vehicle Technology (AVT) Symposium on Computational Uncertainty in Military Vehicle Design, Athens, Greece, December 3-6, 2007
  - "CFD for Aircraft Design: Expectations, Challenges and Opportunities," *Recent Trends in Applied Aerodynamics and Design*, edited by D. Kroner et al, Proceedings of SAROD-2007, Thiruvananthapuram, India, November 2007, pp. 123-142
  - "An Assessment of CFD Effectiveness for Vortex Flow Simulation to Meet Preliminary Design Needs," NATO/RTO Air Vehicle Technology (AVT) Symposium on Advanced Flow Management, Loen, Norway, May 7-11, 2001
  - "Aircraft Design in the 21st Century: Implications for Design Methods," AIAA Fluids Conference, Albuquerque, New Mexico, June 1998
  - "CFD at a Crossroads: An Industry Perspective," Frontiers of Computational Fluid Dynamics Symposium, Everett, Washington, June 1997 (to honor Prof. Murman, Aero & Astro, MIT, on his 55th Birthday)
  - "Requirements for Effective Use of CFD in Aerospace Design," NASA Workshop on Surface Modeling, Grid Generation and Related Issues in CFD, Cleveland, Ohio, May 1995
  - "Recent Advances in Euler/Navier-Stokes Computational Methods," International Symposium on Advances in Aerospace Sciences and Engineering, Bangalore, India, December 1992
  - "Recent Developments in the Computational Solutions of the Euler Equations," Third International Congress of Fluid Mechanics, Cairo, Egypt, January 1990
- International conference presentations include
  - Royal Aeronautical Society Applied Aerodynamics Conference, U.K. (2010, 2014, 2016, 2018)
  - International Council of the Aeronautical Sciences (ICAS) Congress in France (1984), U.K. (1986), Sweden (1990), Italy (1996), and South Korea (2016)
  - Symposium on Integration of CFD and Experiments in Aerodynamics, Japan (2012)

- NATO Air Vehicle Technology Symposium, Greece (2007)
- SAROD, Symposium on Applied Aerodynamics and Design of Aerospace Vehicles, India (2007)
- NATO Air Vehicle Technology Symposium, Norway (2001)
- International Symposium on Advances in Aerospace Sciences and Engineering, India (1992)
- SAE International Pacific Aerospace Conference (iPAC), Japan (1991)
- Third International Congress of Fluid Mechanics, Egypt (1990)

VI. PROFESSIONAL RECOGNITION AND AWARDS

- Distinguished Faculty Award, Academy of Aerospace and Ocean Engineering Excellence, Virginia Tech, 2022:*"…for lifelong contributions…evidenced by activities that extend beyond normal expectations, unique contributions, long-standing leadership and impact on the university and beyond"*
- Fellow, Royal Aeronautical Society, 2016: *"…outstanding contributions in an aerospace or aerospace-related profession"*
- Dean's Award for Excellence in Teaching, College of Engineering, Virginia Tech, 2016: *"In recognition of extraordinary performance in teaching"*
- Fellow, American Institute of Aeronautics & Astronautics, 2011: *"In recognition of professional distinction and notable and valuable contributions made to the arts, sciences, and technology of aeronautics and astronautics"*
- Distinguished Engineering Merit Award, Engineers' Council, 2006: *"…outstanding contributions to the management, development and application of technologies…*"
- Technical Fellow, Lockheed Martin Aeronautical Systems, 1992–1999: *"In recognition of superior technical accomplishments and contributions to Lockheed"*
- Best Presentation in Session Award, AIAA Atlanta Section Aerospace Technology Symposium, 1997.
- Mission Success Award, Lockheed Martin Aeronautical Systems, 1996: *"For a record of significant technical achievement of value to programs"*
- Outstanding Session Speaker Award, AIAA Atlanta Section Aerospace Technology Symposium, 1992 and 1993.
- Engineer/Scientist of the Month Award, Lockheed Aeronautical Systems Company, July 1991: *"In recognition of demonstrated technical excellence and in appreciation for outstanding job performance"*
- Associate Fellow, American Institute of Aeronautics & Astronautics, 1991: *"In recognition of professional standing and successful practice"*
- Engineering Merit Award, San Fernando Valley Engineers' Council, 1991: *"For outstanding qualities and meritorious achievements within the field of Engineering"*
- SAE Teetor Award, Industrial Lecturer, 1990–1991: *"For recognized skills as a speaker to technical audiences and an outstanding representative of practicing engineers in industry"*
- Fellow, Institute for the Advancement of Engineering, 1990: *"In recognition of outstanding contributions to the advancement of engineering profession"*
- R&D Advancement Award, Lockheed-California Co., 1987: *"For exceptional personal commitment in advancing excellence of research and development"*
- Meritorious Technical Contribution Award, AIAA St. Louis Section, 1979: AIAA paper 79-0278 presented at the AIAA Aerospace Sciences Meeting, New Orleans, LA.
- Hay Medal, Indian Institute of Science, 1970: *"…for graduating at the top of the class."*
- Chancellor's Medal, Agra/Meerut University, 1967: *"…for graduating at the top of the class"*

VII. KEY LEADERSHIP AND TECHNICAL ACCOMPLISHMENTS

CFTI Strategy to meet U.S. National Aeronautical Goals: As Lockheed Martin representative on the Leadership Integrated Product Team of the U.S. Department of Defense Fixed Wing Vehicle (FWV) Program—a focused national aeronautics technology program—from 2001 through 2008, actively participated in developing a Capabilities Focused Technology Investment (CFTI) strategy. The CFTI construct offers a highly effective way of prioritizing technology investment to best meet end-user needs, and is widely recognized and accepted as the "model" for technology planning. Closely collaborated with Air Vehicles Directorate, Air Force Research Laboratory (FWV IPT chair), and a group of government and industry partners in identifying key technology enablers and developing technology maturation roadmaps for timely and cost-effective development of aerospace vehicle systems responsive to the warfighter needs in the near, mid and far-term. The vehicle systems cover the entire flight regime from low subsonic to hypersonic.

