

WILLIAM P. SCHONBERG, PhD, PE, DS
Fellow, ASCE; Fellow, ASME; Associate Fellow, AIAA
Civil, Architectural, and Environmental Engineering Department
Missouri University of Science and Technology

EDUCATION

NORTHWESTERN UNIVERSITY *1983-1986* *EVANSTON, ILLINOIS*
Doctor of Philosophy in Civil Engineering; August, 1986. Dissertation: "Static and Dynamic Indentation of Transversely Isotropic Beams and Plates" (*conferred June, 1987*).

NORTHWESTERN UNIVERSITY *1981-1983* *EVANSTON, ILLINOIS*
Master of Science in Civil Engineering; June, 1983. Thesis: "Modal Superposition Methods in Seismic Soil-Structure Interaction".

PRINCETON UNIVERSITY *1977-1981* *PRINCETON, NEW JERSEY*
Bachelor of Science in Civil Engineering (cum laude); June, 1981. Thesis: "Dynamic Response Characteristics of Embedded Tower-Foundation Systems".

LANGUAGES

(in addition to English)

Russian

French

ACADEMIC LEADERSHIP AND ADMINISTRATIVE ACCOMPLISHMENTS

Administrative experience and recognition

- Nineteen years' experience as chair of two civil engineering departments, and one year of experience as interim dean of engineering. In these positions, I have
 - led the development of new and expanded degree program offerings,
 - managed and directed office staff,
 - conducted regularly scheduled, effective meetings on college level and of department faculty,
 - performed annual evaluations of large numbers of faculty and staff
 - led school-wide committees,
 - expanded and coordinated online course offerings,
 - executed a variety of administrative and academic functions, and
 - developed, streamlined, and managed budgets, resulting in increased budget stability.
- Currently serving as Assistant Chair for Distance Ed and Remote Programs, Civil, Architectural, and Environmental Engineering Department.
 - Updated Ft. Wood recruiting materials and presentation
 - Streamlined advising meetings and processes for Ft. Wood students

 - Developed promotional materials for department's distance ed programs, including ads for KC and STL ASCE section newsletters and promotional flyers
 - Coordinated funds distribution for faculty teaching distance ed courses

- Working with faculty to identify certificate program coordinators
- Served as advisor and/or inquiry point-of-contact for 103 distance ed students

Strategic Planning

- Worked with faculty, staff, alumni, business leaders, and students to develop plans, initiatives, and goals that to set us apart from our competitor, as well as comparator, institutions.
- At current and previous institutions, led faculty and staff to write departments' first Five-Year Strategic Plans, including mission and vision statements, strategic goals, action items and metrics.
- Recently completed new department-level strategic planning initiative that will set a course for our programs, faculty, and students through the year 2020 and beyond.
 - Faculty and alumni have a cohesive sense of purpose regarding the future of the department and its education, research, and technology transfer programs.
- Followed through on Strategic Plan development with annual progress reports to all major constituents.
- As interim dean, participated in national "Dean's Day on Capitol Hill", met with key representatives from Missouri, and worked with Advisory Council on directions, initiatives, and business trends.

Working with the entire University community

- Continually explored new methods of instruction to meet needs of both traditional and non-traditional students.
- Cooperation, unified sense of purpose, collaborative teaching and research activities now permeate the department.
 - Faculty and staff operate in a working and learning environment in which all are motivated to work towards achieving their full potential.
 - Alumni motivated to contribute their time, talents, and resources to support the department's programs and initiatives.
 - Staff members in other parts of campus routinely seek employment opportunities in my department.
- Successfully engaged with colleagues and programs across campus.
 - Major supporter of the Missouri S&T Film Series as well as the newly established Hispanic Film Program on campus.
 - Faculty from English and Psychology departments frequent guest lecturers.
 - Primary contributor to saving Missouri S&T's Freshman Orientation Week Reading Program.
 - Thanks in great part to my leadership, the program was fully reinstated and should continue to operate in the years ahead.

The department is now a more integral part of the university community while still maintaining its leadership position on campus.

- Contributed to regional and national economic development by leading the restructuring of department curricula to render them more appropriate for the training of future engineering professionals.

- Increased the access of working professionals to our courses and degree programs using internet-based courses.
 - Developed an income-sharing arrangement with faculty and university that has resulted in a new income stream for the department.

Undergraduate students and programs

- Number of scholarships available to department students has more than doubled since my arrival at Missouri S&T, giving the department an enhanced ability to recruit exceptional undergraduate students.
- As interim dean, conducted a study regarding the feasibility of offering a biomedical engineering degree program at Missouri S&T.
- Have led program accreditation activities since the beginning of my professional academic career (fourteen on-site visits and successful program reviews to date, including three in 2014), including
 - writing self-study documents,
 - development of continuing improvement processes and assessment tools, and
 - convening alumni and industry panels to review and assess objectives.
- Led the development and accreditation of new and expanded inter-disciplinary degree program offerings at Missouri S&T to meet local industry and student needs, including
 - online distance-ed based MS and graduate certificate programs,
 - two new autonomous ABET-accredited undergraduate degree programs (architectural engineering and environmental engineering), and
 - one ABET-accredited undergraduate degree program at a satellite location in civil engineering.
- Certified and active ABET Program Evaluator (civil engineering and architectural).
 - This provides me with an excellent perspective of pedagogical innovations and curricular content improvements, which is very helpful at time of home program re-accreditation visits.
- Facilitated comprehensive curriculum reform in current department, focusing on increased flexibility to meet individual student needs.
- Worked to increase student participation in Study Abroad and co-op work programs.
 - Developing plans for required experiential learning curriculum component in accordance with Strategic Plan.
 - Active member of campus Study Abroad Advisory Committee.
- Missouri S&T undergraduate civil engineering program was ranked 24th nationally by the U.S. News and World Report in 2004, five years after my arrival.
 - This was the first time that any undergraduate engineering program in the State of Missouri had been nationally ranked.
 - As such, a very significant milestone in the growth of the department and its programs had been reached!

I am very pleased to have been able to lead the department to this national recognition.

Graduate students and programs

- Led growth in the number of graduate student fellowships from two in 1999 to ten in 2014.
- Worked with faculty to develop distance education based courses and professional

development seminars to increase the access of working professionals to our courses.

- This has also created new income streams for the department.
- Worked with faculty to implement a revenue sharing program for tuition proceeds from distance ed courses.
- Engaged with the Engineer School at Ft. Leonard Wood to facilitate the delivery of graduate-level courses to Army personnel as part of its Engineer Captain's Career Course program.
- Developed MOUs with numerous international institutions (e.g. Ecole Centrale Nantes, University of Naples, University College of the Cayman Islands) to facilitate exchange of faculty and graduate students in several targeted areas of instruction and/or scholarship.

Faculty recruitment, retention, shared governance, and development

- Created an environment that fostered a four-fold increase in annual research awards in the department (from ~\$1.2M in 1999 to over \$5.4M in 2014).
 - Most growth came from multi- and inter-disciplinary activities involving faculty from several STEM and non-STEM departments across campus.
 - Faculty and their research programs more productive and more visible than ever before on national and international levels.
- Developed sustainable methods for providing start-up funds to new faculty, and for providing funding for faculty in support of professional development activities.
- As interim dean developed formal nomination and selection processes for faculty awards recognizing teaching excellence and innovation.
- Successful in increasing the number of full-time faculty by 50% in current department (from 16 in 1999 to 25 in 2014); have also worked diligently to increase faculty diversity (see below).
- Regularly engaged faculty task forces to address key department-wide issues as they arise, including the development of a new
 - comprehensive promotion and tenure policy,
 - faculty workload policy that rewards high levels of scholarly productivity as well as teaching excellence,
 - faculty sabbatical leave policy,
 - graduate student handbook,
 - department-wide lab safety manual,
 - policy governing department support of graduate students of newly hired as well as recently departed faculty members,
 - graduate teaching assistant workload policy, and a new
 - post-tenure review policy as required by state law.
- Led the implementation of a new donor-supported Faculty Excellence Program to help reward and retain high-achieving junior faculty.
- Instrumental in securing alumni funding for three new endowed chaired professor positions.
- Successfully led the promotion and tenure process for five faculty in the department.
- Have been closely engaged in the hiring of senior as well as junior faculty in targeted strategic areas in the department.

Faculty mentoring activities

- Initiated departments' first formal mentoring activities and processes for new and junior faculty at previous and present institutions.

- Supported faculty trips to NSF and other funding agencies headquarters to meet with program directors and project managers.
- Personally review and edit proposal drafts for junior faculty when requested
- Partnered with senior faculty on proposals for graduate student support and laboratory equipment acquisitions.
- Valued and rewarded teaching excellence; nominate outstanding faculty for teaching awards.
- Nominated and supported faculty for prestigious national and international awards, programs and honoraria, including Fulbright Fellowship (three awarded so far), CAREER, Jefferson Science Fellowship, and Erskine Fellowship.
 - First to showcase faculty achievements through prominent plaque displays.

Communication and interpersonal skills

- Skilled in making presentations to a variety of audiences, including advisory boards, senior university administrators, industry partners, department alumni, congressional delegations, potential donors, and at open houses.
- Frequently asked to represent the university at variety of formal and informal community and industry-oriented events.
- Directed and led building/facilities tours for congressional delegations and admissions office personnel and their guests.
- Have mediated conflicts that have arisen between faculty or between faculty and staff.
- Have counseled faculty on career paths and growth opportunities.

