Stress Analysis Of Riveted Lap Joint Ijmerr

KADE HALEY

Three-Dimensional Geometric Nonlinear Contact Stress Analysis of Riveted Joints ASTM International
Finite Element Analysis represents a numerical technique for finding approximate solutions to partial differential equations as well as integral equations, permitting the numerical analysis of complex structures based on their material properties. This book presents 20 different chapters in the application of Finite Elements, ranging from Biomedical Engineering to Manufacturing Industry and Industrial Developments. It has been written at a level suitable for use in a graduate course on applications of finite element modelling and analysis (mechanical, civil and biomedical engineering studies, for instance), without excluding its use by researchers or professional engineers interested in the field, seeking to gain a deeper understanding concerning Finite Element Analysis.
Finite Element Analysis Woodhead Publishing
Aging aircraft may develop multiple-site damage (MSD) that can reduce the structural integrity of fuselage structures. The existence of small cracks emanating from adjacent rivet holes in a fuselage lap-splice joint is of major concern. The residual strength of a panel with a lead crack is greatly reduced by the presence of smaller collinear cracks compared to that of only a lead crack. Recent studies in predicting the residual strength of flat and curvilinear panels with riveted lap-splice joints gave quite encouraging results, but some difficulties arose in modeling small cracks at rivet-loaded holes. Thus, there was a need to conduct detailed fracture analyses of the crack-linkup phenomenon in lap-splice joints with rivet-loaded fasteners.
Practical Engineering Failure Analysis ASTM International
Due to its speed, low energy requirements, and the fact that it does not require a pre-drilled hole, the technique of self-piercing riveting (SPR) has been increasingly adopted by many industries as a high-speed mechanical fastening technique for the joining of sheet material components. Self-piercing riveting comprehensively reviews the process, equipment, and corrosion behaviour of self-piercing riveting, and also describes the process of evaluation and modelling of strength of self-piercing riveted joints, quality control methods and non-destructive testing. Part one provides an extensive overview of the properties of self-piercing riveting. Chapters in this section review the mechanical strength, fatigue, and corrosion behaviour of self-piercing riveted joints. The second part of the book outlines the processing and applications of SPRs, and describes the dynamic strength evaluation/crashworthiness of SPRs, and the modelling of strength of self-piercing riveted joints, before going on to discuss the assessment of the suitability of materials for self-piercing riveting. The concluding chapters describe the quality control and non-destructive testing of self-piercing riveted joints, optimization of the strength of self-piercing rivets, and provides an overview of self-piercing rivets in the automotive industry and the applications of self-piercing riveting in automated vehicle construction. Self-piercing riveting is a standard reference for engineers and designers in the aerospace, materials, welding, joining, automotive and white goods industries, as well as manufacturers of metal components for the automotive, aerospace, white goods and building industries. Comprehensively reviews the process, equipment, and corrosion behaviour of self-piercing riveting Describes the process of evaluation and modelling of strength of self-piercing riveted joints, quality control methods and non-destructive testing