Balanced and Responsive NASA CAS Program Plan: As the U.S. Military Aircraft Industry representative on the NASA Computational Aero-Sciences (CAS) Re-planning Working Group, provided crucial perspective and leadership in helping NASA craft a balanced program that was fully responsive to the needs of the aerospace community. The program was focused on systematically developing the requisite massively parallel high performance computing hardware and software systems capable of providing accurate solutions of multidisciplinary computational aero-sciences problems at affordable cost (labor + computing). At NASA's request, continued to serve on the CAS Review and Planning team to ensure that the program remained focused on achieving its goals.

CoC HPC Initiative for Innovation and Competitiveness: Represented Lockheed Martin on the National Advisory Committee of the Council on Competitiveness (CoC) High Performance Computing (HPC) Initiative since its inception in 2003 through 2011. Provided constructive criticism and recommendations for stimulating and facilitating wider usage of HPC across the private sector to propel productivity, innovation and competitiveness. This effort attests to a shared conviction with CoC that HPC has been, and will continue to be, a key ingredient in accelerating the innovation process by shrinking "time-to-insight" and "time-to-solution"—and in an increasingly competitive global environment, out-compete will increasingly mean out-compute.

Cost-effective Support for Aircraft Programs: Led a successful engineering effort to support F-22 Engineering & Manufacturing Development (EMD) needs by generating full-aircraft aerodynamic loads using CFD. Wide range of flight conditions including transonic Mach numbers were covered (nearly 370 cases). The effort was unprecedented in its scope and magnitude and resulted in an estimated cost avoidance of $40M. Also directed value-added CFD applications to YF-22 design and development, C-5M Reliability Enhancement & Re-engining Program, P-3 Service Life Assessment Program, and a multitude of advanced design projects.

Successful CRAD Capture and Program Management: Instrumental in capturing CRAD (contract research & development) worth several million dollars between 1984 and 1999, and in successfully managing the associated activities. Program Manager and/or Principal Investigator of

- Navy contract (N00014-99-3-0010) on multidisciplinary assessment of hydrofoil concept for fast ships, 1999-2001
- Air Force Delivery Order Contract (F33615-96-D-3013) on CFD Technology Development, Analysis and Assessment, 1996-2001
- Navy contract (N00014-97-C-0351) on feasibility of long-range high-speed ships, 1997-98
- NASA contract (NAS2-14092) on research in aero-servo-elasticity using advanced parallel computing systems, 1993-1998

- Air Force contract (F33615-84-C-3005) on Three-dimensional Euler/Navier-Stokes Aerodynamic Method (TEAM) development, 1984-89

Enhanced CFD Effectiveness for Flow Simulation: From 1979 to 1998, directed and conducted IRAD and CRAD projects—marked by initiative, innovation, and collaboration—focused on *simultaneously* improving the quality of solutions and productivity of the processes. Resulted in significant enhancement of the overall effectiveness of computational aerodynamic methods for flight vehicle design. For example, turnaround time for full-aircraft viscous analysis using Reynolds-Averaged Navier-Stokes methods was reduced from months in the late 1980s to weeks in mid-1990s to less than 24-hours in the year *2000*.

VIII. PROFESSIONAL SERVICE

Service to Virginia Tech

- Member, AOE Honorifics Committee, 2021–2023
- Chair & Member, AOE Honorifics Committee, 2012–2021
- Member, COE (College of Engineering) Honorifics Committee, 2012–2021
- Member, AOE Undergraduate Curriculum Committee, 2015–present
- Member, AOE Ad hoc Undergraduate Curriculum Redesign Committee, 2014–2018
- Chair, AOE Ad hoc Strategic Planning Committee, 2016–2018
- Member, AOE departmental search committee for a faculty position in aerospace propulsion, 2018–2019

Service to AIAA

- Member, 2023 & 2024 AIAA SciTech Forum Guiding Coalition Committee, 2022–present
- AIAA Fellow Nominator
  - B. Smith (Lockheed Martin); D. Miller (Lockheed Martin); R. Canfield (Virginia Tech)
- AIAA Fellow Reference
  - E. Burnett (Lockheed Martin); M. Fujino (HondaJet); L. Leavitt (NASA-LaRC); J. Peraire (MIT); L. Sankar (Georgia Tech); R. Makoske (Lockheed Martin)
- AIAA Associate Fellow Nominator
  - H. Pat Artis (Virginia Tech)
- AIAA Associate Fellow Reference
  - E. Paterson (Virginia Tech); F. Ghaffari and V. Vatsa (NASA-LaRC); R. Boyd, J. Buffington, G. Carichner, A. Carty, M. Cawood, M. Chang, C. Davies, S. Engelstad, C. Gaharan, N. Hall, B. Holm-Hansen, R. Makoske, J. Moorehouse, and B. Van Lear (all Lockheed Martin)
- AIAA Aerodynamics Award Reference
  - N. Frink and R. Hall (NASA LaRC)
- Member, AIAA Aircraft Design Technical Committee, 2013–present
- Technical Program Co-chair, 9th AIAA/ISSMO Symposium and Exhibit on Multidisciplinary Analysis and Optimization, 2002
- Member, AIAA Progress Series Review Panel, 1999
- Member, AIAA Journal of Aircraft Review Committee, 1997
- Member, AIAA Multidisciplinary Design Optimization Technical Committee, 1993–1997
- Vice-Chair Special Events, AIAA San Fernando Valley Section, 1990–1991
- Vice-Chair Education, AIAA San Fernando Valley Section, 1989–1990
- Member, AIAA Applied Aerodynamics Technical Committee, 1989–1992
- Member, AIAA Fluid Dynamics Technical Committee, 1985–1988

- Technical Paper Reviewer for AIAA Journal, Journal of Aircraft, and numerous conference presentations, 1980–present
- Session organizer and session chair for numerous AIAA meetings and conferences including Aerospace Sciences, Applied Aerodynamics, MA&O, SciTech, and Aviation,1985–present

Other Professional Societies and Laboratories

- Member, SAE Teetor Educational Award Committee, 2006–2011
- Member, NRC ASEB (National Research Council, Aeronautics and Space Engineering Board), Fluids Panel tasked to evaluate research proposals submitted to AFOSR, 1996–2002
- Member, Peer Review Panel, NASA-Langley Research Center, Aerodynamics Research Programs, 2015
- Member, Peer Review Panel, Sandia National Laboratory, Compressible Fluid Mechanics and Aerothermodynamics Programs, 1999
- Member, Peer Review Panel, Air Force Research Laboratory, Computational Sciences Research Branch, 1999
- Member, Peer Review Panel, NASA-Langley Research Center, High-Lift Aerodynamics Program, 1999; Computational Algorithms Program, 1997; High Alpha Research Program, 1991