Commitment to diversity

- Worked to ensure a campus environment that is supportive of all under-represented groups.
- Member of the Missouri S&T Coordinated Community Response Team, OVW Campus Program Grant.
- Co-Chair of the Missouri S&T Title IX Curricular Development/Implementation Committee.
- Facilitated development of several efforts to help the campus achieve greater diversity.
- Served on Chancellor's Advisory Council on African American Recruitment & Retention.
- Developed a course on professionalism and ethics that I am now sharing with other departments on campus and with other University of Missouri System institutions.
- Participated in workshops and training programs aimed at enhancing skills at facilitating diversity among faculty, staff, and students.
- Worked closely with search committees to increase diversity of faculty, staff, and students.
- Completed the Safe Space/Ally training program offered at Missouri S&T.
- Hired four female tenure-track faculty (two at Missouri S&T and two at UAHuntsville).
 - Mentored two of them through promotion & tenure processes; the third is well on the way to same; the fourth opted to pursue career with U.S. Army Corps of Engineers.
- Hired three Hispanic faculty (one tenure-track, one with tenure, one lecturer).
 - Mentored a fourth Hispanic faculty through the tenure and promotion process.
 - Promoted two Hispanic faculty to leadership positions in department administration.
- Helped fund Society of Women Engineers' activities and trips.
- Sponsored new campus-wide Hispanic Film Program.
- Invited participant for Black Man's Think Tank workshop on academics and learning.

- Have hired female lecturers and adjunct faculty (ten so far at Missouri S&T) to teach graduate and undergraduate courses.
- Sponsored table for students to attend Minority in Engineering Program 40th anniversary dinner celebration.

Fundraising and marketing initiatives and achievements

- Facilitated a 400% increase in annual giving donations by the department's alumni (from ~\$30K 1999 to over \$120K in 2014).
 - This has increased stability in department's budget and annual expenditures; department operations not as susceptible to yearly budget fluctuations.
- Worked closely with University Advancement to update and follow through on my department's Fundraising Plan to reflect changing needs and priorities.
- Regularly met and worked with alumni and industry constituents to explore and capitalize on new partnership opportunities.
- Showcased alumni support through permanent plaque displays
 - *Bridges to the Future* – individual plaque displays for contributions of \$500,000+
 - *Hall of Fame* – plaque displays for alumni and industry sponsored scholarships; also listed are names of student scholarship or fellowship recipients.
- Worked with industry to secure nearly \$10M to support a planned laboratory expansion.
- Worked with administration, faculty, staff, students, and construction personnel to oversee \$23M renovation of civil engineering building at current institution.
 - Approx. 20% of the building renovation budget was provided by grants and gifts from industry and other corporations.
- Hired a communications / marketing communications specialist for my department.
 - We are the only academic unit on campus with an embedded communications specialist.
 - Marketing materials, communications, and public relations activities are outstanding and are very well received by all constituent groups.
 - Great variety of full-color publications mailed nation-wide to alumni, other department chairs, and engineering deans; publications include
 - *The Bridge* – our department's semi-annual newsletter
 - *Common Ground* – a new publication showcasing accomplishments of student groups and alumni support
 - *Faculty Scholarly Productivity* – a new publication highlighting faculty research and scholarly accomplishments
 - *New Faces* – a new brochure introducing new department faculty to the academic community
 - *Vision 2020* – the department's Strategic Plan
 - *By The Numbers* – a new flyer succinctly highlighting new and/or exciting departmental characteristics)

This has helped the department improve its ability to better inform alumni, constituents, and colleagues of the exciting activities and accomplishments of its faculty, students, and alumni.

HONORS AND AWARDS

International

- Distinguished Scientist Award, Hypervelocity Impact Society, 2015.
- Fraunhofer Bessel Research Award, Humboldt Foundation, 2007.
- Best Oral Presentation, HVIS2005, Hypervelocity Impact Society, 2005.
- Charles Sharpe Beecher Prize, Institute of Mechanical Engineers, Aerospace Division, England, 1999 (Awarded in April 2000 for the paper entitled, "Onset of Petalling in a Thin Spacecraft Wall Perforated by an Orbital Debris Particle.")

National

- Group Achievement Award, NASA Engineering and Safety Center (NESC), 2014 (in recognition of outstanding accomplishment through the coordination of individual efforts that have contributed substantially to the success of NESC's mission).
- 3rd Place, New Engineering Educators Division Best Paper Competition, ASEE Annual Meeting, 2011.
- Honor Award, NASA Engineering and Safety Center (NESC), 2010 (for outstanding leadership, technical insight and support of micrometeoroid and orbital debris protection and damage prediction analysis for the NESC).
- Fellow, American Society of Mechanical Engineers, 2005.
- Fellow, American Society of Civil Engineers, 2003.
- Associate Fellow, American Institute of Aeronautics and Astronautics, 1998.
- Lawrence Sperry Award, AIAA, January, 1995 (Awarded for a notable contribution made by a young person to the advancement of aeronautics or astronautics.)

Regional / Local

- Young Engineer of the Year Award, AIAA, Alabama-Mississippi Section, 1990.
- Certificate of Recognition, NASA/ASEE, 1995, 1994, 1988, 1987
- Certificate of Recognition, Huntsville Association of Technical Societies, 1993.

University

- Manuel T. Pacheco Academic Leadership Award, University of Missouri System, 2007 (This award honors an academic administrator who exemplifies outstanding academic leadership at one of the four institutions within the University of Missouri System.)
- Honorary Knight of St. Patrick, Missouri S&T, 2006.
- Elevated to Chapter Honor Member, Chi Epsilon, University of Missouri-Rolla, 2000.
- Outstanding Research and Creativity Award, University of Alabama Huntsville, 1992.
- Outstanding Engineering Faculty Member Award, College of Engineering, University of Alabama in Huntsville, 1990.
- Certificate of Appreciation, American Society of Civil Engineers Student Club, University of Alabama in Huntsville, 1988.

Other

- Semi-Finalist, Intel/Westinghouse Science Talent Search Competition, 1977.
- Gordon Woulff Mathematics Team Award, Bronx High School of Science, 1977.
- National Honor Roll, Mathematics Association of America Competition, 1977.
- Honorable Mention, Otto P. Burgdorf Science Conference, NY Academy of Sciences, 1977.

- Certificat d'Honneur, Concours National de Francais, Association Americaine des Professeurs de Francais, 1976.
- Bronze Medal, Greater New York Mathematics Fair, 1976.

LEADERSHIP AND DEVELOPMENT TRAINING

- Understanding the University Budget Structure, University of Missouri, Leadership Development Program, Columbia, Missouri, September, 2016.
- Missouri S&T Supervisor Training, Missouri University of Science and Technology, Rolla, Missouri, October – December, 2014.
 - First Time Managers: Understanding a Manager's Role
 - Meeting Expectations and Challenges
 - Cross-Cultural Managing: Managing Workforce Generations, Conflict, and Diversity
 - Communicating with a Cross-Cultural Audience
- Protecting Your Intellectual Property and Proprietary Information: How to Avoid Conflict with Federal Laws, Missouri University of Science and Technology, Rolla, Missouri, January, 2013.
- Leadership and High Performance, University of Missouri, Leadership Development Program, Columbia, Missouri, September, 2012.
- Safe Space/Ally Training, Missouri University of Science and Technology, Rolla, Missouri, March, 2012.
- Reframing Academic Leadership, University of Missouri, Leadership Development Program, Columbia, Missouri, September, 2011.
- Women in the Academy: Leveling the Playing Field, University of Missouri – St. Louis, Gender Studies Program, St. Louis, Missouri, May, 2011.
- Inspiring Trust, University of Missouri Leadership Development Program, Rolla, Missouri, March, 2011.
- Improving the Recruitment of Women in Science and Engineering Seminar and Workshop, UMR Women's Leadership Institute, Rolla, Missouri, September, 2004.
- University of Missouri Leadership Development Program, UM System, October 2000.

PROFESSIONAL POSITIONS

- MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY* *ROLLA, MISSOURI*
- Professor, Civil, Architectural, and Environmental Engineering Department, August, 1999 to present.
 - Assistant Chair for Distance Education and Remote Programs, Civil, Architectural, and Environmental Engineering Department, January 2016, to present.
 - Chair, Civil, Architectural, and Environmental Engineering Department, August, 1999 to September, 2015.
 - Interim Chair, Interdisciplinary Engineering Department, January 2009 to August 2009.
 - Interim Dean, School of Engineering, September, 2006 to May, 2007.
- CALIFORNIA INSTITUTE OF TECHNOLOGY* *PASADENA, CALIFORNIA*
- Summer Faculty Fellow, NASA/Jet Propulsion Laboratory, May, 2106 to August, 2016; and, June, 2014 to August, 2014.

UNIVERSITY COLLEGE OF THE CAYMAN ISLANDS

GRAND CAYMAN, B.W.I.

- Visiting Professor, Department of Engineering and Computer Science, January to May, 2014.

FRAUNHOFER ERNST MACH INSTITUTE

FREIBURG, GERMANY

- Visiting Professor, Humboldt Foundation Friedrich Wilhelm Bessel Research Award winner, June, 2007 to December, 2007.

CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA

- Summer Faculty Fellow, NASA/Jet Propulsion Laboratory, June, 2006 to August, 2006.

UNIVERSITY OF ALABAMA IN HUNTSVILLE

HUNTSVILLE, ALABAMA

- Professor, Civil and Environmental Engineering Department, Sept, 1994 to August, 1999.
- Chair, Civil and Environmental Engineering Department, September, 1995 to August, 1999.
- Associate Professor, Civil and Environmental Engineering Department, September, 1992 to August, 1994.
- Associate Professor, Civil Engineering Program, Mechanical and Aerospace Engineering Department, September, 1990 to August, 1992.
- Assistant Professor, Civil Engineering Program, Mechanical and Aerospace Engineering Department, September, 1986 to August, 1990.

