Alfred M. Pettinger

PhD, PE

Principal, Vice President

Dr. Alfred Pettinger is a Principal and Vice President at Engineering Systems Inc. (ESi), where he currently leads the Mechanical Engineering, Applied Mechanics, and Materials Science Group. He also led the Aviation, Rail, and Biomedical Device group. He is a recognized authority in failure analysis, mechanical systems, pipeline integrity, and forensic engineering with over 25 years of experience. He frequently advises stakeholders in complex, high-value litigation and international arbitration, and has provided expert testimony in U.S. courts and arbitral forums. His work integrates field investigation, mechanical design review, and regulatory compliance to support the resolution of disputes involving infrastructure, energy, machinery, and transportation systems.

Dr. Pettinger's expertise spans the mechanical behavior of materials, as well as the design, reliability, durability, and maintainability of complex systems. He has conducted design reviews, failure investigations, risk and safety assessments, regulatory compliance audits, and damage tolerance evaluations for offshore and onshore pipelines, composite and metallic aircraft, mechanical and industrial equipment, power plant components, and transport systems (civilian and military). His experience includes pumps, actuators, gears, engines, bolts, fans, turbines, industrial equipment, and pressure containing systems. He has been retained by power plant operators, pipeline companies, petrochemical firms, producers, contractors, regulators, and product manufacturers.

He has performed specialized assessments of soil-pipe interactions, pipe vibration, and pipe integrity for pipelines and piping systems in buildings and industrial plants. He has also investigated incidents involving heavy machinery, personal injury, and the overland transport of industrial equipment. In aerospace, Dr. Pettinger has focused on structural engineering, damage tolerance, and failure analysis, having worked in the European aerospace sector on the design of glass and carbon fiber reinforced polymer (GFRP and CFRP) structures for wings, fuselages, and stabilizers.

Contact Information

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ESi Irvine

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Areas of Specialization

- Failure Analysis & Root Cause Investigations
- Mechanical Design & Evaluation
- Machinery Transport Damage Assessment
- Structural Integrity & Damage Tolerance
- Pipeline Integrity Management
- Energy & Power Generation
- LNG
- Oil & Gas
- Fitness-for-Service & Reliability Engineering
- Product Recalls & Safety Assessments
- Regulatory Compliance & Code Review
- Defense & Government Programs
- Aviation & Aerospace
- Expert Witness & Litigation Support

Education

PhD, Mechanical Engineering/ Applied Mechanics. Massachusetts Institute of Technology (MIT). 1998

MS, Mechanical Engineering. Worcester Polytechnic Institute (WPI). 1993

Dipl. Ing. Aerospace & Vehicle Engineering. Fachhochschule München (FHM), (Nowadays known as the University of Applied Sciences), Germany. 1991

Licenses & Certifications

- State of California P.E. License No. M32075
- State of Texas P.E. License No. 101701

Languages

- Fluent in German and Spanish
- Conversation level Italian

Positions Held

Engineering Systems Inc., Irvine, California

- Principal and Vice President, January 2022 – Present
- Principal and Senior Director, January 2021 – December 2021
- Principal, Senior Managing Consultant and Director of Mechanics, January 2011 – December 2020

Exponent, Irvine, CA

- Senior Managing Engineer, Managing Engineer in the Mechanics & Metallurgy Practice, February 2001 – December 2010

Exponent, Menlo Park, CA

- Senior Engineer and Engineer in the Mechanics & Metallurgy Practice, July 1998 – January 2001

Massachusetts Institute of Technology (MIT)

- Instructor of Mechanics & Materials I (Undergraduate Course 2.001) from 1997 to 1998
- Teaching Assistant of Mechanics & Materials I (Undergraduate Course 2.001) and Dynamics (Graduate Course 2.032) from 1996 to 1997

Worcester Polytechnic Institute (WPI)

- Teaching Assistant of Stress Analysis, Thermodynamics and Conceptual Design of Aircrafts (Part Time Instructor) from 1992 to 1993

