WALTER BOSSCHAERTS

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CURRICULUM VITAE

BOSSCHAERTS WALTER, RAYMOND M.
Born BELGIUM, LIER On 04 FEBRUARY 1956.

- December 1979 Royal Military Academy: Engineer in Mechanics and Armement&Ballistics
  For the master rewarded with the student price 1980 from the Royal Flemish Engineers Society (KVIV). This price awards the best thesis made during the past academic year in one of the Flemish Universities and Royal Military Academy. The title of the master thesis is:
  "Experimental study of a two dimensional transonic cascade in steam"

- From Jul 1980 until Jun 1982 Technical Officer at the 202 Cie Mat in Germany.

- In Jul 1982 arrival at the Applied Mechanics Department at the Royal Military Academy.

- Sep 1983 until Jun 1984 Diploma course student at the Von Karman Institute for Fluid Dynamics in the turbo machinery department.

- In Jun 1988 PhD in Applied Sciences with the thesis "Studie van de transsone stroming doorheen schoepenrijen van stoomturbines" (Study of the transonic flow through steam turbine blade rows) at the University of Ghent (RUG).

- During the academic year 1988-1989 in followed the candidate-higher officer course at the Royal Defense College. (The aim of this course is to provide the officer-candidate with general education and training for the functions and responsibilities of commanding or staff senior officer in his own specific Service or in inter-service bodies in a national or international environment.

- On 1 Feb 1991 military associate professor

- In Dec 1992 promoted to the rank of major of the logistic troops.

- On 1 June 1994 promoted to civil associate professor at the Royal Military Academy

- Dec 1996 promotion to lieutenant-colonel in reserve forces of the Logistic corps of the BE army
- On Jul 1999 promoted to professor at the Royal Military Academy
- On 01 Jul 2002 promoted to full professor at the Royal Military Academy
- On 01 Jul 2005 Head of the Fluid Dynamics Chair at the Royal Military Academy
- On 01 Jul 2010 Head of the Mechanics Department at the Royal Military Academy

OTHER ACTIVITIES

- Lecturer at the Belgian Aviation School, member of the Sabena Group 1991-1999
- 1994-2002 examiner at the Federal Public Service for Aeronautics (Bestuur van de luchtvaart) for ATPL – Airline Trafic Pilot Licencing (turbopropulsion), prof IFR and helicopter pilots.
- 1995-2002 member of the board of the Belgian Society of Mechanical Engineers.
- Jun 1997 member of the task group to study the impact of the JAR-FCL (Joint Aviation Requirements – Flight Crew Licensing) upon the Sabena group.
- 2002-2005 elected President of the Belgian Society for Mechanical and Environmental Engineering.
- 2002-2007 Professor at the University of Antwerp
- 2006-... Invited professor at both Free Universities of Brussels (ULB and VUB) (Course on Aircraft Performance)
- 2008-... Professor at the Erasmus University College (Brussels)
- 2010-… Professor at the Université Lille 1 (Polytech Lille)

- Feb 2010-Jan 2013 President of the Belgian section of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- Member of several scientific committees in BE, GE and FR.
- 2001 -2006 Member of the Committee for examination of the candidates for an education position at the Royal Military Academy
- 2006 – 2015 President of the Committee for examination of the candidates for an education position at the Royal Military Academy
- 1999- … member or president of the Committee for educational and pedagogic matters at the Royal Military Academy
- 2012- … member of the National Committee for theoretical and applied mechanics
- 2013 Membre du Comité d'orientation Stratégique du Laboratoire de Génie Civil et géo-Environnement (LGCgE) Université de Lille, Université d'Artois, Ecole des Mines Douai, Yncréa.
- 2013-2016 Member of the « Raad van bestuur » of the Royal Military Academy
- 2017-… Member of the « Raad van bestuur » of Patrimoine of the Royal Military Academy
- Mar 2017 Président du Comité d'orientation Stratégique du Laboratoire de Génie Civil et géo-Environnement (LGCgE) Université de Lille, Université d'Artois, Ecole des Mines Douai, Yncréa.

Scopus

Documents

1) Bosschaerts, W., Van Renterghem, T., Hasan, O.A., Limam, K.

Development of a Model Based Predictive Control System for Heating Buildings
(2017) *Energy Procedia*, 112, pp. 519-528.