GEORGE C. MARSHALL SPACE FLIGHT CENTER

HUNTSVILLE, ALABAMA

- NASA/ASEE Summer Faculty Fellow, June 1995 - August 1995; June 1994 - August 1994.

USAF WRIGHT LABORATORIES

EGLIN AFB, FLORIDA

- AFOSR Summer Faculty Fellow, June 1993 - August 1993; June 1992 - August 1992.

GEORGE C. MARSHALL SPACE FLIGHT CENTER

HUNTSVILLE, ALABAMA

- NASA/ASEE Summer Faculty Fellow, June 1988 - August 1988; June 1987 - August 1987.

REFEREED JOURNAL PUBLICATIONS

Schonberg, W.P., and Williamsen, J.E., “Calculating Hole Size and Crack Length in Multi-wall Systems Following an Orbital Debris Impact”, *International Journal of Impact Engineering*, Vol. 109, 2017, pp. 335-341.

Schonberg, W.P., “Concise History of Ballistic Limit Equations for Multi-Wall Spacecraft Shielding”, *Reviews in Human Space Exploration*, Vol. 1, No. 1, 2016, pp. 46-54.

Asareh, M., Schonberg, W.P., and Volz, J., “Fragility Analysis of a 5-MW NREL Wind Turbine Considering Aero-Elastic and Seismic Interaction Using Finite Element Method”, *Finite Elements in Analysis and Design*, Vol. 120, 2016, pp. 57–67.

Schonberg, W.P., and Jenkin, A.B., “A Comment on the Reimerdes Ballistic Limit Equation for Dual-Wall Structural Systems”, *Journal of Spacecraft and Rockets*, Vol. 53, 2016, No. 3, pp. 584-586.

Schonberg, W.P., and Hull, S., “MMOD Impact of Pressurized Tanks: A Comment on Current Design Criteria”, *ASCE Journal of Aerospace Engineering*, Vol. 29, 2016, No. 3, pp. 06016-004/1-4.

Asareh, M., Prowell, I., Schonberg, W.P., and Volz, J., “A Computational Platform for Considering the Effects of Aerodynamic and Seismic Load Combination for Utility Scale Horizontal Axis Wind Turbines”, *Earthquake Engineering and Engineering Vibration*, Vol. 15, 2016, pp. 91-102.

Schonberg, W.P., “Using Modified Ballistic Limit Equations in Spacecraft Risk Assessments”, *Acta Astronautica*, Vol. 126, 2016, pp. 199-204.

Asareh, M., Schonberg, W.P., and Volz, J., “Effects of Seismic and Aerodynamic Load Interaction on Structural Dynamic Response of Multi-megawatt Utility Scale Horizontal Axis Wind Turbines”, *Renewable Energy Journal*, Vol. 86, 2016, pp. 49-58.

Schonberg, W.P., and Ratliff, M., “Hypervelocity Impact of a Pressurized Vessel: Comparison of Ballistic Limit Equation Predictions with Test Data and Rupture Limit Equation Development”, *Acta Astronautica*, Vol. 115, 2015, pp. 400-406.

Schonberg, W.P., Evans, S., and Bjorkman, M.D., “Hypervelocity Impact Testing of Multi-Wall Targets Using Multiple Simultaneously Launched Projectiles”, *Journal of Spacecraft and Rockets*, Vol. 50, No. 2, 2013, pp. 358-364.

Williamsen, J.E., Schonberg, W.P., and Evans, H.J., “Generic Module Wall Damage Prediction Equations for Habitable Spacecraft Crew Survivability Evaluations”, *International Journal of Impact Engineering*, Vol. 56, 2013, pp. 71-81.

Williamsen, J.E., Schonberg, W.P., and Jenkin, A.B., “On the Effect of Considering More Realistic Particle Shape and Mass Parameters in MMOD Risk Assessments”, *Advances in Space Research*, Vol. 47, 2011, pp. 1006–1019.

Schonberg, W.P., “Protecting Earth-orbiting Spacecraft against Micro-Meteoroid/Orbital Debris Impact Damage Using Composite Structural Systems and Materials: An Overview”, *Advances in Space Research*, Vol. 45, 2010, pp. 709-720.

Schonberg, W.P., Schaefer, F., and Putzar, R., “Hypervelocity Impact Response of Honeycomb Sandwich Panels”, *Acta Astronautica*, Vol. 66, 2010, pp. 455-466.

Schonberg, W.P., Schaefer, F., and Putzar, R., “Some Comments on the Protection of Lunar Habitats Against Damage from Meteoroid Impacts”, *ASCE Journal of Aerospace Engineering*, Vol. 33, No. 1, 2010, pp. 90-97.

Schonberg, W.P., Schaefer, F., and Putzar, R., "Predicting the Perforation Response of Honeycomb Sandwich Panels Using Ballistic Limit Equations," *Journal of Spacecraft and Rockets*, Vol. 46, No. 5, 2009, pp. 976-981.

Schonberg, W.P., and Compton, L.E., "Application of the NASA/JSC Whipple Shield Ballistic Limit Equations to Dual-Wall Targets under Hypervelocity Impact", *International Journal of Impact Engineering*, Vol. 35, 2008, pp. 1792-1798.

Williamsen, J.E., Schonberg, W.P., Evans, H., and Evans, S., "A Comparison of NASA, DoD, and Hydrocode Spherical and Non-spherical Ballistic Limit Predictions for Dual-Wall Targets and Their Effect on Spacecraft Risk", *International Journal of Impact Engineering*, Vol. 35, 2008, pp. 1870-1877.

Schonberg, W.P., and Williamsen, J.E., "RCS-Based Ballistic Limit Curves for Non-Spherical Projectiles Impacting Dual-Wall Spacecraft Systems", *International Journal of Impact Engineering*, Vol. 33, 2006, pp. 763-770.

Singh, M., and Schonberg, W.P., "Bonded Composite Patch Design for Aircraft Structures Exhibiting Cracking and Corrosion", *Journal of Aircraft*, Vol. 42, No. 1, 2005, pp. 269-274.

Myers, B.A., Schonberg, W.P., and Williamsen, J.E., "Temperature Effects on Bumper Hole Diameter for Impact Velocities from 2 to 7 km/s", *International Journal of Impact Engineering*, Vol. 29, 2003, pp. 487-496.

Hu, K., and Schonberg, W.P., "Ballistic Limit Curves for Non-Spherical Projectiles Impacting Dual-Wall Systems", *International Journal of Impact Engineering*, Vol. 29, 2003, pp. 345-356.

Depczuk, D. and Schonberg, W.P., "Characterizing the Debris Clouds Created in an Oblique Orbital Debris Particle Impact", *Journal of Aerospace Engineering*, Vol. 16, No. 4, pp. 177-190, 2003.

Kruse, G.R., and Schonberg, W.P., "A Non-Isotropic Model of Microdebris From Impacts With Complex Targets", *AIAA Journal*, Vol. 40, No. 11, pp.2345-2353, 2002.

Sayyah, T. and Schonberg, W.P., "A New Failure Criterion for Space Shuttle Main Engine Turbine Blades", *Journal of Spacecraft and Rockets*, Vol. 39, No. 1, 2002, pp.140-145.

Zhou, M., and Schonberg, W.P., "Smooth Static and Dynamic Indentation of a Cantilever Beam", *International Journal of Solids and Structures*, Vol. 39, 2002, pp. 297-310.

Schonberg, W.P., "Protecting Spacecraft against Meteoroid/Orbital Debris Impact Damage: An Overview", *Space Debris*, Vol. 1, 2001, pp. 195-210.

Schonberg, W.P., "Characterizing Secondary Debris Impact Ejecta", *International Journal of*

Impact Engineering, Vol. 26, 2001, pp. 713-724.

Zhou, M., and Schonberg, W.P., "Smooth Asymmetric Two-Dimensional Indentation of a Finite Elastic Beam", *Journal of Applied Mechanics*, Vol. 68, No. 1, 2001, pp. 357-360.

Schonberg, W.P., "Protecting Spacecraft Against Orbital Debris Impact Damage Using Composite Materials", *Composites Part A-Applied Science & Manufacturing*, Vol. 31, No. 8, 2000, pp. 869-878.

Schonberg, W.P., "Energy Partitioning in High Speed Impact of Analog Solid Rocket Motors", *The Aeronautical Journal*, Vol. 103, No. 1029, 1999, pp. 519-527.

Williamsen, J.E., Evans, H.A., and Schonberg, W.P., "Effect of Multi-Wall System Composition on Survivability for Spacecraft Impacted by Orbital Debris", *Space Debris*, Vol. 1, No. 1, 1999, pp. 37-43.

Schonberg, W.P., and Williamsen, J.W., "Modeling Damage in Spacecraft Impacted by Orbital Debris Particles", *Journal of Astronautical Sciences*, Vol. 47, No. 1&2, 1999, pp. 103-115.

Schonberg, W.P., "Hole Size and Crack Length Models for Spacecraft Walls under Oblique Hypervelocity Projectile Impact", *Aerospace Science and Technology*, Vol. 3, 1999, pp. 461-471.

Schonberg, W.P. and Mohamed, E., "Analytical Hole Size and Crack Length Models for Multi-Wall Systems under Hypervelocity Projectile Impact", *International Journal of Impact Engineering*, Vol. 23, 1999, pp. 835-846.

Schonberg, W.P. and Ebrahim, A., "Modelling Oblique Hypervelocity Impact Phenomena Using Elementary Shock Physics", *International Journal of Impact Engineering*, Vol. 23, 1999, pp. 823-834.