Continuing Education

- **Airframe Stress Analysis and Sizing** – UCLA Extension, 2006
- **Practical Piping Vibration** – Becht Engineering Company, 2005
- **Structural Integrity of New and Aging Metallic Aircraft** – UCLA Extension, 2004
- **HALT, HASS and ESS – Fundamentals and Practice** – Equipment Reliability Institute, 2001

Professional Affiliations/Honors

American Society of Mechanical Engineers (ASME)

- Member
- Member of the Power Train and Gear Committee
- Former Vice-Chair of the Special Committee on Engineering Licensure

ASM International

- Past Member

ASTM International

- Past Member
- Past Member of the E58 Committee on Forensic Engineering Project Experience

Project Experience

Regulatory Compliance and Government Engagement in the Energy Sector

- Since 2022, Dr. Pettinger has assisted the Department of Justice (DOJ) and the Environmental Protection Agency (EPA) in coordination with the Pipeline and Hazardous Materials Safety Administration (PHMSA) in negotiations with a pipeline operator to develop a suitable method for assessing the severity of circumferential cracks. The pipeline system is a collection of fourteen pipelines concentrated in the upper Midwest that traverses six states and deliverers 40% of oil imports to the United States. The method included the evaluation and development of analysis tools, in-line Inspection (ILI) tools, risk management techniques and root cause investigations for assessing the integrity of pipelines regulated by PHMSA. Briefly stated the procedure considers stresses caused by pumping, by welding of the pipe, installation of the pipe, ground movement, and proximity to pipe bends. The method also considers conditions like stream crossings, road crossings, rail crossings, temperature, and the pipe condition (e.g., defect geometry). The operator agreed to add these new agreed-upon requirements to its operational manual making them enforceable by PHMSA.
- Dr. Pettinger conducted an integrity assessment for the DOJ and EPA of a submerged pipeline system initially suspected of experiencing vortex-induced vibration (VIV). His investigation included analysis of fluid–structure interaction, pipeline configuration, and operational data, ultimately identifying alternative root causes unrelated to VIV that were consistent with field observations.

- Dr. Pettinger was engaged by the Inter-American Development Bank (IADB) for a multi-phase investigation and remediation program following five spill incidents on the Camisea pipeline system in Peru within 19 months of operation. In the initial phase, he led failure analysis, design and construction audits, and risk assessments focused on seismicity, river scour, geotechnical instability, construction, weld integrity, and mechanical pipe performance.
- Subsequently he was retained as an independent engineer to oversee the implementation of a pipeline integrity management program. He contributed to the development of hazard identification tools, quantitative risk assessments, and field mitigation strategies. Over time the operator constructed more than 140 geotechnical risk mitigation measures along the right of way and installed several hundred sensors for input of the developed risk assessment tool.
- In a separate engagement, he supported the IADB in the development of infrastructure for natural gas supply to a liquefied natural gas (LNG) facility under construction, providing technical oversight and engineering advisory services.
- Evaluated the inspection and testing requirements of a large gas pipeline in Australia. The investigation included the review of prior evaluations by the operator, various consulting firms and Universities. Provided an independent assessment for the operator's In-line inspection (ILI) results and mitigation options.
- Performed several investigations in the Energy, Oil and Gas industry to address issues on the validity and scope of claims on grounds of technical requirements and regulatory compliance. These investigations were typically conducted after disputes arose from the Merger & Acquisition of larger assets like pipelines, terminals, tank farms, and power plants.
- Provided construction and maintenance cost estimates for pipeline systems and analyzed the FERC submitted cost estimates for pipeline construction.
- Performed a feasibility and due diligence study for a pipeline expansion project in Africa and an oil terminal in Costa Rica for stakeholders affiliated with the World Bank.

Pipeline Facilities

- Performed an evaluation of a gas pipeline explosion that ruptured due to a landslide in the United States of America. ESi was asked to evaluate the impact the design, the construction and the mitigation measures used for erosion and sedimentation control had upon the direct and indirect causes for the pipeline rupture. Dr. Pettinger testified in court and arbitration on this matter.
- Performed an evaluation of a recall decision to replace seamless nickel alloy pipe of a gas processing facility for the transport of hazardous sour gas downstream of the "Christmas tree" in the Middle East. The investigation entailed a detailed review and analysis of the pipe processing records, a metallurgical pipe analysis, and the development of additional testing and analysis to evaluate the pipe recall decision. During the investigation ESi visually and ultrasonically inspected the pipe, destructively tested removed pipe, established causation for the pipe material's failure to adhere to the technical specifications and substantiated the need to recall pipe material.