Abstract
The problems concerning pollution and energy supply have forced Europe to dwindle its consumption. In this contribution, a new control method will be developed based on Model Predictive Control (MPC) to optimally drive a heating system. The goal is to develop a model predictive control for heating in buildings calculating optimal heating inputs for the heating system while assuring a standard level of comfort. The optimization covers the minimization of the difference between the desired temperature and the measured temperature, this for a specific building and a fixed time period. The purpose is to establish a physical model to simulate the real thermal behavior of a basic building. The model needs to be easily adaptable to varying life situations. We propose model predictive controllers which are based on a dynamic model of the building. By means of predictive control, a finite time interval can be optimized, keeping future time steps in mind. Different types of control techniques are discussed: the traditional MPC method and MPC based on Laguerre functions. Both are studied taking into account the constraints on the control signals for the heating system. In the calculations, disturbances as predicted heat fluxes and ambient temperature are taking into account. © 2017 The Authors.

Author Keywords
heating; Laguerre functions; Matlab; Model-based predictive control; TRNSYS

Index Keywords
Buildings, Heating, Heating equipment, MATLAB, Predictive control systems, Sustainable development; Control techniques, Finite time intervals, Laguerre functions, Measured temperatures, Model based predictive control, Model predictive controllers, Predictive control, TRNSYS; Model predictive control

2-s2.0-85018345199
Document Type: Conference Paper
Source: Scopus
Access Type: Open Access

2) Anton, A., Balan, C., Balan, M.C., Bode, F., Bosschaerts, W., Croitoru, C.V., Inard, C., Meslem, A., Nastase, I., Sandu, M., Neagu, A., Dogeanu, A., Chereches, C.

Editorial to the Proceedings of the Sustainable Solutions for Energy and Environment, EENVIRO 2016, 26-28 October 2016
(2017) *Energy Procedia*, 112, pp. 1-2.

2-s2.0-85018344260
Document Type: Editorial
Source: Scopus
Access Type: Open Access

3) Janssens, B., Bosschaerts, W., Limam, K.

Finite element modeling of polydisperse flows using the direct quadrature method of moments
(2017) *Energy Procedia*, 139, pp. 410-416.

Abstract
We present an Eulerian method to compute polydisperse flow, using a stabilized finite element method for the flow and particle transport equations, an equilibrium approach to compute the particle velocity field and a Direct Quadrature of Method of Moments to take into account polydispersity and particle coagulation. For the coagulation, a kernel that can be used in direct numerical simulation is derived. The method is tested on the Taylor-Green vortex and a Burgers vortex. © 2017 The Authors. Published by Elsevier Ltd.

Author Keywords
Computational Fluid Dynamics; Direct Quadrature Method of Moments; Eulerian dispersed flow model; Finite Element Method

Index Keywords
Coagulation, Computational fluid dynamics, Method of moments, Polydispersity, Velocity, Velocity control, Vortex flow; Direct

quadrature method of moments, Dispersed flow, Equilibrium approaches, Particle coagulation, Particle transport equation, Particle velocities, Stabilized finite element methods, Taylor-Green vortex; Finite element method

2-s2.0-85040165613
Document Type: Conference Paper
Source: Scopus
Access Type: Open Access

4) Ferroukhi, M.-Y., Belarbi, R., Limam, K., Bosschaerts, W.

Experimental validation of a HAM-BES co-simulation approach
(2017) *Energy Procedia*, 139, pp. 517-523.

Abstract
High levels of humidity in buildings lead to building pathologies. Moisture also has an impact on the indoor air quality and the hygrothermal comfort of the building's occupants. To better assess these pathologies, it is necessary to take into account the heat and moisture transfer between the building envelope and its indoor ambience. In this work, coupled heat, air and moisture transfer model in multilayer walls (HAM) was established. Thereafter, the HAM model is coupled dynamically to a building behavior code (BES). The coupling concerns a co-simulation between COMSOL Multiphysics and TRNSYS softwares. Afterward, the HAM-BES co-simulation accuracy was verified by conducting an experimental validation using an experimental device devoted to assess the hygrothermal response of building walls under several hygrothermal conditions. The comparison between numerical and experimental results showed good agreement with acceptable errors margins. © 2017 The Authors. Published by Elsevier Ltd.

Author Keywords
experimental validation; HAM-BES co-simulation; Heat; mass transfers

Index Keywords
Air quality, Buildings, Computer software, Heating, Indoor air pollution, Mass transfer, Meteorological problems, Moisture, Moisture control, Multilayers, Pathology; Air and moisture transfer, Building envelopes, Comsol multiphysics, Cosimulation, Experimental devices, Experimental validations, Heat and moisture transfer, Hygro-thermal conditions; Walls (structural partitions)

2-s2.0-85040177879
Document Type: Conference Paper
Source: Scopus
Access Type: Open Access

5) Ferroukhi, M.Y., Belarbi, R., Limam, K., Bosschaerts, W.