IX. PROFESSIONAL SOCIETY MEMBERSHIP

- American Institute of Aeronautics and Astronautics (AIAA): Fellow (2011–present); Associate Fellow (1991–2011); Member (1972–2022) and Emeritus Member (2022–present)
- AHS International (formerly American Helicopter Society): Member (1976–present)
- SAE International (formerly Society of Automotive Engineers): Member (2006–present)
- National Defense Industrial Association (NDIA): Member (2011–present)
- Royal Aeronautical Society (RAeS): Fellow & Member (2016–present)

X. PUBLICATIONS & PRESENTATIONS

BOOK CHAPTERS (4)

1. Raj, P., "CFD for Aircraft Design: Expectations, Challenges and Opportunities," *Recent Trends in Applied Aerodynamics and Design*, Proceedings of SAROD-2007, Thiruvananthapuram, India, November 2007, pp 123-142, Kroner, D. et al (Editors)
2. Raj, P., "CFD at a Crossroads: An Industry Perspective," *Frontiers of Computational Fluid Dynamics*, World Scientific Publishing Co., 1998, pp. 429-445, Caughey, D.A. and Hafez, M.A. (Editors).
3. Olling, C.R., Raj, P., and Miranda, L.R., "Aerodynamic Analysis Using Euler/Navier-Stokes Equations," *Computational Fluid Dynamics Techniques*, CRC Press, Gordon and Breach Publishers, 1995, pp. 525-540, Habashi, W.G. and Hafez, M.A. (Editors)
4. Raj, P., "Aerodynamic Analysis Using Euler Equations: Capabilities and Limitations," Chapter 18, *Applied Computational Aerodynamics*, Progress in Astronautics and Aeronautics, Vol. 125, AIAA, Washington D.C., 1990, Henne, P.A. (Editor).

JOURNAL PAPERS (12)

1. Sudalagunta, P.R., Sultan, C., Kapania, R., Watson, L., and Raj, P., "Aeroelastic Control-Oriented Modeling of an Air-breathing Hypersonic Vehicle," *AIAA Journal of Guidance, Control and Dynamics*, Vol. 41, No. 5, May 2018, pp. 1136-1149.
2. Sudalagunta, P.R., Sultan, C., Kapania, R., Watson, L., and Raj, P., "Accurate Computing of Higher Vibration Modes of Thin Flexible Structures," *AIAA Journal*, Vol. 54, No. 5, 2016, pp. 1704-1718.
3. Goodwin, S., Weed, R., Sankar, L.N., and Raj, P., "Toward Cost-effective Aeroelastic Analysis on Advanced Parallel Computing Systems," *AIAA Journal of Aircraft*, Vol. 36, No. 4, July-August 1999, pp 710-715.

4. Raj, P., Keen, J.M., and Singer, S.W., "Applications of an Euler Aerodynamic Method to Free-Vortex Flow Simulation," *AIAA Journal of Aircraft*, Vol. 27, No. 11, November 1990, pp 941-949.
5. Raj, P., and Brennan, J.E., "Improvements to an Euler Aerodynamic Method for Transonic Flow Simulation," *AIAA Journal of Aircraft*, Vol. 26, No.1, January 1989, pp 13-20.
6. Raj, P., Sikora, J.S., and Keen, J.M., "Free-Vortex Flow Simulation Using a Three-Dimensional Euler Aerodynamic Method," *AIAA Journal of Aircraft*, Vol. 25, No. 2, February 1988, pp 128-134.
7. Raj, P., "A Multigrid Method for Transonic Wing Analysis and Design," *AIAA Journal of Aircraft*, Vol. 21, No. 2, February 1984, pp 143-150.
8. Raj, P., Miranda, L.R., and Seebass, A.R., "A Cost-Effective Method for Shock-Free Supercritical Wing Design," *AIAA Journal of Aircraft*, Vol. 19, No. 4, April 1982, pp 283-289.
9. Raj, P., and Iversen, J.D., "Computational Simulation of Turbulent Vortex Merger and Decay," *AIAA Journal*, Vol. 18, No. 8, August 1980, pp. 865-866.
10. Raj, P., and Gray, R.B., "Computation of Three-Dimensional Potential Flow Using Surface Vorticity Distribution," *AIAA Journal of Aircraft*, Vol. 16, No. 3, March 1979, pp 162-169.
11. Raj, P., and Iversen, J. D., "Inviscid Interaction of Trailing Vortex Sheets Approximated by Point Vortices," *AIAA Journal of Aircraft*, Vol.15, No.12, December 1978, pp. 857-859.
12. Raj, P., and Gray, R.B., "Computation of Two-Dimensional Potential Flow Using Elementary Vortex Distributions," *AIAA Journal of Aircraft*, Vol. 15, No.10, October 1978, pp. 698-700.

CONFERENCE PAPERS (47)

1. Arbolino, J.C., Edwards, L.H., von Spakovsky, M.R., Raj, P., "Experimental Evaluation of Innovative Thermal Energy Storage Options for a Non-Airbreathing Hypersonic Vehicle's Internal Loads," AIAA-2024-1897, AIAA SciTech Forum, Orlando, FL, Jan 8-12,, 2024.
2. Edwards, L.H., Arbolino, J.C., von Spakovsky, M.R., Raj, P., "Evaluation of Various Energy Storage Options for the Internal Thermal Loads of a Non-Airbreathing Hypersonic Vehicle," AIAA-2024-1896, AIAA SciTech Forum, Orlando, FL, Jan 8-12,, 2024.
3. Shah, H., and Raj, P., "An Assessment of CFD Effectiveness for Simulating Wing-Propeller Aerodynamic Interactions," RAeS Applied Aerodynamics Conference, London, UK, September 13-15, 2022.
4. Polepeddi, V., Raj, P., and Emeneth, M., "Regional Transport Aircraft Design Using Turbo-Electric Distributed Propulsion (TEDiP) System," ICAS 2022-0609, 33rd Congress of the International Council of the Aeronautical Sciences, Stockholm, Sweden, September 4-9, 2022.
5. Raj, P., "Applied Computational Aerodynamics: *An Unending Quest for Effectiveness*," Lead Paper, RAeS Applied Aerodynamics Conference, Bristol, UK, July 24-26, 2018.
6. Ganesh, R.V., Raj, P., Choi, S., and Emeneth, M., "Development and application of WASPE for conceptual design of HEDiP aircraft," Paper P.2, RAeS Applied Aerodynamics Conference, Bristol, UK, July 24-26, 2018.
7. Park, J., Arora, A., Prasad, R., Choi, S., and Raj, P., "Multi-response Gaussian Process Regression for Multidisciplinary Design Analysis and Optimization," AIAA-2018-4172, Multidisciplinary Analysis and Optimization Conference, AIAA Aviation Forum, Atlanta, GA, June 25-29, 2018.
8. Park, J., Jo, Y., Yi, S., Choi, S., and Raj, P., "Variable-Fidelity Design Optimization using Adaptive Sampling and Polynomial Chaos Kriging Model," AIAA-2017-1754, 58th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA SciTech Forum, Grapevine, TX, January 9-13, 2017.
9. Li, Q., Balakrishnan, D., Zhang, X., Burgos, R., Boroyevich, D., and Raj, P., "Conceptual Design and Weight Optimization of Aircraft Power Systems with High-Peak Pulsed Power Loads," SAE 1016-01-1986, SAE 2016 Aerospace Systems and Technology Conference, Hartford, CT, Sept. 27-29, 2016.