- Dr. Pettinger has assisted in the evaluation of offshore and on shore pipeline leaks and the development of mitigation measures needed to enhance the system's resilience and increase operational proficiency to mitigate further oil leaks into the Pacific Ocean.
- Evaluated the cathodic protection of multiple U.S.-based pipeline systems, focusing on electric interference from adjacent lines and the impact on third-party pipelines outside the interconnected impressed current system. Conducted technical assessments of stray current behavior and failure causation. Provided expert testimony on failure analysis and the standard of care for pipeline operators; opinions were incorporated by the U.S. Court of Appeals.
- Investigated the operation and maintenance procedures of a natural gas pipeline that was in close proximity to a coal mine in the USA. Hazard identification, regulatory compliance, and standard of care in the pipeline industry were evaluated. Specifically, possible risk mitigation techniques for pipelines subjected to geotechnical hazards in proximity to a coalmine were evaluated. The investigation also addressed issues related to the route selection for a pipeline expansion project and compliance with reporting requirements of the Federal Energy Regulatory Commission (FERC).
- Reviewed the design of high temperature sour gas flow lines to address issues of upheaval buckling and pipe integrity.
- Performed failure analysis investigations of two separate pipeline ruptures of a heavy crude oil pipeline in Ecuador. The first investigation included a metallurgical field investigation, site inspection, geotechnical evaluation, and review of the operational data to determine the root cause of this pipeline failure. In both cases landslide activity caused the pipeline to rupture. In one instance the pipeline was aligned parallel to the slope and the second instance the pipeline was downslope. In the second case Dr. Pettinger also evaluated the operator's emergency response and repair procedures for the London reinsurance market.
- Evaluated the operations and maintenance practices for a liquefied petroleum gas (LPG) pipeline in the USA. One of the issues was maintenance of cover depth and the design of a pond over a preexisting pipeline. Third party damage (TPD) risk and requirements of the "call before you dig" system was evaluated.
- Evaluated the effect of mine subsidence on several pipelines due to long wall coal mining. Reviewed the maintenance and integrity management procedures for pipelines.
- Evaluated regulatory requirements and engineering considerations for various pipeline crossings of other linear structures like roads, railroads, rivers, channels, and other utilities. Evaluated various design solutions for cased and uncased crossings.
- Evaluated issues relating to corrosion and alternating current corrosion and the use of impressed cathodic protection systems.
- Performed failure analyses of insulated steel piping systems, with a focus on polyurethane foam insulation exhibiting excessive creep deformation and disbondment from the steel substrate. Notably evaluated the design, construction, and operation of an insulated oil pipeline system in the Boral forests of Canada, which experienced a severe failure of its multilayered insulation. The investigation addressed pipe-soil interaction behavior, load transfer mechanisms through the insulation, cathodic protection integration, coating performance, construction practices, and operational conditions.