Impact of coupled heat and moisture transfer effects on buildings energy consumption
(2017) *Thermal Science*, 21 (3), pp. 1359-1368. Cited 1 time.

Abstract
Coupled heat, air, and moisture transfers through building envelope have an important effect on prediction of building energy requirements. Several works were conducted in order to integrate hygrothermal transfers in dynamic buildings simulations codes. However, the incorporation of multidirectional hygrothermal transfer analysis in the envelope into building simulation tools is rarely considered. In this work, coupled heat, air, and moisture (HAM) transfer model in multilayer walls was established. Thereafter, the HAM model is coupled dynamically to a building behavior code (BES).The coupling concerns a co-simulation between COMSOL Multiphysics and TRNSYS software. Afterward, the HAM-BES co-simulation accuracy was verified. Then, HAM-BES co-simulation platform was applied to a case study with various types of climates (temperate, hot and humid, cold and humid). Three simulations cases were carried out. The first simulation case consists of the TRNSYS model without HAM transfer model. The second simulation case, 1-D HAM model for the envelope was integrated in TRNSYS code. For the third one, 1-D HAM model for the wall and 2-D HAM model for thermal bridges were coupled to the thermal building model of TRNSYS. Analysis of the results confirms the significant impact of 2-D envelope hygrothermal transfers on the indoor thermal and moisture behavior of building as well as on the energy building assessment. These conclusions are shown for different studied climates. © 2017 Society of Thermal Engineers of Serbia.

Author Keywords
Energy performance; HAM-BES co-simulation; Hygrothermal transfer; Multidimensional effect

2-s2.0-85025432155
Document Type: Article
Source: Scopus

6) Baldani, F., Bosschaerts, W.

Design of a Hot-wire Rake for Measurements in Temperature-varying Flow Fields
(2016) *Energy Procedia*, 85, pp. 35-43.

Abstract
The present work deals with the design of a multi-probe support for simultaneous multi-point measurements. The article

analyses the effects of the insertion of a hot-wire rake in a test section where the flow shows not constant temperatures. The constant temperature anemometry technique is known to have a relevant sensibility to both fluid temperature variations during the measurements and temperature differences between calibration and testing conditions. Therefore a technique to take into account for the flow temperature drifts influence is proposed and validated. The temperature correction presented allows reducing the influence of temperature variations on the measured velocity. This is achieved introducing a correction term, namely the temperature-loading factor that can be optimized for the individual probe and measurement conditions. The correction also takes into account for variations in fluid property values (Prandtl number, dynamic viscosity, heat conductivity and density) with temperature. © 2016 The Authors.

Author Keywords
Constant temperature anemometry; non-uniform temperature flow field; probes rak; temperature correction calibration

Index Keywords
Anemometers, Calibration, Flow fields, Prandtl number, Probes, Temperature, Temperature distribution; Constant temperature, Dynamic viscosities, Measurement conditions, Nonuniform temperature, Temperature correction, Temperature differences, Temperature loadings, Temperature variation; Sustainable development

2-s2.0-84964088526
Document Type: Conference Paper
Source: Scopus
Access Type: Open Access

7) Janssens, B., Bosschaerts, W.

Study of the Airflow Window
(2016) *Energy Procedia*, 85, pp. 303-310.

Abstract
Multiple-skin facades are popular in the construction of fully-glazed buildings since they have the potential to reduce the heating and cooling load of the building. To make optimal use of multiple-skin facades, their performance needs to be calculated during the design phase. The study of the flow in such a façade is the purpose of this study.

Author Keywords
CFD; Multiple skin façade; ventilation

Index Keywords
Computational fluid dynamics, Ventilation; Design phase, Heating and cooling loads; Sustainable development

2-s2.0-84964043770
Document Type: Conference Paper
Source: Scopus
Access Type: Open Access

8) Bouache, T., Limam, K., Bosschaerts, W.

New thermal parameters identification approach applied to the thermal renovation of buildings
(2015) *Energy and Buildings*, 104, art. no. 5996, pp. 156-164. Cited 3 times.

Abstract
Abstract In this article, a new technique for identification of the thermal parameters of simplified mathematical model for an existing building is presented. This thermal simulation model allows the performance analysis of a building. The model is based on the electrical analogue with resistances and capacitors (RC) used for the simulation of the unsteady heat flow in the building. The model is validated with the results of a TRNSYS simulation. The obtained accuracy lies within a 7% interval. This tool is then used in an inverse method in order to determine the value of the electrical (RC) equivalent thermo physical characteristics of the building envelope. The model for the determination is based upon the least squares method, between the indoor measured temperatures and the model response, using an inverse iterative algorithm (Reflective Newton). © 2015 Elsevier B.V.