10. Park, J., Choi, S., and Raj, P., "On More Effective Aerodynamic Data Generation for Simulation Based Aircraft Conceptual Design," ICAS 2016-0151, 30th Congress of the International Council of the Aeronautical Sciences, Daejeon, Korea, September 25-30, 2016.
11. Raj, P., and Abulawi, J., "Using International Collaborative Aircraft Design Projects to Enhance Undergraduate Design Education: Lessons Learned," ICAS 2016-0150, 30th Congress of the International Council of the Aeronautical Sciences, Daejeon, Korea, September 25-30, 2016.
12. Raj, P., and Choi, S., "TiCTaC: An Innovative Paradigm for Aerodynamic Data Generation to Meet Aircraft Conceptual Design Needs," Paper C.2, RAeS Applied Aerodynamics Conference, Bristol, UK, July 19-21, 2016.
13. Park, J., Jo, Y., Yi, S., Choi, S., and Raj, P., "Variable-Fidelity Multidisciplinary Design Optimization for Innovative Control Surface of Tailless Aircraft," AIAA-2016-4038, 34th AIAA Applied Aerodynamics Conference, AIAA Aviation Forum, Washington, D.C., June 13-17, 2016.
14. Reed, W.C., von Spakovsky, M.R., and Raj, P., "Comparison of Heat Exchanger and Thermal Energy Storage Designs for Aircraft Thermal Management Systems," AIAA-2016-1023, 54th AIAA Aerospace Sciences Meeting, AIAA SciTech Forum, San Diego, CA, January 4-8, 2016.
15. Sudalagunta, P., Sultan, C., Kapania, R., Watson, L., and Raj, P., "Aeroelastic Control-oriented Modeling of an Air-breathing Hypersonic Vehicle," AIAA-2016-1325, 15th Dynamics Specialists Conference, AIAA SciTech Forum, San Diego, CA, January 4-8, 2016.
16. Friedman, A., Raj, P., and Alyanak, E., "Multidisciplinary Design Space Exploration Using Additive Manufacturing and Rapid Prototype Testing," AIAA-2015-2942, 16th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, AIAA Aviation Forum, Dallas, TX, June 22-26, 2015.
17. Sudalagunta, P.R., Sultan, C., Kapania, R., Watson, L., and Raj, P., "A Novel Scheme to Accurately Compute Higher Vibration Modes using the Ritz Method and a Two-point BVP Solver," AIAA Paper 2015-1166, 56th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA SciTech Forum, Kissimmee, FL, January 5-9, 2015.
18. Raj, P., and Friedman, A., "On timely and cost-effective prediction of aerodynamic data to meet aircraft design needs," Paper H.1, RAeS Applied Aerodynamics Conference, Bristol, UK, July 22-24, 2014.
19. Raj, P., "CFD for Aerodynamic Flight Performance Prediction: From Irrational Exuberance to Sobering Reality (Invited)," 5th Symposium on Integrating CFD and Experiments in Aerodynamics, Tokyo, Japan, October 3-5, 2012.
20. Raj, P., "Computational Uncertainty: *Achilles' Heel* of Simulation Based Aircraft Design (Invited)," NATO/RTO Air Vehicle Technology (AVT) Symposium on Computational Uncertainty in Military Vehicle Design, Athens, Greece, December 3-6, 2007.
21. Raj, P., "CFD for Aircraft Design: Expectations, Challenges and Opportunities (Invited)," 3rd Symposium on Applied Aerodynamics and Design of Aerospace Vehicles, SAROD-2007, Thiruvananthapuram, India, 22-23 November 2007.
22. Raj, P., Finley, D.B. and Ghaffari, F., "An Assessment of CFD Effectiveness for Vortex Flow Simulation to Meet Preliminary Design Needs," NATO/RTO Air Vehicle Technology (AVT) Symposium on Advanced Flow Management, Loen, Norway, 7-11 May 2001.
23. Raj, P., "Aircraft Design in the 21st Century: Implications for Design Methods (Invited)," AIAA 98-2895, 29th AIAA Fluid Dynamics Conference, Albuquerque, NM, June 15-18, 1998.
24. Raj, P., "CFD at a Crossroads: An Industry Perspective (Invited)," *Thirty Years of CFD and Transonic Flow* Symposium to honor Prof. Earll Murman on his 55th Birthday, Everett, WA, June 1997.
25. Vermeersch, S., Weed, R., Sankar, L.N., and Raj, P., "Towards Cost-effective Aeroelastic Analysis on Advanced Parallel Computing Systems," AIAA Paper 97-0646, 35th Aerospace Sciences Meeting, Reno, NV, January 1997.