- Assisted a U.S. gas pipeline operator in characterizing the impacts of a large-scale natural gas explosion and fire in a populated area that resulted in several fatalities, injuries, and substantial loss of property. Reviewed issues related to the dynamic interaction of the pressurized gas, crack propagation in the pipe material, and ground deformation in the ensuing explosion.
- Assisted a U.S. gas pipeline operator on a natural gas explosion related to third party damage. This pipeline crossed an active shooting range.
- Assisted in the evaluation of a hazardous liquid pipeline that leaked gasoline into the ground. Evaluation centered on the weld integrity of pipe joints for ERW pipelines and the use of in-line inspection tools. The analysis included an evaluation of the pipeline operator's operation and maintenance procedures.
- Analyzed gas leak rates for various pipeline systems through small crack like features.
- Assisted in the investigation of pipe soil interactions occurring during hydrostatic testing of pipelines and the evaluation of pipeline ruptures and leaks at welded joints. Evaluated the welding of circumferential welds.
- Assisted in the analysis of a pipeline transporting hazardous liquids that ruptured due to ground movement. The investigation included a design and construction review of subject pipeline.
- Evaluated a spill incident at an oil terminal in Panama. The investigation included the inspection of the oil terminal, operation procedures, and maintenance records to determine the causal links that led to the spill incident. The investigation included a detailed inspection and technical evaluation of valves.
- Performed a root cause investigation into the failure of a pipe component during the "fracking" operation. It was determined that the plug valve had a preexisting crack that grew over time. The fracking fluid escaped under high pressure severely eroding the fracture surface. The back-flowing gas ignited and caused significant damage.
- Performed a statistical analysis and review of a proposed risk-based inspection program of deep seawater flow lines.
- Performed failure analyses and design evaluations of various gas distribution systems made of polyethylene and steel pipe. These investigations included the analysis of pipe soil interactions, failure analyses of various pipe components and a performance evaluation of buried compression couplings.
- Performed design and constructability studies of pipeline systems crossing landfills. These efforts included the design and design evaluation of large diameter above ground HDPE pipeline systems (soil settlement and thermally induced deflections).
- Evaluated various drainage and sewer piping systems for various parties where soil movement was identified to be a significant risk factor.
- Performed a root cause failure analysis investigation of a large diameter low-pressure air piping system. The investigation determined that the failure of the expansion joints during pressure testing was related to the design of the piping system. The design was subsequently changed.

- Assisted in the investigation of a large diameter mining tailing pipeline in Southeast Asia where the inner liner of vulcanized rubber separated from the steel spools. The investigation included the investigation of the rubber's adhesion strength and the prevalent loading conditions.

Power Generation, Energy Distribution Systems and Thermal Systems

- Dr. Pettinger was asked to evaluate the technical aspects related to Force Majeure claims and the means and efforts a party undertook to mitigate its inability to perform the agreed upon services of consuming landfill gas at a power plant. The equipment of interest were stainless steel tanks, piping, heat exchangers, and gas fired turbines.
- Assisted the general contractor of a nuclear power plant where a large pipe of the primary circuit was vibrating excessively, significantly reducing the allowable power production. The assignment included the technical support of the general contractor's engineering staff on fluid induced pipe vibration, and the selection of the most effective mitigation methods to reinstate full power production.
- Assisted another operator of a nuclear power plant in the identification of pump and pipe related vibration problems. Identified the root cause and recommended simple structural changes to the pump's support structure to shift the critical natural frequency away from the van bypass frequency of the impeller. The operator recently implemented these recommendations to successfully curb the pumps' unwanted vibration.
- Assisted a power plant operator in the evaluation of a vibration related problem of an induced draft fan. Evaluated the proposed design changes and assisted the general contractor in identifying the problem and developing an effective solution.
- Performed a failure analysis and designed a replacement for a cement lined pipeline system at a geothermal power plant. This project included a root cause analysis, a preliminary pipe stress analysis, a development of design criteria, qualified welding procedures, construction specifications, and a startup procedure.
- Worked on valve operation at a combined cycle power plant.
- Conducted failure and performance evaluations of gas and steam turbines for Power Plants. These investigations involved foreign object damage, water injection modifications, blade fatigue, and blade rupture.
- Evaluated the gas, air, and hydrogen piping system in a large powder metallurgy factory where a fatal incident occurred. Developed a rapid response program for assessing the integrity of several piping systems. Made recommendations concerning possible mitigation projects and developed acceptance criteria for inspection. Assisted in the development of the new preventive maintenance program.
- Performed multiple investigations involving compressed natural gas (CNG) systems, including custom instrumentation and field testing of buses, statistical analysis of parts consumption data, and failure analysis of various engine components. Additional work included evaluations of CNG fueling stations and investigations into explosion events and mechanical equipment failures related to CNG infrastructure.
- Conducted performance evaluation and root cause analysis of a thermal energy storage system, including its piping, tanks, chillers, energy storage medium, and auxiliary equipment.