Author Keywords
Building; Identification; Optimization; Thermal

Index Keywords
Abstracting, Algorithms, Buildings, Heat resistance, Identification (control systems), Inverse problems, Iterative methods, Least squares approximations, Optimization; Iterative algorithm, Least squares methods, Measured temperatures, Performance analysis, Physical characteristics, Simplified mathematical model, Thermal, Thermal simulations; Parameter estimation

2-s2.0-84937899507
Document Type: Article
Source: Scopus

9)

Janssens, B., Bányai, T., Limam, K., Bosschaerts, W.

Finite element assembly using an embedded domain specific language
(2015) *Scientific Programming*, 2015, art. no. 797325, .

Abstract
In finite element methods, numerical simulation of the problem requires the generation of a linear system based on an integral form of a problem. Using C++ meta-programming techniques, a method is developed that allows writing code that stays close to the mathematical formulation. We explain the specifics of our method, which relies on the Boost. Proto framework to simplify the evaluation of our language. Some practical examples are elaborated, together with an analysis of the performance. The abstraction overhead is quantified using benchmarks. Copyright © 2015 Bart Janssens et al.

Index Keywords
C++ (programming language), Computational linguistics, Computer programming languages, Linear systems, Numerical methods, Problem oriented languages; Embedded domain specific languages, Integral form, Mathematical formulation, Meta Programming, Writing codes; Finite element method

2-s2.0-84924157333
Document Type: Article
Source: Scopus
Access Type: Open Access

10) Baldani, F., Bosschaerts, W., Harmand, S., Arts, T.

Low speed numerical and experimental validation of a solving methodology for the inverse heat conduction problem by means of quantitative infra-red thermography
(2014) *10th European Conference on Turbomachinery Fluid Dynamics and Thermodynamics, ETC 2013*, pp. 708-718.

Abstract
The presented paper deals with the solution of the Inverse Heat Conduction Problem (IHCP) through the use of quantitative Infra Red thermography (QIRT) and proposes a solving methodology for the IHCP as a "ill-posed" problem. To solve the IHCP the surface temperature of a heat conducting body is used as boundary condition after measurement by means of an I.R. camera. The proposed methodology is first tested numerically and, subsequently, experimentally on a heated flat plate in a low subsonic speed wind tunnel. The "ill-posed" nature of the IHCP translates into a high sensibility to measurement errors, possibly leading to non-unique solutions. To reduce this sensibility a ridge regression based regularization methodology is proposed. Near-wall and free flow boundary conditions are imposed using Constant Temperature Anemometry (CTA). Results show good agreement between the proposed IHCP solution and reference cases, both for the numerical and the experimental analysis. Moreover, the proposed regularization applied for the experimental analysis is shown to enhance the accuracy of the obtained solution of the IHCP.

Index Keywords
Anemometers, Atmospheric temperature, Boundary conditions, Heat conduction, Problem solving, Regression analysis, Solution mining, Thermodynamics, Thermography (imaging), Wind tunnels; Conducting bodies, Constant temperature, Experimental analysis, Experimental validations, Heated flat plates, Inverse heat conduction problem, Non-unique solutions, Surface temperatures; Inverse problems

2-s2.0-84918544167
Document Type: Conference Paper
Source: Scopus

11) Nastase, I., Croitoru, C.V., Vartires, A.A., Gustiuc, M., Bosschaerts, W.

Measurement and questionnaires survey of the indoor environment quality in an emergency hospital from bucharest
(2014) *Indoor Air 2014 - 13th International Conference on Indoor Air Quality and Climate*, pp. 956-963.

Abstract
Data about overall perceived environmental quality were considered through questionnaires distributed to the medical staff and patients in a large hospital building and in an operating zone. Two types of questionnaires were used: for operating rooms and other areas like wards and medical and non-medical offices. In parallel, measurements of IEQ most important parameters were performed in the analyzed building. We monitored the air temperature, the operative temperature, the air speed, the radiant meant temperature, the relative humidity, the CO and CO2 level, the VOC level, and 31 diameters of aerosols between 0.35μm and 30μm. The questionnaires were filled in by 200 hospital occupants such as physicians, nurses and non-medical staff. The questions in this survey are mostly addressed to evaluate the indoor environmental quality and the implications on the medical activity. Regarding the air quality, it is perceived as low in some medical wards and relatively high in the operating zone. Measurements of air quality confirmed the results of the enquiry. Thermal comfort was found to be variable in function the occupants' activity level. Measured values of the Predicted Mean Vote and of the Draft Risk were confronted with data collected from questionnaires. A correlation of the variation of the measured levels of CO2 and dust particles concentration between the operating zone and its adjacent zones was also observed. The overall conditions at workplace are perceived as "good" at the majority of interrogated personnel, but we have found an important percentage, who complains about "poor" IEQ.