Schonberg, W.P., "Onset of Petaling in a Thin Spacecraft Wall Perforated by an Orbital Debris Particle", *Proceedings of the Institution of Mechanical Engineers, Part G (Journal of Aerospace Engineering)*, Vol. 212, 1998, pp. 407-414 [**awarded Charles Sharpe Beecher Prize from IMechE / Aerospace Division, UK**].

Triplett, M.H., and Schonberg, W.P., "Static and Dynamic Finite Element Analysis of Honeycomb Sandwich Structures", *Structural Engineering and Mechanics*, Vol. 6, No. 1, 1998, pp. 95-114.

Jolly, W.H., and Schonberg, W.P., "Analytical Prediction of Hole Size Due to Hypervelocity Impact of Spherical Projectiles", *Shock and Vibration*, Vol. 4., Nos. 5-6, 1997, pp. 379-390.

Schonberg, W.P., and Williamsen, J.E., "Empirical Hole Size and Crack Length Models for Dual-Wall Systems under Hypervelocity Projectile Impact", *International Journal of Impact Engineering*, Vol. 20, 1997, pp. 711-722.

Schonberg, W.P., and Williamsen, J.E., "Cracking Characteristics of Dual-Wall Structures Following Simulated Orbital Debris Particle Impact", *Journal of Spacecraft and Rockets*, Vol. 34, No. 3, 1997, pp. 318-324.

Schonberg, W.P., "Using Composite Materials to Protect Spacecraft Against Orbital Debris Impact Damage", *Key Engineering Materials*, Vols. 141-143, Part 2, 1997, pp. 573-584.

Schonberg, W.P., Serrano, J., and Williamsen, J.E., "An Internal Effects Model for a Habitable Spacecraft Module Perforated by an Orbital Debris Particle", *Journal of Spacecraft and Rockets*, Vol. 34, No. 3, 1997, pp. 325-333.

Vaughan, R.E., and Schonberg, W.P., "An Inelastic Analysis of a Welded Aluminum Joint", *Metallurgical and Materials Transactions*, Vol. 26B, 1995, pp. 1253-1261.

Schonberg, W.P., "A Comparison of Fragmentation Models", *International Journal of Impact Engineering*, Vol. 17, 1995, pp. 739-750.

Schonberg, W.P., "Debris Cloud Material Characterization for Hypervelocity Impacts of Single- and Multi-Material Projectiles on Thin Target Plates", *Shock and Vibration*, Vol. 2, No. 4, 1995, pp. 273-287.

Zhou, M., and Schonberg, W.P., "Rotation Effects in the GLOBAL/LOCAL Analysis of Cantilever Beam Contact Problems", *Acta Meccanica*, Vol. 108, 1995, pp. 49-62.

Schonberg, W.P., "Effect of Multi-Layer Insulation Thickness and Location on the Hypervelocity Impact Response of Dual-Wall Structures", *Acta Astronautica*, V. 32, No. 9, 1994, pp. 577-589.

Schonberg, W.P., and Cooper, D., "Repeatability and Uncertainty Analysis of NASA/MSFC Light Gas Gun Test Data", *AIAA Journal*, Vol. 32, No. 5, 1994, pp. 1058-1065.

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TECHNICAL COMMITTEE REPORTS

NASA Engineering Safety Center (NESC), Joint Polar Satellite System (JPSS) Micrometeoroid and Orbital Debris (MMOD) Assessment, NASA Engineering and Safety Center, Langley, VA, Report No. NESC-RP-14-00948, April, 2015.

National Research Council, Continuing Kepler’s Quest: Assessing Air Force Space Command’s Astrodynamics Standards, National Academy Press, Washington, D.C., 2012.

National Research Council, Limiting Future Collision Risk to Spacecraft: An Assessment of NASA’s Meteoroid and Orbital Debris Programs, National Academy Press, Washington, D.C., 2011.

NASA Engineering Safety Center (NESC), Independent Review of United States and Russian Probabilistic Risk Assessments (PRAs) for the International Space Station (ISS) Mini Research Module #2 (MRM-2) Micrometeoroid and Orbital Debris (MMOD) Risk, NASA Engineering and Safety Center, Langley, VA, Report No. NESC-RP-09-00592, February, 2011.

NASA Engineering Safety Center (NESC), Lightweight Installable Micrometeoroid and Orbital Debris (MMOD) Shield Concepts for International Space Station (ISS) Modules, NASA

Engineering and Safety Center, Langley, VA, Report No. NESC-RP-09-00593, January, 2011 (also NASA TM-2011-217044, March, 2011).

NASA Engineering Safety Center (NESC), Independent Review of Constellation (Cx) Orion Vehicle Micrometeoroids and Orbital Debris (MMOD) Risk Analysis, NASA Engineering and Safety Center, Langley, VA, Report No. NESC-RP-08-00468, January, 2009.

NASA Engineering Safety Center (NESC), Independent Technical Inspection of the Bumper-II Micrometeoroid and Orbital Debris Risk Assessment, NASA Engineering and Safety Center, Langley, VA, Report No. RP-05-66, April, 2005.

National Research Council, Protecting the Space Shuttle from Meteoroids and Orbital Debris, National Academy Press, Washington, DC, 1997.

TECHNICAL REPORTS

Schonberg, W.P., The 2015 Hypervelocity Impact Conference, Final Report, Contract No. W911-NF-15-1-0200, U.S. Army Research Office, Aberdeen Proving Ground, Maryland, October, 2015.

Schonberg, W.P., A Compendium of Worldwide Research in the Area of Hypervelocity Impact Physics, Final Report, Defense Systems Information Analysis Center, Task Order 0026, Contract No. FA8075-14-D-0001, U.S. Army Research Laboratory, Aberdeen Proving Ground, Maryland, September, 2015.

Schonberg, W.P., MMOD Impact of Pressurized Tanks: Initial Data Analyses and First-Principles-Based Calculations, Report No. JPL-D-93584, Jet Propulsion Laboratory, Pasadena, California, August, 2014.

Schonberg, W.P., The 2007 Hypervelocity Impact Symposium, Final Report, U.S. Army Research Office, June, 2008.

Schonberg, W.P., Hypervelocity Impact Response of Honeycomb Sandwich Panels, Report No. A-04/08, Fraunhofer Ernst-Mach-Institute, Freiburg, Germany, January 2008.

Schonberg, W.P., Sustainable Lunar Habitat Protection Against Damage by Meteoroid Impacts, Report No. A-03/08, Fraunhofer Ernst-Mach-Institute, Freiburg, Germany, January 2008.

Myers, J.J., Hrynyk, T., Ayoub, A., Belarbi, A. and Schonberg, W.P., Incorporation of Hands-on Experiments in an Introductory Structural Analysis Course, Report No. UTC-ETT-160, Contract No. DTRS98-G-0021, Center for Infrastructure Engineering Studies, University of Missouri-Rolla, Rolla, MO, January, 2007.

Schonberg, W.P., Application of the NASA/JSC Whipple Shield Ballistic Limit Equations to Dual-Wall Targets under Hypervelocity Impact, Report No. JPL-D-36531, Jet Propulsion

Laboratory, Pasadena, California, August, 2006.

Schonberg, W.P., The 2005 Hypervelocity Impact Symposium, Final Report, Army Research Office, May, 2006.

Schonberg, W.P., Baird, J., Worsley, P., Belarbi, A., LaBoube, R., and Lusk, B., Rubble Pile Characterization Model, Final Report, 21st Century Systems, Inc., December, 2005.

Rao, V.S, Schonberg, W.P., Chandrashekhara, K., and Pottinger, H., Structural Monitoring of Aircraft, Final Report, Contract 00-S442-026-C1, Universal Technology Corp, May, 2002.

Schonberg, W.P., Characterizing Secondary Debris Impact Ejecta, NASA CR-209516, Marshall Space Flight Center, Alabama, August, 1999.

Schonberg, W.P. and Mohamed, E., Analytical Modeling of Pressure Wall Hole Size and Maximum Tip-to-Tip Crack Length for Perforating Normal and Oblique Orbital Debris Impacts, NASA CR-20571, Marshall Space Flight Center, Alabama, October 1997.

Serrano, J., Liguornik, D., and Schonberg, W.P., Vulnerability of Space Station Freedom Modules: A Study of the Effects of Module Perforation on Crew and Equipment, NASA CR-4716, Marshall Space Flight Center, Alabama, February, 1996.

Schonberg, W.P., Pressure Wall Hole Size and Maximum Tip-to-Tip Crack Length Following Orbital Debris Penetration, Final Report, 1995 NASA/ASEE Summer Faculty Fellowship Program, Marshall Space Flight Center, Alabama, September, 1995.

Schonberg, W.P., Cracking Characteristics of a Habitable Module Pressure Wall Following Orbital Debris Penetration, Final Report, 1994 NASA/ASEE Summer Faculty Fellowship Program, Marshall Space Flight Center, Alabama, September, 1994.

Schonberg, W.P., Debris Cloud Material Characterization for Hypervelocity Impacts of Single- and Multi-Material Projectiles on Thin Target Plates, WL-TR-94-7039, Eglin Air Force Base, Florida, May, 1994.

Schonberg, W.P., A Study of Hypervelocity Impact Fragmentation Algorithms, Final Report, Contract AFOSR-SREP-28, April, 1994.

Schonberg, W.P., Energy Partitioning in High Speed Impact of Analog Solid Rocket Motors, Final Report, Contract DASG60-89-C-0129-TE-12, April, 1994.

Schonberg, W.P., Toward a Characterization of the Debris Clouds Created in a Hypervelocity Impact, WL-TR-93-7028, Eglin Air Force Base, Florida, August, 1993.