- Assisted in the evaluation of various building piping systems. These investigations included issues on vibration, control, maintenance, design, and construction.
- Evaluated the creep behavior and risks associated with carbon steel welds for a high temperature steel pressure vessel (e.g., hydrogen embrittlement).

Machinery Design, Safety, and Maintenance

- Conducted multiple investigations supporting Navy combat vessel programs, including root cause analysis of a gearbox failure onboard a newly commissioned ship, bolted joint failure in a marine engine, and assessment of onboard piping systems. Work involved drivetrain and bearing analysis, metallurgical testing, fracture mechanics analysis, to assist contractors, shipyards, and engine manufacturers in decision-making and remediation efforts.
- Evaluated machinery and equipment in the pharmaceutical, petrochemical, and process industries. Investigations focused on fitness for service and the use or misuse of proprietary technologies or processes on behalf of designers, operators, and the United States Patent and Trademark Office, including cases involving alleged trade secret infringement.
- Evaluated potential shipping damage to a wide range of commercial equipment like gas turbines, compressors, sorters, filling equipment, gearboxes, industrial processing equipment, precision instruments, transformers and pumps that were allegedly caused during transport by sea and land. Developed several cost estimates for the repair of the transported machinery.
- Led and contributed to safety evaluations across industrial, commercial, and food processing facilities, including bakeries, manufacturing plants, and site-specific incidents. Reviewed safety programs, injury and illness prevention plans, job hazard analyses, and hazardous energy control procedures (e.g., Lockout/Tagout). Inspected hundreds of machines—including conveyors, mixers, presses, slicers, injection molding systems, and gates—for guarding, control panel design, and operator safety practices. Evaluations included retrofitted safety systems and compliance with regulatory standards. Also investigated personal injury and fatality incidents involving machinery, hydraulic systems, heavy construction equipment, and gate-related failures.
- Conducted root cause investigations of failures in large stationary diesel engines, including fracture surface analysis, mechanical and metallurgical evaluations, and assessments of operational and maintenance practices.
- Evaluated hydraulic systems in construction equipment, aircraft, and helicopters from both systems and component perspectives, focusing on performance, design integrity, and failure mechanisms.
- Root cause analysis of wind turbine gearboxes failures, to ascertain failure modes, maintenance, and operating conditions and invited National Renewable Energy Laboratory (NREL) participant on the Department of Energy (DOE) Advanced Drive Train Workshop on the failure analysis of wind turbines.
- Performed a mechanical integrity investigation of various mechanical pieces of equipment that were involved in a fire. In this context, the mechanical suitability of the equipment was evaluated and determined the

causality of the noted damage. Reviewed and provided advice on the refurbishment and disposition of subassemblies.

- Performed root cause and dynamic analyses of structural component failures in trailers, semi-trailers, recreational vehicles, and other vehicles. Investigations addressed manufacturing defects, weld quality and design, and structural design flaws to determine causes of accidents and mechanical failures.
- Performed investigations on bolted joints in the aviation, marine, and general machinery industry. Load conditions would be steady or cyclical. Classical bolt joint analysis, fracture mechanics analysis as well as field inspections were performed. In some cases, tests were directed to validate analysis and gather data including the strain gaging of bolts.
- Responsible for the failed item analysis and HALT/HASS of the U.S. Army's Land Warrior (LW) system (fully integrated wearable communication and situational awareness system for the soldier). This project included the system's evaluation of all components, development of test procedures, and execution of the system HALT. Moreover, the assignment included the preliminary engineering evaluation of all reported system anomalies and failures (hardware and software). Recommendations were developed for further detailed consideration and analysis by the contractor responsible for the given system component. Responsible for authoring the failed items report for Project Manager Soldier System (U.S. Army).
- Assisted in the conceptual design of a decontamination system of all assets the U.S. Marine Corps and U.S. Army deployed during Operation Iraqi Freedom. The system needed to significantly reduce the cleaning and decontamination time and provide a safe and efficient working environment for soldiers and other support personnel.
- Performed engineering evaluations and root cause analyses of heavy and specialized equipment, including gearboxes, motors, gas turbines, a large floating dredge (structural assessment of pontoons, welding, and framing), and a vehicle lift system for buses (screw jack load-holding failures). Investigations addressed design integrity, operational performance, and safety-critical failures in real-world conditions.
- Performed a detailed investigation of fire smoke dampers that were investigated by the Consumer Product Safety Commission (CPSC). Our investigation focused on the life-cycle performance of the electric drive train and gear design. The investigation included a customer survey, field inspections, field testing, laboratory testing, and mechanical engineering analysis of the fire smoke damper and actuators.
- Performed several large investigations on recall and warranty claims of consumer products for a large international manufacturer. These investigations included a detailed root cause investigation to isolate potential failure modes, engineering analysis to model loading and usage conditions, fracture and damage tolerance analysis, machine design reviews, manufacturing process evaluations, Failure Mode and Effect Analysis (FMEA), statistical analysis of part's consumption and warranty data, and probabilistic modeling of the likelihood of failure and the severity of consequences of the identified hazards.
- Shape memory alloy usage in the medical device industry.