26. Raj, P., Kinard, T.A., and Vermeersch, S.A., "Vortical Flow Simulation Using an Unstructured-Grid Euler Method," ICAS 96-1.4.5, Proceedings of the 20th Congress of the International Council of the Aeronautical Sciences, Sorrento, Italy, September 1996.
27. Kinard, T.A, Harris, B., and Raj, P., "Computational Simulation of Benign and Burst Vortex Flows," AIAA Paper 95-1815, Proceedings of the 13th Applied Aerodynamics Conference, San Diego, CA, June 19-22, 1995.
28. Raj, P., "Requirements for Effective Use of CFD in Aerospace Design (Invited)," NASA Workshop on Surface Modeling, Grid Generation and Related Issues in Computational Fluid Dynamics (CFD) Solutions, NASA-Lewis Research Center, Cleveland, OH, May 9-11, 1995. (Also NASA CP 3291, pp 15-28)
29. Raj, P., and Harris, B., "Using Surface Transpiration with an Euler Method for Cost-effective Aerodynamic Analysis," AIAA 93-3506, Proceedings of the 11th AIAA Applied Aerodynamics Conference, Monterey, CA, August 9-11, 1993.
30. Raj, P., "Recent Advances in Euler/Navier-Stokes Computational Methods (Invited)," International Symposium on Advances in Aerospace Sciences and Engineering, Bangalore, India, December 1992.
31. Raj, P., and Singer, S.W., "Computational Aerodynamics in Aircraft Design: Challenges and Opportunities for Euler/Navier-Stokes Methods," iPAC 911990, Proceedings of the International Pacific Air & Space Technology Conference, Gifu, Japan, October 7-11, 1991.
32. Raj, P., Olling, C.R., and Singer, S.W., "Application of Euler/Navier-Stokes Aerodynamic Methods to Aircraft Configuration," ICAS Paper 90-6.4.4, Proceedings of the 17th Congress of the International Council of the Aeronautical Sciences, Stockholm, Sweden, September 9-14, 1990.
33. Raj, P., "Recent Developments in the Computational Solutions of Euler Equations (Invited)," Third International Congress of Fluid Mechanics, Cairo, Egypt, January 2-4, 1990.
34. Raj, P., "An Euler Code for Nonlinear Aerodynamic Analysis: Assessment of Capabilities," Advanced Aerospace Aerodynamics, SAE SP 757, 1988, pp 215-230. (Also SAE Paper 881486, Aerospace Technology Conference and Exposition, Anaheim, CA, October 3-6, 1988)
35. Raj, P., Keen, J.M., and Singer, S.W., "Applications of an Euler Aerodynamic Method to Free-Vortex Flow Simulation," AIAA paper 88-2517, Proceedings of the 6th Applied Aerodynamics Conference, Williamsburg, VA, June 6-8, 1988.
36. Raj, P., and Brennan, J.E., "Improvements to an Euler Aerodynamic Method for Transonic Flow Simulation," AIAA Paper 87-0040, 25th Aerospace Sciences Meeting, Reno, NV, January 12-15, 1987.
37. Raj, P., Sikora, J.S. and Keen, J.M., "Free-Vortex Flow Simulation Using a Three-dimensional Euler Aerodynamic Method," ICAS Paper 86-1.5.2, Proceedings of the 15th Congress of the International Council of the Aeronautical Sciences, London, England, U.K., September 7-12, 1986.
38. Raj, P., and Long, L.N., "An Euler Aerodynamic Method for Leading-Edge Vortex Flow Simulation," NASA Conference on Vortex Flow Aerodynamics, NASA CP-2416, October 1985, pp 263-282.
39. Raj, P., "Computational Simulation of Free Vortex Flows Using an Euler Code," ICAS Paper 84-1.3.1, Proceedings of the 14th Congress of the International Council of the Aeronautical Sciences, Toulouse, France, September 10-14, 1984.
40. Raj, P., and Sikora, J.S., "Free-Vortex Flows: Recent Encounters with an Euler Code," AIAA Paper 84-0135, 22nd Aerospace Sciences Meeting, Reno, NV, January 9-12, 1984.
41. Sharble, R.C., and Raj, P., "An Algebraic Grid-Generation Method Coupled with an Euler Solver for Simulating Three-Dimensional Flows," AIAA Paper 83-1807, AIAA Applied Aerodynamics Conference, Danvers, MA, July 13-15, 1983.
42. Raj, P., "A Multigrid Method for Transonic Wing Analysis and Design," AIAA Paper 83-0262, 21st Aerospace Sciences Meeting, Reno, NV, January 10-13, 1983.
43. Raj, P., Miranda, L.R. and Seebass, A.R., "A Cost-Effective Method for Shock-Free Supercritical Wing Design," AIAA Paper 81-0383, 19th Aerospace Sciences Meeting, St. Louis, MO, January 12-15, 1981.

44. Raj, P., and Iversen, J.D., "Computational Simulation of Corotational Vortex Merger Using 0, 1, and 2 Equation Turbulence Models," Proceedings of the Second International Symposium on Turbulent Shear Flows, Imperial College, London, July 2-4, 1979.
45. Raj, P., and Iversen, J.D., "Computational Simulation of Turbulent Vortex Merger and Decay," AIAA Paper 79-0278, 17th Aerospace Sciences Meeting, New Orleans, LA, January 15-17, 1979.
46. Raj, P., and Iversen, J.D., "Computational Studies of Turbulent Merger of Corotational Vortices," AIAA Paper 78-108, 16th aerospace Sciences Meetings, Huntsville, AL, January 16-18, 1978.
47. Iversen, J.D., Brandt, S.A., and Raj, P., "Merging Distance Criteria for Corotating Trailing Vortices," Proceedings U.S. Department of Transportation Conference on Aircraft Trailing Vortices, Cambridge, MA, March 15-17, 1977.