Schonberg, W.P., and Cooper, D., Repeatability and Uncertainty of NASA/MSFC Light Gas Gun

Test Data, NASA CR-192496, Marshall Space Flight Center, March 1993.

Schonberg, W.P., Predicting Multi-Wall Structural Response to Hypervelocity Impact Using the HULL Code, NASA CR-4486, Marshall Space Flight Center, January, 1993.

Schonberg, W.P., and Yang, F., Response of Space and Aerospace Structures To Hypervelocity Debris Particle Impact, Final Report, Engineering Foundation Research Initiation Grant RI-A-89-6, February, 1992.

Schonberg, W.P., Bean, A.J., and Darzi, K., Hypervelocity Impact Physics, NASA CR-4343, Marshall Space Flight Center, January, 1991.

Schonberg, W.P., and Petersen, M.E., Predicting the Low Velocity Impact Response of Composite Beams, Final Report, University of Alabama in Huntsville Research Inst., July, 1990.

Schonberg, W.P., Bean, A.J., and Darzi, K., Hypervelocity Impact Physics, Final Report, Contract NAS8-36955/D.O.16, July, 1990.

Schonberg, W.P., Beasley, P.A., Guinn, G.R., and Bean, A.J., Static Stress Studies of Formed Metal Bellows, Final Report, Contract NCC8-4, Marshall Space Flight Center, July, 1989.

Schonberg, W.P. and Taylor, R.A., Oblique Hypervelocity Impact Response of Dual-Sheet Structures, NASA TM-100358, Marshall Space Flight Center, February, 1989.

Schonberg, W.P., An Elementary Failure Analysis for Finite Beams Under Low Velocity Impact Loading, Final Report, University of Alabama in Huntsville Research Institute, December, 1988.

Schonberg, W.P., Dynamic Impact of Beams: A Correlation of Experimental Results and Analytical Theories, Final Report, U. of Alabama Huntsville Research Inst, February 1988.

Schonberg, W.P., Taylor, R.A., and Horn, J., An Analysis of Penetration and Ricochet Phenomena in Oblique Hypervelocity Impact, NASA TM-100319, Marshall Space Flight Center, February, 1988.

CONTRACTS AND GRANTS SUMMARY

Missouri University of Science & Technology, Online Course Development Grant; Principal Investigator; September 2016 to September 2017; \$5,000.

Missouri Department of Transportation, “Characterization and Performance of Zero-Cement Concrete for Longer Service Life of Bridges”; Co-Principal Investigator; October 2016 to April 2018; \$100,000; W.P. Schonberg: \$5,000.

U.S. Army Research Laboratory, “Compendium of Hypervelocity Impact Phenomena Research”; Principal Investigator; April 2015 to September 2015; \$24,801.

U.S. Army Research Office, “HVIS2015: The 2015 Hypervelocity Impact Symposium”; Principal Investigator; May 2015 to December 2015; \$7,500.

Missouri Department of Transportation, “Nondestructive Evaluation of MoDOT Bridge Decks - Pilot Study”; Co-Principal Investigator; August 2013 to March 2014; \$53,089 (W.P. Schonberg: \$2,124).

Missouri Department of Transportation, “Recycled Concrete Aggregate (RCA) for Infrastructure Elements”; Co-Principal Investigator; October 2012 to May 2014; \$129,999 (W.P. Schonberg: \$6,500).

U.S. Department of Transportation/NUTC, “Adding Faculty in Transportation Areas”; Co-Principal Investigator; July 2012 to December 2013; \$433,920 (W.P. Schonberg: \$216,960).

U.S. Department of Transportation/NUTC, “Advanced Moisture Modeling of Polymer Composites”; Co-Principal Investigator; February 2012 to August 2013; \$50,000 (W.P. Schonberg: \$12,500).

Missouri Department of Transportation, “Polyurethane Foam Infill for Fiber-Reinforced Polymer (FRP) Bridge Deck Panels”; Co-Principal Investigator; December 2011 to May 2014; \$119,999; W.P. Schonberg: \$4,800).

Gulf University for Science and Technology, Kuwait, “Collaboration in Development of Programs in the New GUST College of Engineering”; Co-Principal Investigator; August 2008 to July 2013; \$1,956,700; (W.P. Schonberg: \$97,835; other S&T Co-PIs: \$1,858,865).

U.S. Army Research Office, “HVIS2007: The 2007 Hypervelocity Impact Symposium”; Principal Investigator; November 2006 to December 2007; \$9,950.

U.S. Department of Transportation/UTC, “Adding Faculty in Transportation Areas”; Principal Investigator; June 2006 to July 2008; \$468,878 (DOT: \$300,000; UMR Cost-Share: \$168,878).

National Science Foundation, “International Research Experience for Students (IRES) in Emerging Construction Technologies”; Co-Principal Investigator; April 2006 to March 2009; \$126,672 (W.P. Schonberg: \$27,868; other UMR Co-Principal Investigators: \$98,804).

21st Century Systems, Inc., “AmmoSIM Rubble Characterization Model”; Principal Investigator; May 2005 to December 2005; \$55,046 (W.P. Schonberg: \$22,018; other UMR Co-Principal Investigators: \$33,028).

U.S. Army Research Office, “HVIS2005: The 2005 Hypervelocity Impact Symposium”; Principal Investigator; July 2005 to December 2005; \$9,750.

Department of Transportation/UTC, “Enhancing Student Awareness and Faculty Capabilities in Transportation Engineering”; Principal Investigator; July 2004 to June 2006; \$150,121 (W.P. Schonberg: \$15,012; other UMR Co-Principal Investigators: \$135,110).

State of Missouri Research Board, “Acquisition of an Integrated Testing System for Civil Infrastructure Engineering Research and Education”; Co-Principal Investigator; August 2001 to July 2002; \$32,477 (W.P. Schonberg: \$3,248; other UMR Co-Principal Investigators: \$29,229).

National Science Foundation/Major Research Instrumentation Program, “Acquisition of an Integrated Testing System for Civil Infrastructure Engineering Research and Education”; Co-Principal Investigator; August 2001 to July 2002; \$483,321 (NSF: \$338,325; UMR Cost-Share: \$144,996; W.P. Schonberg: \$33,833/NSF + \$14,450/UMR).

Universal Technology Corporation/U.S. Air Force, "Structural Monitoring of Aircraft"; Co-Principal Investigator; August 2000 to December 2001; \$641,600 (W.P. Schonberg: \$64,160; other UMR Co-Principal Investigators: \$577,440).

Missouri Research Board, "Increasing the Safety of Manned Space Operations"; Principal Investigator; October 2000 to September, 2001; \$16,000.

U.S. Department of Transportation, “Operation of the UTCA Branch Office at the University of Alabama in Huntsville”, Principal Investigator, January 1999 to August 1999; \$81,842 (USDOT: \$41,636; UAH: \$40,206 Cost Share).

Sandia National Laboratory, "HVIS98-SNL", Principal Investigator, July–Dec. 1998; \$10,250.

Army Research Office, "HVIS98", Principal Investigator, July 1998 to December 1998; \$5,000.

Alabama Space Grant Consortium, “1998 Hypervelocity Impact Symposium”, Principal Investigator, July 1998 to December 1998; \$5,000.

NASA/Marshall Space Flight Center, “Characterization of Orbital Debris Impact Ejecta”, Principal Investigator; August 1997 to August 1998; \$24,590.

NASA/Marshall Space Flight Center, "High Speed Impact Analysis II"; Principal Investigator; May 1996 to July 1997; \$16,313.

NASA/Graduate Student Researchers Program, "Space System Design Considerations of the Orbital Debris Environment: Year III"; Faculty Advisor; Sept 1994 to August 1995; \$22,000.

NASA/Marshall Space Flight Center, "High Speed Impact Analysis"; Principal Investigator; September 1994 to May 1995; \$53,961.

U.S. Army/Missile Command, "Projectile Impact Investigations in Analog Test Specimens: Phase II"; Principal Investigator; May 1993 to December 1993; \$25,000.

NASA/Marshall Space Flight Center, "Vulnerability of Space Station Freedom Modules: A Study of the Effect of a Module Perforation on Crew and Equipment"; Co-Principal Investigator; September 1993 to August 1994; \$253,464 (W.P. Schonberg: \$39,759; G.R. Hough: \$213,705).

NASA/Graduate Student Researchers Program, "Space System Design Considerations of the Orbital Debris Environment: Year II"; Faculty Advisor; Sept 1993 to August 1994; \$22,000.

Air Force Office of Scientific Research, "Characterizing the Solid Fragment Population in a Debris Cloud Created by a Hypervelocity Impact"; Principal Investigator; January 1993 to December 1993; \$25,074 (AFOSR: \$19,991; UAH: \$5,083 Cost-Share).

NASA/Graduate Student Researchers Program, "Space System Design Considerations of the Orbital Debris Environment, Year I"; Faculty Advisor; Sept 1992 to August 1993; \$22,000.

NASA/Graduate Student Researchers Program, "Hypervelocity Impact of Habitable Spacecraft Modules: Year III"; Faculty Advisor; June 1992 to May 1993; \$22,000.

U.S. Army/Missile Command, "Projectile Impact Investigations in Analog Test Specimens: Phase I"; Co-Principal Investigator; August 1991 to September 1991; \$25,000 (W.P. Schonberg: \$11,586; T.A. Neely: \$13,414).

NASA/Graduate Student Researchers Program, "Hypervelocity Impact of Habitable Spacecraft Modules: Year II"; Faculty Advisor; June 1991 to May 1992; \$22,000.

NASA/Graduate Student Researchers Program, "Hypervelocity Impact of Habitable Spacecraft Modules: Year I"; Faculty Advisor; June 1990 to May 1991; \$22,000.