Airplane Design, Maintenance and Composites

- Performed certification-related reviews and structural evaluations of commercial and business aircraft modifications, including STCs for Boeing 737 and 747 airframes. Investigations addressed upper deck cargo door modifications, fuselage and cargo deck structural integrity, and compliance with Federal Aviation Regulations using finite element analysis and classical structural analysis techniques.
- Evaluated engineering viability of repair procedures for business jets with wing, fuselage, and tail damage from impacts and corrosion, using Structural Repair Manuals and analytical tools.
- Led design review and accident investigation of a CFRP vertical tail separation on an Airbus A300-600 that resulted in over 270 fatalities. Evaluated structural design, failure scenarios, and hydraulic actuator performance with focus on pilot input dynamics.
- Performed wreckage inspections and damage assessments for general aviation aircraft and aircraft engines (turbines) following incidents during operation and transport.
- Investigated accidents involving airfield ground equipment, contributing to root cause determinations in operational safety reviews.
- Investigated the throttle of a twin engine aircraft.
- Investigated failures in satellite payload deployment systems, including the loss of two satellites due to fairing separation issues and the evaluation of frangible joint designs (large complex claim of about $1 billion). Work included in-depth review of frangible joint performance, material certification concerns, and limited-access flight data.
- Conducted FMEA and design review of a novel release mechanism for solar panels and auxiliary satellite equipment for satellites.
- Executed the design and analysis of two horizontal stabilizers for the Dornier Composites Seastar, which was developed in the late 80s. This assignment included the design of two horizontal stabilizers to reduce the weight of the existing design and to evaluate different designs, and manufacturing techniques. One design study utilized carbon fiber reinforced plastics and the other glass fiber reinforced plastics. Integral as well as sandwich designs were evaluated during this design study using classical techniques as well as the finite element method. In addition, analysis tools for composite fiber reinforced materials were developed and a complete set of manufacturing drawings of two designs were provided.
- Investigated multiple rupture and mechanical explosion incidents involving Type 4 compressed natural gas (CNG) tanks and other pressure vessels constructed from short- and long-fiber composite materials. In one case, two individuals were injured during refueling of CNG tanks on a delivery vehicle. Conducted detailed root cause and fracture surface analyses to determine the rupture sequence and failure mechanisms of the composite tank structures.
- Evaluated the design of a composite carbon fiber wheel assembly for high performance motorbikes, rotor blades, and structures.

- Assisted in the evaluation of cadmium plating on bolts and mechanical attachments, focusing on material suitability, corrosion resistance, and implications for structural integrity in aerospace applications.