TECHNICAL REPORTS (12)

1. Kinard, T.A., and Raj, P., "Euler Technology Assessment for Preliminary Aircraft Design—Compressibility Predictions by Employing the Unstructured Grid USM3D Code," NASA Contractor Report 4711, March 1996.
2. Kinard, T.A., Harris, B.W., and Raj, P., "An Assessment of Viscous Effects in Computational Simulation of Benign and Burst Vortex Flows on Generic Fighter Wind-Tunnel Models Using TEAM Code," NASA Contractor Report 4650, March 1995.
3. Goble, B.D., Raj, P., and Kinard, T.A., "Three-dimensional Euler/Navier-Stokes Aerodynamic Method (TEAM) Upgrade, Version 713 User's Manual," WL-TR-93-3115, February 1994.
4. Raj, P., Olling, C.R., Sikora, J.S., Keen, J.M., Singer, S.W., and Brennan, J.E., "Three-dimensional Euler/Navier-Stokes Aerodynamic Method (TEAM), Volume I: Computational Method and Verification," AFWAL-TR-87-3074, June 1989.
5. Raj, P., Olling, C.R., Sikora, J.S., Keen, J.M., Singer, S.W., and Brennan, J.E., "Three-dimensional Euler/Navier-Stokes Aerodynamic Method (TEAM), Volume II: Grid Generation User's Manual," AFWAL-TR-87-3074, June 1989.
6. Raj, P., Olling, C.R., Sikora, J.S., Keen, J.M., Singer, S.W., and Brennan, J.E., "Three-dimensional Euler/Navier-Stokes Aerodynamic Method (TEAM), Volume III: Flow Analysis User's Manual," AFWAL-TR-87-3074, June 1989.
7. Raj, P., Brennan, J.E. and Sikora, J.S., "CFD at LASC: Present Capabilities and Plan for Technological Leadership," Lockheed Aeronautical Systems Company Report, LR 31615, February 1989.
8. Raj, P., "Applied Computational Aerodynamics: 1985 Year End IRAD Progress Report," Lockheed-California Company Report, LR 30975, February 1986.
9. Raj, P., "PACMAPS: A Three-Dimensional Grid-Generation Method," Lockheed-California Company Report, LR 30811, October 1984.
10. Raj, P., "A Generalized Wing-Body Euler Code, FLO-57GWB," Lockheed-California Company Report, LR 30490, June 1983.
11. Raj, P., and Reaser, J.S., "An Improved Full-Potential Finite-Difference Transonic-Flow Code, FLO-22.5," Lockheed-California Company Resort, LR 29759, June 1981.
12. Raj, P., "Shock Free Advanced Supercritical Wing Design," Lockheed-California Company Report, LR 29697, May 1981.

ORAL PRESENTATIONS (39, in addition to 45 presentations at conferences listed above)

1. Raj, P., "Evolution of Applied Computational Aerodynamics and Pursuit of Effectiveness: *Reflections of My Journey on a Long and Winding Road*," Ohio State University, Columbus, Ohio, October 25, 2019.
2. Raj, P., "Applied Computational Aerodynamics (ACA): *Reflections on My Long and Exciting Journey in the Never-ending Pursuit of Effectiveness*," Dinner Meeting, AIAA University of Dayton Student Branch, Dayton-Cincinnati Section, Dayton, Ohio, October 22, 2019.

3. Raj, P., "Applied Computational Aerodynamics: *A Perspective on the Unending Quest for Effectiveness*," University of Illinois Aerospace Engineering Seminar, Urbana-Champaign, Illinois, November 5, 2018.
4. Raj, P., "Aerodynamic Simulation with Propeller Effects for Aircraft with Hybrid-electric Distributed Propulsion," PACEdays Conference & User Group Meeting, Berlin, Germany, September 11, 2018.
5. Raj, P., "An Unending Quest for Effective ACA: A Perspective," Virginia Tech AOE Seminar, Blacksburg, Virginia, September 10, 2018.
6. Raj, P., "The Skunk Works®: Continually Redefining Flight for 75 Years," Loughborough University, Loughborough, UK, March 6, 2018.
7. Raj, P., "Conversation with a 40^{+} Year Aerospace Engineering Veteran," AIAA Virginia Tech Student Branch Meeting, Blacksburg, Virginia, December 11, 2013.
8. Raj, P., "The Skunk Works®: Continually Redefining Flight for Nearly Seven Decades," AIAA Virginia Tech Student Branch Meeting, Blacksburg, Virginia, November 27, 2012.
9. Raj, P., "The Skunk Works®: Revolutionizing Aviation for Nearly Seven Decades," Japan Aerospace Exploration Agency, Chofu, Tokyo, Japan, October 2, 2012.
10. Raj, P., "Computational Fluid Dynamics for Simulation Based Design: Challenges and Opportunities," National Defense Industrial Association (NDIA) Physics-Based Modeling in Design & Development for U.S. Defense Conference, Denver, Colorado, November 14-17, 2011.
11. Raj, P., "On 'Grand Challenges' for CFD-focused Engineering Simulations (in the context of Flight Vehicles Development)," CD-adapco Customer Advisory Council Meeting, New Orleans, LA, November 9-11, 2011.
12. Raj, P., "Overarching Challenges and Opportunities for the Development of Future Air Platforms," 2010 Royal Aeronautical Society Aerodynamics Conference, Bristol, UK, July 27-28, 2010.
13. Raj, P., "Computational Methods for Stability and Control: A Perspective," NASA Symposium on Computational Methods for Stability and Control (COMSAC), Hampton, Virginia, September 23-25, 2003.
14. Raj, P., "Aerodynamic Data Generation for SBA (Simulation Based Analysis): *A "New Partnership" of CFD with Wind Tunnels,"* DoD HPCMPO Workshop on V&V and Certification by Analysis, Dayton, Ohio, May 28-29, 2003.
15. Raj, P., "Aerodynamic Flight Prediction: A Perspective," NASA/DoD Workshop on Aerodynamic Flight Prediction, Williamsburg, Virginia, November 19-21, 2002.
16. Raj, P., "Aircraft Design in the 21st Century: Implications for Design Methods," Multidisciplinary Analysis, Inverse Design and Optimization Program, Department of Mechanical and Aerospace Engineering, University of Texas at Arlington, Arlington, Texas, March 14, 2002.
17. Raj, P., "Twenty Five Years of CFD: From Irrational Exuberance to Rational Sobriety!," AIAA Atlanta Section - Dinner Meeting, Atlanta, Georgia, September 19, 2000.
18. Raj, P., "Perspectives on the Future of CFD," AIAA Fluids 2000 Meeting, Denver, Colorado, June 19-22, 2000.
19. Raj, P., "Aircraft Design in the 21st Century: Implications for Design Methods," AIAA Atlanta Section, Aerospace Technology Symposium, Marietta, Georgia, February 26, 2000.
20. Raj, P., "Aircraft Design in the 21st Century: Implications for Design Methods," MAD Center Industrial Advisory Board Meeting, Virginia Tech, Blacksburg, Virginia, November 13, 1998.
21. Raj, P., "Aircraft Design in the 21st Century: Implications for Design Methods," Interdisciplinary Science Colloquium, Kennesaw State University, Kennesaw, Georgia, October 23, 1998.
22. Raj, P., "Reflections on Euler/Navier-Stokes Methods for Aircraft Design Applications," Computational Aerodynamics—Past, Present and Future (A conference honoring Paul Rubbert for over thirty years of outstanding vision and leadership in the development and application of CFD; hosted by the Boeing company), Seattle, Washington, September 26-27 1997.