NASA/Marshall Space Flight Center, "Nodes and Airlocks - Meteoroid/Debris Protection"; Principal Investigator; March 1990 to December 1992; \$116,977.

Engineering Foundation/American Society of Mechanical Engineers, "Predicting the Response of Space and Aerospace Structures to Hypervelocity Debris Particle Impact"; Principal Investigator; September 1989 to May 1991; \$20,000.

NASA/Marshall Space Flight Center, "Hypervelocity Impact Data Analysis for the Design of Space Station Meteoroid and Space Debris Protection Systems"; Principal Investigator; January 1989 to March 1990; \$76,988.

UAH/Research Institute, "Predicting the Impact Response of Composite Beams"; Principal Investigator; January 1989 to December 1989; \$2,485.

UAH/Research Institute, "Failure Analysis for Beams through the Study of Internal Stress Fields"; Principal Investigator; January 1988 to December 1988; \$1,492.

NASA/Marshall Space Flight Center, "Stress and Fatigue Study of Formed Metal Bellows"; Co-Principal Investigator; October 1987 to March 1989; \$186,561 (W.P. Schonberg: \$64,669; G.R. Guinn: \$121,892).

UAH /Research Institute, "Dynamic Impact of Beams - A Correlation of Experimental and Analytical Theories"; Principal Investigator; March 1987 to February 1988; \$1,237.

RESEARCH AWARDS AND FELLOWSHIPS

NASA/ASEE Summer Faculty Fellowship Program, NASA/Jet Propulsion Laboratory, 2016 (\$17,550); 2014 (\$13,500); 2006 (\$12,000).

Friedrich Wilhelm Bessel Research Award, Humboldt Foundation, 2007 (€40,000).

NASA/ASEE Summer Faculty Fellowship Program, NASA/Marshall Space Flight Center, 1995 (\$11,000); 1994 (\$10,000).

Air Force Office of Scientific Research/Summer Faculty Research Program, Wright Laboratory, Eglin Air Force Base, 1993 (\$13,080); 1992 (\$12,760).

NASA/ASEE Summer Faculty Fellowship Program, NASA/Marshall Space Flight Center, 1988 (\$8,000); 1987 (\$8,000).

Walter P. Murphy Fellowship, Northwestern University, 1981; \$5000.

PANELS AND WORKSHOPS

"A Conversation on Learning", Black Man's Think Tank, Missouri S&T, Rolla, MO, May, 2015.

"Gender and Tertiary Education", University College of the Cayman Islands, March, 2012.

"Leadership in Education", University College of the Cayman Islands, March, 2011.

"Effect of Technology on Higher Education", Panel Member, Princeton University, June, 2006.

SEMINARS PRESENTED

"The Ethics of Engineering Design and Risk", Chi Epsilon Chapter Meeting, Missouri S&T, Rolla, Missouri, October, 2016.

"Studies of Hypervelocity Impact Phenomena as Applied to the Protection of Spacecraft Operating in the MMOD Environment", The Aerospace Corporation, El Segundo, California, July, 2016.

"Engineering Ethics and Professionalism", Chemical Engineering Department Seminar Series, Missouri S&T, Rolla, Missouri, February, 2017; February, 2016; January, 2015.

"Heavens, What a Mess!", Special Seminar, Physics Department, University of the West Indies,

St. Augustine, Trinidad & Tobago, November, 2015.

“Engineering Ethics and Sustainable Design”, Special Seminar, College of Engineering, University of Missouri, Columbia, Missouri, April, 2015.

“Heavens, What a Mess! How to Deal with the Problem of Space Debris”, St. Louis Academy of Science, St. Louis, Missouri, October, 2014 (<https://www.youtube.com/watch?v=Liv3uD7Nh1E>, starting at 3:09).

“The Ethics of Risk in Engineering Design”, Stonehenge Brigade, Army ROTC, Missouri S&T, Rolla, Missouri, October, 2014.

“The Ethics of Sustainable Design”, Chi Epsilon Chapter Meeting, Missouri S&T, Rolla, Missouri, September, 2014.

“The Ethics of Engineering Design and Risk”, NASA/Jet Propulsion Laboratory, Pasadena, California, August, 2014.

“Heavens, What a Mess!”, Special Seminar, Department of Aeronautics and Astronautics, Stanford University, Palo Alto, California, July, 2014.

“Space Junk”, Cayman Society of Architects, Surveyor, and Engineers, Georgetown, Grand Cayman, April, 2014.

“MMOD Risk Assessment: Some Recent Developments and Some Suggestions for the Future”, NASA/Jet Propulsion Laboratory, Pasadena, California, December, 2012.

“Heavens, What a Mess!”, Special Seminar, Physics Department, University of Illinois at Urbana-Champaign, November, 2012; Rockwood School District, Partners in Education Program, May, 2012; MAE Department Graduate Seminar Series, Missouri S&T, September, 2011; Chi Epsilon Chapter Meeting, Missouri S&T, August, 2013, February, 2010; Linda Hall Library, Kansas City, Missouri, October, 2009.

“Space Debris – An Overview of Key Issues and Satellite Insurance Considerations”, Swiss Re, Kansas City, Missouri, October, 2009.

“Orbital Debris – aka Space Junk”, Missouri Society of Professional Engineers, 72nd Annual Convention, Branson, Missouri, June, 2009.

“Sustainable Lunar Habitat Protection against Damage by Meteoroid Impacts”, Sigma Gamma Tau Chapter Meeting, Missouri S&T, February, 2008.

“Assessing and Reducing the Vulnerability of Future Earth-Orbiting and Lunar Missions”, Fraunhofer Ernst Mach Institute, Freiburg, Germany, December, 2007.

“Protecting Lunar Habitats against Meteoroid Impact Damage”, European Space Agency, Science, Technology, and Engineering Center, Noordwijk, The Netherlands, November, 2007.

“Filling the Pipeline: Providing Engineering Graduates to Meet National Needs”, TL07: The 2007 Transmission Line Symposium, Kansas City, Missouri, April, 2007.

“Modeling Explosive Interactions with Structures Using Coupled Eulerian and Lagrangian Grids”, 7th World Congress on Computational Mechanics, Los Angeles, California, July, 2006.

“Heavens, What a Mess!”, Adler Planetarium, Chicago, Illinois, April, 2006.

“The Mysteries of Stonehenge”, University of Missouri-Rolla, Freshman Seminar, Rolla, Missouri, February, 2006.

“Faculty Licensure: Pros and Cons”, American Society of Civil Engineers Annual Meeting, Baltimore, Maryland, October, 2004.

“Heavens, What a Mess!”, American Institute of Aeronautics and Astronautics, Missouri Section Meeting, March 2004; Society of American Military Engineers, Mid-Missouri Chapter Meeting, February, 2004.

“Space Debris and Space Junk”, Sigma Xi, Rolla Chapter Meeting, February 2003; Missouri Society of Professional Engineers, Lake Ozark Section Meeting, September, 2002; UMR Mechanical and Aerospace Engineering Department Seminar Series, January, 2001.

“Dealing with the Problem of Space Debris”, Chi Epsilon Luncheon Meeting, ASEE Annual Convention, St. Louis, Missouri, June, 2000.

“Heavens, What a Mess!”, UMR Civil Engineering Department Seminar Series, September 1999; UAH ElderHostel Session, May, 1997; UAH Lifelong Learning Academy, Huntsville, Alabama, October, 1996.

“Space Station Crew Risk Assessment”, University of Alabama System Board of Trustees Meeting, Huntsville, Alabama, April, 1996.

“Cracking Characteristics of a Habitable Module Pressure Wall Following Orbital Debris Penetration”, NASA/Marshall Space Flight Center, Alabama, August, 1994.

“An Analysis of the Dynamic Response of the Space Station Freedom Due to a Module Perforation by an Orbital Debris Particle Impact”, Future Leaders in Science and Engineering Symposium, NASA/Marshall Space Flight Center, May, 1993.

“Use of Ballistic Ranges to Test Alternative Designs and Materials for Perforation Resistant Space Structures”, Co-author with Eve J. Walker, Symposium on Applications of Ballistic Ranges for Military and Aerospace Research, Huntsville, Alabama, October, 1990.

“The Status and Use of the UAH Aerophysics/Propulsion Facility”, Co- Speaker with Gerald R. Guinn and Roy A. Taylor, Mechanical Engineering Seminar Series, University of Alabama in Huntsville, March, 1990.

“Predicting Penetration and Ricochet Damage Due to an Oblique Hypervelocity Impact”, Second Post-SMiRT Impact Seminar, Anaheim, California, August, 1989.

“Hypervelocity Impact Testing of Dual-Wall Structures”, Fifth Annual Technical and Business Exhibition and Symposium, Huntsville, Alabama, May, 1989.

“Hypervelocity Impact Testing for Space Station Applications”, Department of Mechanical Engineering Seminar Series, University of Alabama in Huntsville, November, 1988.

“Further Investigation of Oblique Hypervelocity Impact Phenomena”, NASA/Marshall Space Flight Center, August, 1988.

“Hypervelocity Impact Studies for the Space Station”, American Society of Civil Engineers, Alabama Section, Annual Conference, Huntsville, Alabama, April, 1988.