Peer Reviewer

- Journal of Applied Mechanics, ASME.
- Journal of Testing and Evaluation, ASTM International.
- Journal of Failure Analysis and Prevention, ASM International.
- Technical Papers Review Coordinator, Paper Reviewer, ASME International Design Engineering Technical Conference (IDETC/CIE) 2023.
- Technical Papers Review Coordinator, Paper Reviewer, Session Organizer, ASME International Design Engineering Technical Conference (IDETC/CIE) 2019.
- Paper Reviewer, ASME International Design Engineering Technical Conference (IDETC/CIE) 2017.
- Technical Papers Review Coordinator, Paper Reviewer, Session Chair, ASME International Design Engineering Technical Conference (IDETC/CIE) 2015.
- Technical Papers Review Coordinator, Paper Reviewer, Session Chair, ASME International Design Engineering Technical Conference (IDETC/CIE) 2013.
- Technical Papers Review Coordinator, Paper Reviewer, Session Chair, ASME International Design Engineering Technical Conference (IDETC/CIE) 2011.
- Paper Reviewer, ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC) 2010.
- Technical Papers Review Coordinator, Paper Reviewer, Session Chair, ASME International Design Engineering Technical Conference (IDETC/CIE) 2009.
- Paper Reviewer, ASME International Design Engineering Technical Conferences, Long Beach, CA, 2005.

Publications

“Measuring Tension Imbalance in U-Bolts During Tightening,” Ginsberg L., Hassebrock J, Wagner J., Iwand H., **Pettinger A**., Journal of Failure Analysis and Prevention, April 2025.

“Corrosion of Sulfur Removal Tanks Used in the Processing of Landfill Gas,” **Pettinger A.,** Solomon E.L., Babcock J.R., Sanders S.A., McDougall J.L., Journal of Failure Analysis and Prevention, February 2021.

“Thermal Analysis of Buried Insulated Pipes,” **Pettinger A.**, Shireen S., Journal of Failure Analysis and Prevention, 18, 1554-1561 (2018), October 2018.

“Interactions between Cathodically Protected Pipelines and Grounding Systems,” **Pettinger A.**, Mitolo M., IEEE Transactions on Industry Applications Vol. 52, No. 5; Sep/Oct 2016. Pages: 3694-3698. ISSN: 0093-9994; DOI: 10.1109/TIA.2016.2593809.

“The Effect of Low Sulfur Content on the Weldability of Linepipe Steel,” **Pettinger A.**, Cameron K., Proceedings, 9th International Pipeline Conference, September 2012.

“Landslide Risk Assessment for Pipelines Crossing Mountainous Regions,” **Pettinger A.**, Sykora D., Journal of Pipeline Engineering, September 2011.

“Chapter 9. Structures Investigation: Composite Materials. Manual of Aircraft Accident and Incident Investigation, Part III, International Civil Aviation Organization, Doc 9756-AN/965,” **Pettinger A.**, Rakow J., 2011.

“Project Management Considerations of Pipelines Crossing the Andes,” **Pettinger A.**, Montgomery R., Proceedings, 8th International Pipeline Conference, October 2010.

“Effectiveness of Hydrostatic Testing for High Strength Pipe Material,” **Pettinger A.**, Cameron C., Proceedings, 8th International Pipeline Conference, October 2010.

“Design, Construction and Operation of South American Pipelines Crossing the Andes,” **Pettinger A.**, Montgomery R., Mathieson E., Touch Briefings – Hydrocarbon World 2010; 5(1).

“Axial Loads from Soil Movement Challenge Pipeline Integrity,” **Pettinger A.**, Cameron K., Pipeline Gas Technology, November/December 2009.

“Assessing Pipeline Integrity Using Fracture Mechanics and Currently Available Inspection Tools,” Cameron K., **Pettinger A.**, Journal of Pipeline Engineering, October 2009.

“Hazards and Benefits of Pipelines Crossing the South American Andes,” **Pettinger A.**, Montgomery R., Pipeline & Gas Journal, August 2009; 236(8).

“Failure Analysis of Composites: Sandwich Structures,” **Pettinger A.**, Rakow J., Advanced Materials & Process, August 2009; 167(8).

“Failure Analysis of Composites: Laminate Behavior,” **Pettinger A.**, Rakow J., Advanced Materials & Process, July 2009; 167(7).

“Assessing Pipeline Integrity Using Fracture Mechanics and Currently Available Inspection Tools,“ Cameron K., **Pettinger A.**, The 2008 European Conference on Evaluation and Rehabilitation of Pipelines, Prague, Czech Republic, October 2008.