23. Raj, P., "CAS and Aircraft Design: Challenges and Opportunities" NASA Computational Aerosciences Workshop, Moffett Field, California, March 7-9, 1995.
24. Raj, P., "Modern Methods for Aerodynamic Analysis," Lecture, AIAA Short Course on Aerodynamic Analysis and Design, Palo Alto, California, June 1992.
25. Raj, P. "An Euler Code for Nonlinear Aerodynamic Analysis: Assessment of Capabilities," Seminar, Department of Mechanical Engineering, University of Miami, Coral Gables, Florida, March 1, 1991.
26. Raj, P. "An Euler Code for Nonlinear Aerodynamic Analysis: Assessment of Capabilities," Seminar, Department of Mechanical and Aerospace Engineering, Florida Institute of Technology, Melbourne, Florida, February 28, 1991.
27. Raj, P., "Computational Fluid Dynamics for Flight Vehicle Design: Present Capabilities and Future Requirements," Seminar, Department of Mechanical Engineering, University of Southern California, Los Angeles, California, October 11, 1990.
28. Raj, P. "An Euler Code for Nonlinear Aerodynamic Analysis: Assessment of Capabilities," Seminar, Department of Mechanical Engineering, Washington University, St. Louis, Missouri, September 27, 1990.
29. Raj, P., "CFD for Aircraft Design: Present Capabilities and Future Requirements," Minisymposium 29: Aerospace Design, SIAM Conference on Dynamical Systems, Orlando, FL, May 7-10, 1990.
30. Raj, P., "CFD: The Adolescent Years," Presentation to AIAA Student Chapter, San Diego State University, San Diego, California, May 3, 1990.
31. Raj, P., "Three-dimensional Euler/Navier-Stokes Aerodynamics Method (TEAM)," Aerodynamic Methods Group Contracts Review, Wright Research and Development Center, Wright-Patterson AFB, Ohio, November 15, 1989.
32. Raj, P., "Airplane Aerodynamic Design: The Challenge of Flow Simulation," Aircraft Design Seminar, Cal Poly Pomona, California, 1989 and 1990.
33. Raj, P., "Aerodynamic Simulation on CRAY Supercomputers: Bridging the Gap between Imagination and Reality," Cray User Group (CUG) Conference, Los Angeles, California, April 1989.
34. Raj, P., "Three-dimensional Euler Aerodynamic Method, TEAM," AIAA Professional Study Series, Euler Solvers Workshop, Monterey, California, August 1987.
35. Raj, P., "Vortex Breakdown Simulation Using an Euler Aerodynamic Method," Open Forum – Vortex Breakdown, AIAA 25th Aerospace Sciences Meeting, Reno, Nevada, January 1987.
36. Raj, P., "Three-dimensional Euler Aerodynamics Methods," 2nd Lockheed Corporation Symposium on Computational Aerodynamics/Fluid mechanics, Marietta, Georgia, May 1985.
37. Raj, P., "Free Vortex Flows: Continuing Encounters of the Euler Kind," 2nd Lockheed Corporate Symposium on Computational Aerodynamics/Fluid mechanics, Marietta, Georgia, May 1985.
38. Raj, P., "Transonic Wing Analysis and Design Using FLO-22.5," 1st Lockheed Corporate Symposium on Computational Aerodynamics, Burbank, California, April, 1983.
39. Raj, P., "Free-Vortex Flows: Recent Encounters of the Euler Kind," 1st Lockheed Corporate Symposium on Computational Aerodynamics, Burbank, California, April, 1983.

XI. FUNDED RESEARCH @VT

Multiple projects; list available upon request

XII. STUDENT FEEDBACK (AIR VEHICLE DESIGN COURSES @VT)

UNSOLICITED

- "Throughout my undergrad, I was in Aerospace just to say I was. I never truly had any aspiration to work in the aerospace field. But then after taking your class, talking to you, I realized that I wanted to design aircraft more than anything in the world. So thank you for helping me realize my dream and always supporting me along the way." (E.R., Class of 2013, Recd. May 2013)
- "I absolutely love how you taught the course, if nothing else you desired personal responsibility and it is sad to think that too many students wanted things spoon fed to them and could not figure out what to do on their own accord. That being said, I hope that you will not change the way you teach to accommodate a few lazy students." (C.K., Class of 2013, Recd. May 2013)
- "…thank you for your guidance and caring attitude throughout our senior design project, it truly meant a lot to everyone on the team…I learned many things through this project that will help me in the future, especially how to think the right way." (J.H., Class of 2013, Recd. May 2013)
- "It was an honor taking your class this past year. Thank you for providing great feedback and allowing us to learn firsthand instead of telling us what to do!" (J.L., Class of 2014, Recd. May 2014)
- "I want to express my thanks to you for helping to guide my team and me throughout the year. It was by far my favorite class during my time here at Virginia Tech and while there were struggles, it was an extremely valuable experience that I learned a lot from. Thanks for everything!" (A.M., Class of 2014, Recd. May 2014)
- "I really appreciate you working with us this semester. I truly believe that this class was the most useful of my engineering career." (J.A., Class of 2014, Recd. May 2014)
- "I just wanted to thank you for the wonderful experience that was our senior design class. It was easily my favorite class during my undergraduate career, and I'm sure it will give my upcoming graduate school classes a good run for their money. What I appreciated most was that you always made yourself as available as possible, and never answered my questions for me. The nature of the class focuses on open ended problems with no perfect solution, however whenever I came to you with a question, you never dictated the correct answer to me. What you did was always much more valuable. You taught me to ask myself the right questions of whatever problem I had encountered, so that I could reach a reasonable solution on my own. More succinctly, you encouraged me to think critically on my own." (B.N., Class of 2014, Recd. May 2014)
- "Love Dr. Raj! He's very personable and approachable. Prospective students always gasp when I tell them how many people are in some of our AOE classes, but with professors like Dr. Raj you don't really notice that you're sometimes 1 of 200 other students. It's professors like him that are the reason why I chose to come to Virginia Tech." (N.P., Class of 2015, Recd. May 2015)
- "Being almost 3 years on I wanted to reflect and thank you for everything you taught us in your classes. I still use many of the principles you taught us daily in things as simple as presentation building, communications, and probably the biggest thing your courses did for me was give me a mindset to consider how leadership will receive the things I present and how to be more effective as an engineer; skills most students would never gain from traditional engineering courses." (M.K., Class of 2013, Recd. October 2015)
- "Thanks for all the help and mentoring at VT. I wouldn't be here without you and your class." (J.T., Class of 2013, Recd. October 2015)
- "Thank you for your countless hours of work and dedication making me and others proud to be VT Aerospace engineers." (S.A., Class of 2013, Recd. October 2015)