PROFESSIONAL AFFILIATIONS

American Institute of Aeronautics and Astronautics (*Associate Fellow*)

American Society of Civil Engineers (*Fellow*)

American Society of Mechanical Engineers (*Fellow*)

American Society of Engineering Education (Member)

Chi Epsilon (*Honor Member*, Missouri S&T)

Hypervelocity Impact Society (*Distinguished Scientist*)

DOCTORAL STUDENTS SUPERVISED

- Asareh, Mohammad-Amin, Dynamic Behavior of Operational Wind Turbines Considering Aerodynamic and Seismic Load Interaction, May, 2015.
- Minggang Zhou, Further Studies of Non-Hertzian Contact and Low Velocity Impact Phenomena, December, 1999.
- Mohamed Tarek Sayyah, A New Failure Criterion for the Space Shuttle Main Engine High Pressure Turbopump, August, 1999.
- Ahmed Ebrahim, Analytical Modeling of the Oblique Hypervelocity Impact of Thin Plates, June 1998.
- Patrick Tobbe, Substructure Modal Selection for Multi-Body Dynamic Simulations, June 1995.
- Thomas Howsman, Dynamics of Geometrically Non-Linear Multi-Body Systems, June 1993.

MASTERS THESIS STUDENTS SUPERVISED

- Madhukar Singh, Adhesively Bonded Patch Repair of Aircraft Fuselages with Simultaneous Cracking and Corrosion Damage, August, 2002.

- Paresh Kumar, Adhesively Bonded Patch Repair of Corroded Aircraft Fuselages under Fatigue Loads, August, 2002.
- Kuifeng Hu, Ballistic Limit Curves for Non-Spherical Projectiles Impacting Dual-Wall Structures, June, 2002.
- Dominik Depczuk, Modelling Oblique Hypervelocity Impact Phenomena, June, 2001.
- Gregory Kruse, Modelling Micro-Debris Created in a Hypervelocity Impact on a Complex Target, June, 1999.
- Hill, Ashley, A Structural Dynamic Analysis of the METEOR Rocket Post-Launch Failure, December, 1996.
- Toby Norris, A Finite Element Study of Linear and Non-Linear Effects for a Two-Dimensional Surface Contact Problem, June, 1995.
- Matthew Triplett, Static and Dynamic Finite Element Analysis of Honeycomb Sandwich Structures, June, 1995.
- Mohamed Tarek Sayyah, Effect of Setback Distance on Steel T-shaped Connection Response, December, 1994.
- Robert Vaughan, An Inelastic Analysis of a Welded Aluminum Joint, June, 1994.
- William Jolly, Analytical Prediction of Hole Size due to Hypervelocity Impact of Spherical Projectiles, December, 1993.
- Gregory Olsen, Crack Growth Initiation in a Habitable Spacecraft Module due to an On-Orbit Hypervelocity Impact, June, 1993.
- Eve Walker, Hypervelocity Impact of Habitable Spacecraft Modules, December, 1992.
- Minggang Zhou, Further Studies in the Analysis of Contact and Low Velocity Impact Phenomena, December, 1992.
- John Celestian, Dynamic Response of Space Station Freedom Caused by a Module Perforation from a Hypervelocity Impact, June, 1992.
- F-W Yang, Response of Space Structures to Orbital Debris Particle Impact, December, 1991.
- Jeff Peck, Asymmetric Indentation of a Finite Elastically Supported Beam, December, 1991.
- Edmond Limoge, Optimum Ringframe Size and Spacing to Inhibit Yielding in Short Cylindrical Sections, June, 1990.
- Philip Beasley, Stress Analysis of U-Shaped Formed Metal Bellows, December, 1990.

EXTERNAL GRADUATE STUDENT COMMITTEE SERVICE

- Brooke Myers, PhD Committee Member, University of Denver, 2008.
- Shannon Ryan, PhD Committee Member, Royal Melbourne Institute of Technology, 2007.
- Timothy Maclay, PhD Committee Member, University of Colorado-Boulder, 1996.

NON-THESIS MASTERS STUDENTS SUPERVISED

- William Hess, The Design of Reinforced Concrete Drilled Piers for Geological Conditions in North Alabama, June, 1996.

JOURNAL EDITORIAL BOARD MEMBERSHIPS

International Journal of Impact Engineering (Elsevier Publishers)

- Member, Editorial Advisory Board, 2011 – present.
- Guest Editor, Special Issues: Proceedings of the 2005 (*IJIE Vol. 35*), 2007 (*IJIE Vol. 35*), 2010 (*IJIE Vol. 38*), and 2012 (*IJIE Vol. 56*) Hypervelocity Impact Symposia.

TECHNICAL CONFERENCE ACTIVITIES

Conferences Organized

- *2015 Hypervelocity Impact Symposium*, Boulder, Colorado, 2015; Symposium Co-Chair.
- *2007 Hypervelocity Impact Symposium*, Williamsburg, Virginia, 2007; Technical Program Co-Chair.
- *2005 Hypervelocity Impact Symposium*, Squaw Valley, California, 2005; Technical Program Co-Chair and Symposium Treasurer.
- *1998 Hypervelocity Impact Symposium*, Huntsville, Alabama, 1998; Symposium Chair.

Technical / Conference Program Committee Membership

- *Towards a Corruption-Free Caribbean: Ethics, Values, Trust, and Morality*, 2014 (Grand Cayman, BWI).
- *Hypervelocity Impact Symposium*, 1998 (Huntsville, AL), 2000 (Houston, TX), 2003 (Noordwijk, The Netherlands), 2005 (Squaw Valley, CA), 2007 (Williamsburg, VA), 2010 (Freiburg, Germany), 2012 (Baltimore, MD).
- *Computational Ballistics 2005*, Spain, 2005.
- *Structures under Shock and Impact VIII*, Greece, 2004.
- *20th International Ballistics Symposium*, Orlando, FL, 2002.
- *12th International Conf on Shock Compression of Condensed Matter*, Atlanta, GA, 2001.
- *SPIE Symposium on the Characteristics and Consequences of Orbital Debris and Natural Space Impactors*, Denver, CO, 1996.
- *AIAA Space Pgms and Technologies Conf and Exhibit*, Huntsville, AL, 1994 to 1996.
- *Young Faculty Research Symposium*, UAH, Huntsville, Alabama, 1996.

Sessions Organized

- *Orbital Debris Impact Modeling and Impact Effects*, AIAA Space Programs and Technologies Conference and Exhibit, Huntsville, AL, 1996.
- *Lethality Code Validation for Civilian and Military Space Applications*, AIAA Space Programs and Technologies Conference and Exhibit, Huntsville, AL, 1994 and 1995.

PROFESSIONAL/TECHNICAL COMMITTEES

International

- Hypervelocity Impact Society Board of Directors; Member, 2003 to 2007, 2012 to present; President, 2000 to 2003, 2017 to present; Secretary/Treasurer, 1998 to 2000.
- Publications Committee, Hypervelocity Impact Society; Member, 2003 to 2005; Chair, 2005 to 2012.
- Educational Outreach Committee, Hypervelocity Impact Society; Member, 1994 to 1996.

National

- MMOD Pressure Vessel Failure Criteria Independent Review and Assessment, NASA Engineering and Safety Center, September 2015 to present.
- JPSS MMOD Assessment, NASA Engineering and Safety Center, May 2014 to May 2015.
- Committee for the Assessment of the U.S. Air Force's Astrodynamic Standards, NAE / National Research Council; Member, September 2011 to June 2012.
- Committee on the Assessment of NASA's Orbital Debris Programs, NAE/National Research Council; Member, November 2010 to June 2011.
- Lightweight Installable MMOD Shield Concepts for ISS Modules, NASA Engineering and Safety Center, January 2010 to February 2011.
- Independent Review of US and Russian PRAs for MRM-2 MMOD Risk Calculations, NASA Engineering and Safety Center, November 2009 to December 2009.
- Independent Review of Constellation (Cx) MMOD Risk Analysis Committee, NASA Engineering and Safety Center, August 2008 to April 2009.
- Standards Development Committee for Structures, Structural Components, and Structural Assemblies, AIAA/U.S. Air Force Space and Missile Systems Center, August 2004 to July 2005.
- Independent Meteoroid/Orbital Debris Risk Assessment Tool Validation and Verification Committee, NASA Engineering and Safety Center, August 2004 to June 2005.
- Committee on Space Shuttle Meteoroid/Orbital Debris Risk Management, NAE/National Research Council; Member, April 1997 to October, 1997.
- Weapons System Effectiveness Technical Committee, American Institute of Aeronautics and Astronautics; Charter member, 1995 to 1998.
- NASA/Boeing Space Station Freedom Meteoroid/Debris Working Group; 1988 to 1993.

Regional

- Associate Fellows Nominations Review Committee, AIAA / St. Louis Section, 2007 to present.
- Missouri Transportation Institute; Board of Directors, 2006 to 2007.
- Missouri Department of Transportation Peer Review Program; Committee Member, 2001.
- Missouri Transportation Research and Education Council; Executive Committee Member; 1999 to 2004.
- State of Alabama University Transportation Center; Board of Directors, 1998 to 1999.
- American Society of Civil Engineers, Huntsville Branch, Treasurer and Member of the Board of Directors, 1990 to 1992.

- Impact Mechanics Working Group, Aerophysics Research Center; Chair; 1990 to 1991.