“Failure Analysis of Composites: A Manual for Aircraft Accident Investigators,” **Pettinger A.**, Rakow J., First Edition, International Society of Air Safety Investigators, 2007.

“Supplemental Type Certificates: Understanding and Assessment,” Moore D., **Pettinger A**., Journal of Air Law and Commerce, 40th Annual SMU Air Law Symposium, February 2006.

“On the Nucleation and Propagation of Thermoelastic Phase Transformations in Anti-Plane Shear. Part 1 Couple-Stress Theory,” **Pettinger A.**, Abeyaratne R., Computational Mechanics, 2000; 26, Springer Verlag.

“On the Nucleation and Propagation of Thermoelastic Phase Transformations in Anti-Plane Shear. Part 2 Problems,” **Pettinger A.**, Abeyaratne R., Computational Mechanics, 2000; 26, Springer Verlag.

"A Regularized Couple Stress Theory and Its Implications on Nucleation and Kinetics of Phase Transformations in Anti-Plane Shear," **Pettinger A.**, Ph.D. dissertation, Massachusetts Institute of Technology, May 1998.

"Optimal Focusing of the Heat Flux by an Anisotropic Medium," **Pettinger A.**, M.S. thesis, Worcester Polytechnic Institute, July 1993.

"Überarbeitung und Optimierung der Seastar Höhenleitwerksflosse: Vergleich einer GFK-und CFK Stuktur (Design and Optimization of the Seastar's Horizontal Stabilizer: A Comparison Between GFRP and CFRP)," **Pettinger A.**, Diplomarbeit, Fachhochschule München, July 1991.

Presentations

"Fatigue Crack Growth and Relief of Preload in Bent, Threaded Fasteners (U-bolts)," Ginsberg L., Hassebrock J., Wagner J., Iwand H., **Pettinger A.**, presented at the Society of Experimental Mechanics Annual Meeting, Orlando, FL, June 7, 2023.

"Engineering Investigations in the Court of Law: An Engineer's Perspective," **Pettinger A.**, Bar approved MCLE, presented to various legal and insurance audiences in California since 2013.

"Composite Forensics: Differences between Metals and Composites," **Pettinger A.**, Presented at Society of Naval Architecture and Marine Engineers Southwest Section, San Diego California, September 2012.

"Failure Analysis," **Pettinger A.**, Professional Development Course Hosted by ASME District C–Nebraska Section (Eight Continuing Education Hours Course for Professional Engineers), Omaha Nebraska, March 2012.

"Project Management Considerations of Pipelines Crossing the Andes," **Pettinger A.**, Montgomery R., Proceedings, 8th International Pipeline Conference, October 2010.

"Effectiveness of Hydrostatic Testing for High Strength Pipe Material," Cameron C., **Pettinger A.**, Proceedings, 8th International Pipeline Conference, October 2010.

"Assessing Pipeline Integrity Using Fracture Mechanics and Currently Available Inspection Tools," Cameron K., **Pettinger A.**, The 2008 European Conference on Evaluation and Rehabilitation of Pipelines, Prague, Czech Republic, October 2008.

"Updated Pipeline Integrity Analysis of the Camisea Transportation System," **Pettinger A.**, Presented at 6th public conference on the Camisea Project by the Inter-American Development Bank, Lima, Peru, November 2007.

"Pipeline Integrity Analysis of the Camisea Transportation System," **Pettinger A.**, Presented at 5th public conference on the Camisea Project by the Inter-American Development Bank, Washington D.C., June 2007.

"Failure Analysis of Composite Structures in Aircraft Accidents," **Pettinger A.**, Rakow J., Annual Conference of the International Society of Air Safety Investigators, Cancun, Mexico, September 2006.

"Safety Investigation Elements: Design, Materials, Usage and Manufacture," **Pettinger A.**, Presented at Center for Occupational and Environmental Health of the University of California, Irvine, October 2005.

Various presentations for the London Insurance Market between 2012 and 2025 on pipeline engineering, construction, operation and maintenance, the Oil & Gas industry, and the Energy Transition.