ABSTRACTS

Robert Baraniecki, Marcin Kudelski, Andrzej Leski
The numerical stress analysis of the aircraft flap

The analysis of an aircraft flap is presented in this paper. The analysis was carried out after a structural damage had been found in one operational aircraft. Because the damage could lead to an accident the research effort have been undertaken to find a cause and an mechanism of the damage. In the paper an fragment of whole analysis is presented. Authors described the technique of preparation computer-based model and FE calculations. The optical 3D scanner ATOSIII was used to capture the shape of the object. Measurement data was transferred to the FE software where the FE model was created and FE calculations were performed. The FE calculations included linear stress analysis. The obtained results supported the damage cause investigation.

Wacław Borkowski, Piotr Rybak, Zdzisław Hryciów, Bogusław Michałowski
Multi-axle special-purpose vehicle in blast load conditions

In the paper there were described threats to multi-axle special-purpose vehicles in combat environment as well as within the confines of peace and stabilization missions. Into particular account was taken threats resulting from either so-called ground mine war or realization of patrol and intervention tasks. There were presented assumptions accepted in the process of creating mathematical model of the object and also the model of the blast load. Both models were built using finite elements method. Verification was accomplished based on the results of our own experimental tests. Testing the model of the vehicle structure was realized for most often encountered cases of improvised explosives applications. Presented methodology of research empowers to multivariate analysis of body structure as well as carrier chassis of specialized vehicles under the influence of explosive shock wave loads.

Marian Dacko, Jacek Nowak
Analysis of blast loaded energy absorbing elements using LS-DYNA and MSC.DYTRAN systems

The paper presents the problems of modeling cylindrical specimens, loaded by pressure wave from the blast of explosive charge. The numerical simulation was performed using MSC.Dytran and LS-Dyna. The test rig was setup in numerical model. It consisted of rigid base and the base plate resting on it. The model of energy absorbing cylinder was created. The load was modeled by applying a varying pressure to the top cover of the cylinder. The results of numerical simulation was compared to the results of experiments

Leszek Flis
Taking computer physics to the initial analysis of the special container with the use of the ANSYS® AUTODYN® system

In the article the initial approach of the author was showed to simulate the destruction course of the container intended to the explosives transportation after the explosion into his interior. The aims were presented in reaching them and possibilities of their realizing. Initial results of the computer simulation of the destruction of the special container were described. One qualified guidelines to the further work especially considering the validation of simulation results. To stimulatory subjects one used the latest software of the explicit type ANSYS® AUTODYN® dedicated for assignments of the non-linear dynamics.

Zdzisław Gosiewski, Jerzy T. Sawicki, Robert Zabielski
Signals exciting rotating machinery vibrations for shaft crack detections

Various excitation techniques have been developed to extract information on dynamic state of rotating machinery. This paper will address the effectiveness of selected excitations and analysed signals towards health monitoring of rotating machines from the shaft crack point of view. The computer simulation study is based on the uncracked and cracked Jeffcott rotor models and the efficiency of the selected approaches is examined. As the excitation we have considered the rotor unbalance, additional harmonic forces, and input conditions. The combined resonances as diagnostic indicators of the cracked shaft are good seen in the total frequency spectrum in the case when we consider the difference between the spectra of cracked and uncracked shaft. We have also introduced a new model of the rotor which allows us to use different method of signal processing for the crack detection and the evaluation of its deep. So more, in such model we can take into account the number of excitation planes and directions of the applied forces, the choice of the analysed signals (e.g. transient, steady-state).

Tomasz Huścio, Franciszek Siemieniako
Algorithm of the selection of electromagnetic driving module of a planar aerostatic two-coordinate relative base

The paper describes the construction and the principle of operation of a planar aerostatic two-coordinate relative base with electromagnetic drive. The scope of the research of the planar aerostatic two-coordinate base is presented. Algorithm of the calculations enable determination of the number of the elementary electromagnetic driving modules and optimal distribution of the electromagnetic modules on the working surface of the relative base is presented.

Mariola Jureczko
Optimization of dynamic properties of the wind turbine blade

This paper discusses a computer software package for minimize dynamic properties of the blade. The numerical model of the blade, created with Ansys. Was used to optimize providing a high accuracy of the determination of strength and modal properties of the blade. Optimization studies were carried out by means of the authors' proprietary program that implemented a modified genetic algorithm. Models of reduced number of degrees of freedom were used for dynamic analysis. The consistence of free vibrations of the structural model of the system with the reduced model was investigated using the MAC criterion.

Jan Kiciński, Grzegorz Żywica, Romuald Rządkowski, Marcin Drewczyński
Numerical modelling of the structural layer of foil bearing

Foil bearings fulfil most of the requirements of novel oil-free turbomachinery. Only the experimental investigation of foil bearings giving us the fundamental knowledge of their behaviour, because of the luck of good numerical models. This work presented the preliminary stage of numerical modelling of the structural layer of foil bearing. The FEM model of bump and top foil was prepared and mutual motion was analyzed. The results of FEM model were verified experimentally. A good agreement between numerical simulation and experiment was obtained.