- "Your dedication to Virginia Tech and its students is truly inspiring. Your willingness to mentor and encourage your students has pushed me to be the best engineer and colleague I can. Go Hokies!" (G.S., Class of 2014, Recd. October 2015)
- "Thank you for this past year, and the knowledge you (and other faculty) have passed on to us seniors. Thank you for the ways in which you have challenged us, pushed us to ask questions, and of course, made us into better engineers." (R.F., Class of 2020, Recd. May 2020)
- "…thank you for all the help you provided in the senior design course this past year. Being able to attend class and learn more about how to approach real world problems, and what it takes to understand the problem before solving it, has been one the greatest honors and pleasures of my college experience…I recall in one of the first lectures you gave us you mentioned that there was no right answer, and that there could be many solutions to the problem. I think about that a lot in respect to the past year, and while there may have been no right set of actions to follow or areas to personally grow, I know that the ones you helped me with I would not trade for anything." (J.D., Class of 2020, Recd. May 2020)
- "Thank you for teaching us, helping us forward, and encouraging us to produce the best work we could. It was truly a pleasure working with you all for the past two semesters and I hope we will cross paths again sometime during this school year." (M.C., Class of 2020, Recd. August 2020)
- "This year working under your mentorship has been a real joy." (I.W., Class of 2021, Recd. May 2021)
- "On behalf of my team, thank you very much for all of your assistance and guidance throughout this year. We greatly appreciate everything you've done for us!" (I.S., Class of 2022, May 2022)
- "It was a pleasure to work with you. I believe that I learned more in this class than in any other class that I've taken over the past years and that it definitely had an impact on my future. I'm truly thankful for all the hard work you put into making this thing possible." (M.V., Exchange Student, May 2022)
- "Thank you for your guidance this past year on our project. I enjoyed the process of senior design and certainly learned a lot more about project management and team leadership than I anticipated." (C.F., Class of 2022, Recd. June 2022)
- "…thank you for providing us with your guidance and support throughout the entire senior design. It was a privilege to have you as a professor. I gained valuable experience, technical knowledge, new perspectives, and many tidbits of random information throughout your lectures and class that will be of use in my career or perhaps academic journey." (J.C., Class of 2022, July 2022)

ANONYMOUS SPOT SURVEYS

- "Dr. Raj is one amazing professor that is the top of his field. He was able to strike a balance between letting us develop ourselves as critical thinking engineers while providing us enough feedback and guidance to safely navigate the problems we experienced." (Class of 2016)
- "His feedback on our deliverables was the most important by far. I feel we learned far more from the actual presentations and their feedback than we did from the lectures. Though I suspect that that was because the feedback allowed what had been taught in the lectures to finally sink in." (Class of 2016)
- "Dr. Raj is a great instructor. I think the way he structures everything is a great stepping stone for all of us entering the work force." (Class of 2017)
- "Overall the course was taught very effectively. Your feedback was always helpful and critiques were understandable and fair. More exposure to CAD and CFD software before this course would have been extremely helpful." (Class of 2017)

- “The weekly meetings that the professors offered to us were EXTREMELY helpful during the design process. Them being available on a daily basis kept us from feeling lost sometimes and it was really nice.” (Class of 2018)
- “Dr. Raj did a good job relating the material to real-world situations, which is extremely helpful in a design class. He and Dr. Artis set aside time every week to discuss our project with us, which was very helpful as well.” (Class of 2018)
- “Dr. Raj is awesome and the class was very valuable and a good learning experience in many aspects, not just design. It has been a fantastic experience to be in his class!!!” (Class of 2019)
- “Always available when reached out to, very understanding and easy to talk to, and addressed thoughts/ concerns/ and opinions very respectfully and never judgmental or biased. Dr. Raj fostered an outstanding learning environment and encouraged students to acknowledge and address unknown unknowns that otherwise would have passed under the team’s radar. Doing so taught us not only the design process and aspects of design but helped (me at least) realize how important it is to utilize all available resources when a part of such a highly involved fast paced project.” (Class of 2019)
- “Explaining the concepts from lecture meetings every week clearly and concisely. Also, being available almost any time to help answer questions about the project was valuable and time saving.” (Class of 2020)
- “Very good perspective and reasoning on approaching problems, really gave a strong point of view to students on how to treat the project.” (Class of 2020)
- “Great stories! Honestly, the SR-71 and C-5 stories that provide intuition about the engineering process are much more valuable than anything a textbook or normal lecture can give.” (Class of 2020)
- “Thought the professors did a fantastic job” (Class of 2021)
- “Raj covered a lot of actually important topics probably most students (including me) would have never thought about that these exist with that high importance.” (Class of 2021)
- “He provided relevant feedback on any questions that we had regarding our design project.” (Class of 2021)
- “Raj knows what he’s doing, clearly. He’s also done it enough to know what he wants. It’s nice to have someone just straight up tell you that you’re doing it wrong. That’s appreciated, comes off as harsh sometimes, but appreciated.” (Class of 2021)
- “Thanks for asking questions instead of giving straight answers. It has helped me learn to question the purpose of what I am doing before blindly doing it.” (Class of 2021)
- “One of the best professors in the department of Aerospace Engineering. Harsh, but fair. Incredible critic and conveys his thoughts well.” (Class of 2022)
- “He applied both technical learning and experience to his instruction.” (Class of 2022)
- “Good presentation, good feedback.” (Class of 2022)
- “Wonderful professor and felt that the course gave some experience as to what working in a professional environment could be like.” (Class of 2022)