Provides an overview of quality, optimization, applications and strength evaluations of self-piercing riveting
The First Joint DoD/FAA/NASA Conference on Aging Aircraft BoD – Books on Demand
Filling a gap in the literature, Practical Engineering Failure Analysis vividly demonstrates the correct methodology to conduct successful failure analyses, as well as offering the background necessary for these investigations. This authoritative reference covers procedures to reduce the occurrence of component failures due to errors in material se
Self-Piercing Riveting Woodhead Publishing
The problems associated with fatigue were brought into the forefront of research by the explosive decompression and structural failure of the Aloha Airlines Flight 243 in 1988. The structural failure of this airplane has been attributed to debonding and multiple cracking along the longitudinal lap splice riveted joint in the fuselage. This crash created what may be termed as a minor "Structural Integrity Revolution" in the commercial transport industry. Major steps have been taken by the manufacturers, operators and authorities to improve the structural airworthiness of the aging fleet of airplanes. Notwithstanding, this considerable effort there are still outstanding issues and concerns related to the formulation of Widespread Fatigue Damage which is believed to have been a contributing factor in the probable cause of the Aloha accident. The lesson from this accident was that Multiple-Site Damage (MSD) in "aging" aircraft can lead to extensive aircraft damage. A strong candidate in which MSD is highly probable to occur is the riveted lap joint. Shivakumar, Kunigal N. and Ramanujapuram, Vivek Langley Research Center STRESS ANALYSIS; RIVETED JOINTS; DEBONDING (MATERIALS); FATIGUE (MATERIALS); STRUCTURAL FAILURE; EXPLOSIVE DECOMPRESSION; COMMERCIAL AIRCRAFT; STRESS DISTRIBUTION; NONLINEARITY; CRASHES; CIVIL AVIATION...
International Series on the Strength and Fracture of Materials and Structures CRC Press
Spectrum fatigue test results are presented on riveted lap joint and flush joint specimens made from 7075-T6 plate and extrusion and from 7091-T7E69 and IN9021 powder metallurgy (PM) aluminum alloys. For the lap joint specimens, the 7091-T7E69 PM plate material exhibited a shorter fatigue life than the 7075-T6 plate, 7091-T7E69 extrusion, and IN9021 extrusion materials. Crack growth rates were determined for the PM aluminum alloys from characteristic markings made on the fracture surfaces by the modified Minitwist fatigue loading spectrum. Fatigue life predictions were made for two types of 7075-T6 aluminum joints using the local stress-strain method of fatigue analysis. Finite element stress analyses were conducted to determine the local stress and strain at the fatigue critical location of the test specimens due to the spectrum of applied loads. Fatigue life predictions agreed with the test results within a factor of 1.22 for the two types of 7075-T6 specimens analyzed when accounting for the difference in fatigue properties of the materials with respect to grain direction.
Analysis and Design of Machine Elements John Wiley & Sons
Adhesive Bonding: Science, Technology and Applications, Second Edition guides the reader through the fundamentals, mechanical properties and applications of adhesive bonding. This thoroughly revised and expanded new edition reflects the many advances that have occurred in recent years. Sections cover the fundamentals of adhesive bonding, explaining how adhesives and sealants work, and how to assess and treat surfaces, how adhesives perform under stress and the factors affecting fatigue and failure, stress analysis, environmental durability, non-destructive testing, impact behavior, fracture mechanics, fatigue, vibration damping, and applications in construction, automotive, marine, footwear, electrical engineering, aerospace, repair, electronics, biomedicine, and bonding of composites. With its distinguished editor and international team of contributors, this book is an essential resource for industrial engineers, R&D, and scientists working with adhesives and their industrial applications, as well as researchers and advanced students in adhesion, joining, polymer science, materials science and mechanical engineering. Offers detailed, methodical coverage of the fundamentals, mechanical properties and industrial applications of adhesive bonding Enables the successful preparation of adhesives for a broad range of important load-bearing applications in areas such as automotive and aerospace, construction, electronics and biomedicine Covers the latest advances in adhesive bonding, including improved repair techniques for metallic and composite structures, cohesive zone modeling, and disassembly and recycling
Fatigue Design Springer Science & Business Media
Conducts a detailed 3-D stress analysis of the pin joint and double row single lap rivet joint including nonlinear contact and large deformation. Identifies the regions of contact and high stresses, and establish stress concentration factors. Assesses the effect of rivet clamp-up, rivet interference, and friction on the local stress.
The Characteristics of Fatigue Damage in the Fuselage Riveted Lap Splice Joint Woodhead Publishing
The book covers fundamental concepts, description, terminology, force analysis and methods of analysis and design. The emphasis in treating the machine elements is on methods and procedures that give the student competence in applying these to mechanical components in general. The book offers the students to learn to use the best available scientific understanding together with empirical information, good judgement, and often a degree of ingenuity, in order to produce the best product. Few unique articles e.g., chain failure modes, lubrication of chain drive, timing belt pulleys, rope lay selection, wire rope manufacturing methods, effect of sheave size etc., are included. Friction materials are discussed in detail for both wet and dry running with the relevant charts used in industry. Design of journal bearing is dealt exhaustively. Salient Features: " Compatible with the Machine Design Data Book (same author and publisher). " Thorough treatment of the requisite engineering mechanics topics. " Balance between analysis and design. " Emphasis on the materials, properties and analysis of the machine element. " Material, factor of safety and manufacturing method are given for each machine element. " Design steps are given for all important machine elements. " The example design problems and solution techniques are spelled out in detail. " Objective type, short answer and review problems are given at the end of each chapter. " All the illustrations are done with the help of suitable diagrams. " As per Indian Standards.
Compression Buckling Behavior of Large-scale Friction Stir Welded and Riveted 2090-T83 Al-Li Alloy Skin-stiffener Panels Elsevier
An extensive experimental database has been assembled from very detailed teardown examinations of fatigue cracks found in rivet holes of fuselage structural components. Based on this experimental database, a comprehensive analysis methodology was developed to predict the onset of widespread fatigue damage in lap joints of fuselage structure. Several computer codes were developed with specialized capabilities to conduct the various analyses that make up the comprehensive methodology. Over the past several years, the authors have interrogated various aspects of the analysis methods to determine the degree of computational rigor required to produce numerical predictions with acceptable engineering accuracy. This study led to the formulation of a practical engineering approach to predicting fatigue crack growth in riveted lap joints. This paper describes the practical engineering approach and compares predictions with the results from several experimental studies.