Cezary Kownacki
Estimating distributions of residual stress of axial compressor blade as the function of surface layer depth using wavelet analysis method of barkhausen signal

Magnetic method of Barkhausen effect is able to explore properties of surface layer in non-destructive way. Present methods of Barkhausen signal analysis and also others nondestructive testing methods are useless for estimating distribution of surface layer properties as a function of measurement depth. Engaging continuous wavelet transform and spectral damping function of Barkhausen signal allowed create conversion function, which translates properties of Barkhausen signal into residual stress distributions of surface layer of turbine engine axial compressor blade as the function of residual stress.

Wiesław Krasoń, Jerzy Małachowski, Jerzy Jachimowicz, Rafał Kajka
Chosen aspects of 3d model validation for dynamic tests of main landing gear

Results gained from the simulation have proved how effective the 3D numerical model is and how many problems can be solved in the course of only one numerical run, e.g. the geometric and material non-linearities, the question of contact between mating components, investigation into kinematics of the landing gear and the checking of possible failure influence on the structure behaviour, which can appear in some elements due to overload. The major advantage of the presented numerical method is applicability thereof to landing gear examination with artificially introduced flaws, what is impossible to be performed with other methods, including experimental testing work.

Agnieszka Sabik, Ireneusz Kreja
Analysis of laminated plates using equivalent single layer models

The aim of the paper is to evaluate the performance of several equivalent single-layer models in the framework of linear static analysis of multilayered plates. The effectiveness of approaches based on the first-order as well as on the higher-order shear deformation theories is discussed. Special attention is paid to various techniques of shear correction, which is required in the case of first-order shear deformation based models. To test the efficiency of several shear correction methods, the authors perform computations with their own programs and commercial package MSC/Nastran.

Eugeniusz Sajewicz, Tomasz Koronkiewicz, Jarosław Sidun
A comparative analysis of selected transpedicular stabilization systems

In the paper the results of influence of lumbar spine flexibility on quality of transpedicular stabilization are presented. In particular, measurements of displacements of the lumbar spine subjected to simultaneous compression and bending (eccentric compression) are shown. The displacements were measured at L3 level in nine lumbar specimens stabilized by means of Socon, Omega and Bial-Stab systems. The obtained results were compared with the results of measurements carried out on the specimens without stabilization. It was also shown that a lack of continuity of the anterior column did not influence on quality of the stabilizations in the range of the used loading. The statistical analysis showed that lumbar flexibility sufficiently influenced on the displacements of the fixed lumbar spine. No statistical differences were observed between of the systems used as regards their biomechanical performance.

Jacek Świniarski, Marian Królak, Katarzyna Kowal-Michalska
Approximated material characteristics versus experimental ones in comparative analysis of fem model and laboratory tests of stability of thin-walled columns

The work is devoted to the model tests and numerical analyses of stability and load carrying capacity of thin-walled columns/girders of single cell and multi-cell cross-sections subjected to the uniform compression. The influence of the assumed material characteristics approximations on load-shortening curves obtained in numerical analysis using ANSYS v.11 package is presented. Regarding true material parameters, obtained from tensile tests, the procedure is described allowing for the estimation of ultimate load value of compressed thin-walled columns by finite element method that stays in good agreement with the results gained from laboratory tests.

Roman Trochimczuk
Device for laser engraving glass with polar positioning system

There is presented the analysis of polar positioning system of laser device for glass engraving in the work. The new concept of polar positioning system, alternative for the Cartesian one, is presented too. The scripts of dislocations working arm and forming object in founded conception of polar positioning system is defined.

Tadeusz Wegner, Andrzej Pęczak

Extensibility of object–oriented finite element class system with a conception of finite element based on a strain energy density function

The main purpose of this article is a presentation of the computational method of finite element based on a strain energy density function and its implementation in an object–oriented environment. The original adaptation of the nonlinear finite element is introduced. The different use of the finite element is basing on the old–style framework of classes. Properties of a material are modeled with the modified strain energy density function. The local relaxing procedure is introduced as a solving method implemented in C++ language. The application of the proposed finite element is exposed on the example of computational object made of nearly incompressible hyperelastic material.

Stanisław Wolny, Sławomir Badura

The strenght analysis of the wheel of koepe pulley of winding gear

Winding gears in a mines are built and used from many years. However there are the theme of still experiments, which have the intent to know elements, which make improvement their characteristics exploitations. Dynamic analysis of the work for this constructions and strength's analysis the wheel of koepe pulley of winding gear. This is the theme of this work.

Olena Yevtushenko

Frictional heat generation during cold rolling of metals

The problem of transient frictional heating in cold rolling of metals is considered. For this purpose the equations of heat conduction for the rolls and the rolled strip are solved by the Laplace integral transform method. The evolution of the contact temperature and its dependence from sliding speed is discussed.