MAJOR UNIVERSITY COMMITTEES

Missouri University of Science and Technology (formerly University of Missouri – Rolla) (1999-present)

- Coordinated Community Response Team, OVW Campus Program Grant; Member; 2016 to present.
- Campus Promotion and Tenure Committee; Department Representative; 2016 to present.
- College of Engineering, Discipline Specific Promotion and Tenure Committee; Member; 2016 to present.
- Faculty Senate Discipline Specific Curriculum Committee; Member; 2016 to present.
- Graduate Student Assignment and Workload Task Force; Member; CArE Engineering Department; 2016 to present.
- Title IX Curricular Development and Implementation Committee; Co-Vice Chair; 2014 to 2016.
- Study Abroad Committee; Member, 2009 to present.
- Career Opportunities Center Advisory Board; Member, 1999 to 2015.
- Committee of Department Chairs; Member, 1999-2015; Chair, 2001 to 2002.
- Campus Strategic Planning Committee; Member, 2012 to 2013.
- President's Awards for University Citizenship Advisory Committee; Member, 2012.
- Campus eLearning Committee; Member, 2009 to 2011.
- HLC Institutional Assessment Committee; Member, 2008 to 2011.
- *ad hoc* Committee on (Re)defining the Role of the Department Chair at Missouri S&T; Member, 2009 to 2010.
- Graduate Student Stipend Task Force; Chair, 2008 to 2009.
- Jones Chaired Professorship Search Committee; CArE Engineering Department; Chair, 2007 to 2010.
- *ad hoc* Committee on Biomedical Engineering; Member, 2006 to 2007.
- Administrative Reorganization of External Affairs Activities Committee; Member, 2006 to 2007.
- Vice Provost for Research Search Committee; Member, 2006.
- Resource Allocation Model Committee; Member, 2004 to 2005.
- Missouri Transportation Institute Executive Director Search Committee; Member, 2004.
- Missouri Transportation Institute Steering Committee; Member, 2003 to 2004.
- Blue Ribbon Task Force on Faculty Workload; Member, 2002 to 2003.

University of Alabama-Huntsville (1986-1999)

- Faculty Research Awards Committee (Chair)

- Faculty Integrity Committee
- Faculty Senate; Member (6 years), Secretary (4 years)
 - Admissions & Scholastic Affairs Committee
 - Curriculum Committee
- Library Appropriations Committee (Chair)
- School of Engineering Dean Search Committee
- Strategic Planning Committee
- Student Outcomes Assessment Task Force
- Student Recruitment and Retention Committee (Chair)
- Faculty Panel, New Student Orientation

PEER REVIEW ACTIVITIES

Journals: AIAA Journal, Composites Engineering, International Journal of Impact Engineering, International Journal of Solids and Structures, Journal of Aerospace Engineering, Journal of Aircraft, Journal of Applied Mechanics, Journal of Engineering Mechanics, Journal of Sound and Vibration, Journal of Spacecraft and Rockets, Proceedings of the IMechE, Part G (Aerospace Engineering), Space Debris.

Funding Agencies: European Research Council, Connecticut Innovations Incorporated, International Science Foundation (Canada), NDSEG Fellowship Program (ASEE).

Other: American Council of Engineering Companies of Missouri; Defense Intelligence Agency.

PROFESSIONAL REGISTRATION

- Professional Engineer, State of Missouri, Reg. No. 2000158254
- Professional Engineer, State of Alabama, Reg. No. 20720

PROFESSIONAL DEVELOPMENT

- Orbital Debris Workshop, Center for Orbital Debris Education and Research, University of Maryland, November, 2014.
- New AISC Construction Management Teaching Aids, AISC, Chicago, Illinois, April, 2006.
- ExCEED Two-Day Mini-Workshop, Missouri S&T, Rolla, Missouri, October, 2004 (host and sponsor).
- Teaching and Scholarship in the Grand Tradition of Modern Engineering II, Princeton University, August, 2004.
- ExCEED Teaching and Learning Seminar, ASCE, Nashville, Tennessee, November, 2003.
- ABET Evaluator Training Workshop, ASCE, Nashville, Tennessee, November, 2003.
- Teaching and Scholarship in the Grand Tradition of Modern Engineering I, Princeton University, May, 2003.
- Blackboard Workshop, UMR, Rolla, Missouri, August, 2002.
- Research Management Peer Exchange, Missouri DOT, Jefferson City, Missouri, April, 2002.
- New Developments in Teaching Structural Steel Design, AISC Workshop, AISC, New York

- City, October, 1999
- ABET EC2000 Faculty Workshop, ABET, Atlanta, Georgia, December, 1998
 - Scale Modeling in Engineering Dynamics, Southwest Research Institute, San Antonio, Texas, June, 1991.
 - ACI/PCA 318-89 Building Code Seminar: Recent Changes in the Concrete Building Code Requirements, ACI, Birmingham, Alabama, October, 1990
 - The Growing Challenge: A Short Course on Dealing With Orbital Debris, Southwest Research Institute, San Antonio, Texas, March, 1990.

TEACHING ACTIVITIES

Undergraduate Courses: Engineering Law and Ethics (*at UCCI*), Statics, Dynamics, Structural Analysis I and II, Soil Mechanics, Structural Steel Design, Civil Engineering Senior Design Project, Engineering Communications & Computations, Senior Seminar – Contemporary Issues and the Global Impact of Engineering Solutions.

Graduate Courses: Finite Element Methods, Theory of Vibrations, Applied Mechanics of Solids, Theory of Structural Stability, Hypervelocity Impact Phenomena, Advanced Penetration Mechanics, Composite Materials, Finite Element Methods, Theory of Plates and Shells, Fracture Mechanics, Elasticity, Plasticity, Engineering Analysis I.

Short Courses: Penetration Phenomena in Low and High Speed Impact, University of Alabama in Huntsville Continuing Education Division, February, 1989.

RECENT MEDIA CITATIONS

On-Air Interview, KCBS Newsradio 740 (San Francisco), April 26, 2017.

On-Air Interview, KNX-LA/CBS Newsradio 1070, *In-Depth News with Charles Feldman and Chris Seden*, July 28, 2016.

“Take The Long Way Home: Spacefarers' Journey Prolonged By Space Junk”, <http://www.npr.org/2015/09/04/437597059/take-the-long-way-home-spacefarers-journey-prolonged-by-space-junk>, *All Things Considered News Segment*, September 4, 2015.

“The Problem of Junk Hurling Through Space: A Missouri Man Is On It”, <http://kcur.org/post/problem-junk-hurling-through-space-missouri-man-it>, February 10, 2015.

“There are 300,000 Pieces of Garbage Orbiting earth, and it's a Big Problem”, <http://www.vox.com/2015/1/20/7558681/space-junk>, January 20, 2015.

“Space Debris Expert Warns About Dangers of Orbital Junk”, <http://www.astrowatch.net/2015/01/space-debris-expert-warns-about-dangers.html>, January 9, 2015. Also appeared at http://www.spacedaily.com/reports/Space_Debris_Expert_Warns_About_Dangers_of_Orbital_Junk_999.html (January 11, 2015), <http://phys.org/news/2015-01-space-debris-expert-dangers-orbital.html>

(January 12, 2015), and http://www.science20.com/astro_watch/blog/space_debris_expert_war_ns_about_dangers_of_orbital_junk-152195 (January 12, 2015).

“Waste in Space is a Puzzle With Millions of Pieces”, <http://kbia.org/post/waste-space-puzzle-millions-pieces>, October 16, 2014.

“Waste in Space is a Puzzle With Millions of Pieces”, <http://news.stlpublicradio.org/post/waste-space-puzzle-millions-pieces>, October 14, 2014.

“Insights from Mud Volcanoes and Pitch Lake of Trinidad: Understanding the Mystery of Life”, <http://www.trinidadexpress.com/featured-news/Insights-from-mud-volcanoes-and-Pitch-Lake-of-Trinidad-268378792.html>, July 23, 2014.

“Proliferating Space Debris May Seal Off Earth”, <http://www.compasscayman.com/caycompass/2013/10/22/Proliferating-space-debris-may-seal-off-Earth/>, October 22, 2013.

“Chinese Space Debris Hits Russian Satellite, Scientists Say”, <http://www.cnn.com/2013/03/09/tech/satellite-hit/>, March 9, 2013.

“NASA Buys Blow-up Habitat for Space Station Astronauts”, <http://www.newscientist.com/article/dn23083-nasa-buys-blowup-habitat-for-space-station-astronauts.html#.ViiFjU10x9A>, January 16, 2013.

“Space Debris Hit *Atlantis* During Mission”, <http://ibnlive.in.com/news/space-debris-hit-atlantis-during-mission/23310-11.html>, October 6, 2006.

“Debris Damaged Shuttle: NASA”, <http://www.smh.com.au/news/World/Debris-damaged-shuttle-NASA/2006/10/06/1159641491936.html>, October 6, 2006.

“Hole Found in Shuttle *Atlantis*”, <http://www.abc.net.au/news/2006-10-06/hole-found-in-shuttle-atlantis/1279614>, October 5, 2006.

“Space Debris Hit Shuttle During Last Mission”, <http://www.aulis.com/news139.htm>, October 5, 2006.

“Worries of Potentially Fatal Space Debris Not New”, http://articles.orlandosentinel.com/2003-02-11/news/0302110250_1_space-debris-shuttle-tiny-meteors, February 22, 2003.

“Before Columbia, NASA Mulled Space Repairs”, <http://www.cnn.com/2003/TECH/space/02/14/sprj.colu.debris.study.ap/index.html>. February 14, 2003.

“Shuttle Report Revealed 'Blowtorch' Risk of Space Debris”, http://www.newscientist.com/article/dn3378-shuttle-report-revealed-blowtorch-risk-of-space-debris.html#.VV_FkU9VhBc, February 13, 2003.

“NASA Considers Ways to Fight Space Junk”, http://abcnews.go.com/wire/US/ap20030213_386.html, February 13, 2003.

“Space-debris Worries Not New”, http://articles.orlandosentinel.com/2003-02-11/news/0302110045_1_space-debris-shuttle-hauck, February 11, 2003.

“Descent Subjects Shuttle to Shock Waves, Extreme Heat”, *St. Louis Post Dispatch*, February 2, 2003. Also appeared at <http://www.stltoday.com/stltoday/new/stories.nsf/news>, February 2, 2003.