Shell Structures: Theory and Applications (Vol. 2) Nonlinear Contact Stress Analysis of Riveted JointsConducts a detailed 3-D stress analysis of the pin joint and double row single lap rivet joint including nonlinear contact and large deformation. Identifies the regions of contact and high stresses, and establish stress concentration factors. Assesses the effect of rivet clamp-up, rivet interference, and friction on the local stress.Three-Dimensional Geometric Nonlinear Contact Stress Analysis of Riveted Joints
In this abstract of a thesis (Massachusetts Institute of Technology, Dept. of Mechanical Engineering, June, 1921) twenty-six tension tests on various forms of single-riveted lap-joints was performed. Three thicknesses of duralumin sheet were used, being furnished and riveted by the Engineering Division of the Army Air Service. In making the tests, the slippage of the joints was noted at three points across each joint. In addition, stress-strain curves were obtained for plain tension specimens, and a chemical analysis was made of the sheet. No analysis was made of the rivets which were annealed duralumin with heads formed before riveting.
A Failure Prevention Perspective Springer Science & Business Media
Welding and joining techniques play an essential role in both the manufacture and in-service repair of aerospace structures and components, and these techniques become more advanced as new, complex materials are developed. Welding and joining of aerospace materials provides an in-depth review of different techniques for joining metallic and non-metallic aerospace materials. Part one opens with a chapter on recently developed welding techniques for aerospace materials. The next few chapters focus on different types of welding such as inertia friction, laser and hybrid laser-arc welding. The final chapter in part one discusses the important issue of heat affected zone cracking in welded superalloys. Part two covers other joining techniques, including chapters on riveting, composite-to-metal bonding, diffusion bonding and recent improvements in bonding metals. Part two concludes with a chapter focusing on the use of high-temperature brazing in aerospace engineering. Finally, an appendix to the book covers the important issue of linear friction welding. With its distinguished editor and international team of contributors, Welding and joining of aerospace materials is an essential reference for engineers and designers in the aerospace, materials and welding and joining industries, as well as companies and other organisations operating in these sectors and all those with an academic research interest in the subject. Provides an in-depth review of different techniques for joining metallic and non-metallic aerospace materials Discusses the important issue of heat affected zone cracking in welded superalloys Covers many joining techniques, including riveting, composite-to-metal bonding and diffusion bonding
Proceedings of the VI International Conference on Structural Analysis of Historic Construction, SAHC08, 2-4 July 2008, Bath, United Kingdom CRC Press
Structural and Stress Analysis, Fourth Edition, provides readers with a comprehensive introduction to all types of structural and stress analysis. Starting with an explanation of the basic principles of statics, the book then covers normal and shear force, bending moments, and torsion. Building on the success of prior editions, this update features new material on structural dynamics and fatigue, along with additional discussions of Eurocode compliance in the design of beams. With worked examples, practice problems, and extensive illustrations, it is an all-in-one resource for students and professionals interested in learning structural analysis. Presents a comprehensive overview of structural and stress analysis Includes numerous worked examples and end-of-chapter problems Extensively illustrated to help visualize concepts Contains a greater focus on digital trends in structural engineering, including newer computer analysis methods and how to check output of such methods to avoid ‘black-box’ engineering Contains additional worked examples on plastic analysis of frames, bending moment distribution and displacement evaluations on collapse mechanics Introduces content on statics to ensure that students know the basic concepts and can understand the equilibrium principles that govern all structures as well as the principles of the mechanisms involved in computer-based calculations.
8-10 July 1997, the David Eccles Conference Center, Odgen, Utah : Proceedings CRC Press
Welding and Joining of Aerospace Materials, Second Edition, is an essential reference for engineers and designers in the aerospace, materials, welding and joining industries, as well as companies and other organizations operating in these sectors. This updated edition brings together an international team of experts with updated and new chapters on electron beam welding, friction stir welding, weld-bead cracking, and recent developments in arc welding. Highlights new trends and techniques for aerospace materials and manufacture and repair of their components Covers many joining techniques, including riveting, composite-to-metal bonding, and diffusion bonding Contains updated coverage on recently developed welding techniques for aerospace materials
Handbook of Structural Life Assessment Springer Science & Business Media
Aircraft fuselage skin panels are joined together by rivets. The initiation and propagation of fatigue cracks in aircraft structures at and around the rivet/skin interface is directly related to residual stress field induced during the riveting process and subsequent service loads. Variations in the manufacturing process, such as applied loading and presence of sealant can influence the induced residual stress field. In previous research, the riveting process has been simulated by a 2D axisymmetric force-controlled analysis. The 2D analysis cannot capture the unsymmetrical residual stress state resulting from process variations. Experimental work has also been limited to observing effects of squeeze force on fatigue crack initiation in the riveted lap joint. In this work, a 3D finite element model of the riveting process that incorporates plasticity and contact between the various surfaces is simulated using ABAQUS finite element code to capture the residual stress state at the rivet/skin interface. The finite element model is implemented to observe the effects of interference, sealant and hole quality on the residual stress state using Implicit and Explicit solvers. Effects of subsequent load transfer are also analyzed with the developed model. A set of controlled lap joint fatigue experiments for the different conditions provides validation to the model.
Finite Element Analysis for Satellite Structures Butterworth-Heinemann
Fibre metal laminates were developed at Delft University of Technology in The Netherlands, from the beginning of the 1980s. This is a new family of hybrid materials consisting of thin metal layers bonded together by fibres embedded in an adhesive. As a result of this build-up, fibre metal laminates

possess a mixture of the characteristics of both metals and composite materials. Initial development led to the `Arall' variant using aramid fibres, which was first applied on the C-17 military transport aircraft around 1990. Large-scale application became possible with a variant using glass fibres, dubbed `Glare', which was selected for the Airbus A380 super jumbo in 2001. This is the first book to discuss these new materials and it deals mostly with Glare. It covers most of the relevant aspects of the materials, from static mechanical properties, fatigue and impact to design, production and maintenance of aircraft structures. This book contains the basic information on these new materials necessary for engineers and aircraft operators alike.

Science, Technology and Applications John Wiley & Sons

This important, self-contained reference deals with structural life assessment (SLA) and structural health monitoring (SHM) in a combined form. SLA periodically evaluates the state and condition of a structural system and provides recommendations for possible maintenance actions or the end of structural service life. It is a diversified field and relies on the theories of fracture mechanics, fatigue damage process, and reliability theory. For common structures, their life assessment is not only governed by the theory of fracture mechanics and fatigue damage process, but by other factors such as corrosion, grounding, and sudden collision. On the other hand, SHM deals with the detection, prediction, and location of crack development online. Both SLA and SHM are combined in a unified and coherent treatment.

Welding and Joining of Aerospace Materials Springer Science & Business Media

Nonlinear Contact Stress Analysis of Riveted Joints

Applications to Their Design, Manufacture and Testing Springer Science & Business Media

Designing satellite structures poses an ongoing challenge as the interaction between analysis, experimental testing, and manufacturing phases is underdeveloped. Finite Element Analysis for Satellite Structures: Applications to Their Design, Manufacture and Testing explains the theoretical and practical knowledge needed to perform design of satellite structures. By layering detailed practical discussions with fully developed examples, Finite Element Analysis for Satellite Structures: Applications to Their Design, Manufacture and Testing provides the missing link between theory and implementation. Computational examples cover all the major aspects of advanced analysis; including modal analysis, harmonic analysis, mechanical and thermal fatigue analysis using finite element method. Test cases are included to support explanations an a range of different manufacturing simulation techniques are described from riveting to shot peening to material cutting. Mechanical design of a satellites structures are covered in three steps: analysis step under design loads, experimental testing to verify design, and manufacturing. Stress engineers, lecturers, researchers and students will find Finite Element Analysis for Satellite Structures: Applications to Their Design, Manufacture and Testing a key guide on with practical instruction on applying manufacturing simulations to improve their design and reduce project cost, how to prepare static and dynamic test specifications, and how to use finite element method to investigate in more details any component that may fail during testing.

Design, Analysis and Properties I. K. International Pvt Ltd

The successful preservation of an historic building, complex or city depends on the continued use and daily care that come with it. The possibility of continued use depends on the adaptation of the building to modern standards and practice of living, requiring changes in constructional or structural features. Conservation engineering is the process of understanding, interpreting and managing the architectural heritage to safely deliver it to posterity, enhancing private or public utility vis a vis minimum loss of fabric and significance. These two objectives are sometimes conflicting. With increasing global interest in conservation engineering it is essential to open the debate on more inclusive definitions of significance and on more articulated concepts of safety by use of acceptable and reliable technologies, integrating further the activity of all the professions involved in conservation.