Author Keywords

Field survey; Healthcare facility; Indoor environment quality; Indoor perceived comfort

Index Keywords
Air quality, Carbon dioxide, Hospitals, Indoor air pollution, Risk assessment, Thermal comfort; Environmental quality, Field surveys, Healthcare facility, Indoor environment quality, Indoor environmental quality, Indoor perceived comfort, Operative temperature, Predicted mean vote; Surveys

2-s2.0-84924691818
Document Type: Conference Paper
Source: Scopus

12) Mattheijssens, J., Bosschaerts, W., Marcel, J.-P., Lefeber, D.

Performance of heaving and passively pitching hydrofoils
(2013) *43rd Fluid Dynamics Conference*, .

Abstract
Bio-inspired ship propulsion systems often consist of a hydrofoil in combined heaving and pitching motion. In order to reduce the number of actuators from two to one, the pitching motion in our design happens passively under the influence of the hydrodynamic moment on the hydrofoil, and is counteracted by a joint with adaptable stiffness. Since passive pitching is a relatively new development in bio-inspired ship propulsion, a proof of concept is needed. Further, it is not well known whether resonance is good or bad for the performance. The scaled prototype of a new, bio-inspired, heaving and passively pitching ship propulsor was built and tested. A new mechanism for passive pitching, that allows adaptation of the natural frequency was developed. The thrust and lift forces, as well as the pitching angle were measured for a range of heaving and natural frequencies. This article presents the design of the propulsion system and the results of a series of measurements. Resonance is possibly beneficial for maximal thrust production, but it would happen at a natural frequency outside the possibilities of the experiment. The highest thrust-to-lift ratio, a measure for the effciency, occurs at high heaving and low natural frequency, far away from resonant behaviour. Hence, passive pitching works, and the optimal natural frequency depends on the goal of the design: maximal thrust or maximal effciency.

Index Keywords
Number of actuators, Passive pitching, Pitching angle, Pitching hydrofoil, Pitching motion, Proof of concept, Propulsion system, Ship propulsion system; Design, Fluid dynamics, Hydrofoils, Ship propulsion, Ships; Natural frequencies

2-s2.0-84883507927
Document Type: Conference Paper
Source: Scopus

13) Leenknegt, S., Wagemakers, R., Bosschaerts, W., Saelens, D.

Numerical study of convection during night cooling and the implications for convection modeling in Building Energy Simulation models
(2013) *Energy and Buildings*, 64, pp. 41-52. Cited 6 times.

Abstract
When predicting the performance of night ventilation with Building Energy Simulation models, the results are highly sensitive to the selection of the convective heat transfer coefficient (CHTC). Therefore, a numerical study was conducted, simulating rooms with Fluent 12 for 8 h of flow time. The study was limited to 2D and results must be considered as qualitative. 14 initial conditions were applied to 4 geometries, including the thermal mass in floor and ceiling. The ACH was varied from 4 to 11 h-1 and initial ΔK between room air and supply air from 1.25 to 10 K. The flow development showed three flow phases, influencing the CHTC at the ceiling. The implications for the selection of CHTC in BES are discussed and applied in a sensitivity study in TRNSYS 17. The sensitivity on the thermal comfort was investigated through a parameter variation, using convection correlations from literature. When comparing with the internal CHTC calculation in TRNSYS, the usage of natural convection correlations increased the predicted weighted overheating hours at 4 and 12 ACH respectively with 18 K h (19%) and 105 K h (12%), whereas forced convection correlations reduced this at 4 and 12 ACH respectively with 30 K h (11%) and 210 K h (29%). © 2013 Elsevier B.V.

Author Keywords
Building Energy Simulation; CFD; Convection correlation selection algorithm; Convective heat transfer coefficient; Night ventilation

Index Keywords
Building energy simulations, Convection correlation, Convective heat transfer Coefficient, Convective heat transfer coefficients, Initial conditions, Night ventilation, Selection algorithm, Sensitivity studies; Computational fluid dynamics, Heat transfer coefficients, Sensitivity analysis; Computer simulation

2-s2.0-84878438427
Document Type: Article
Source: Scopus

14) Bouache, T., Ginestet, S., Limam, K., Lindner, G., Bosschaerts, W.

Identification of thermal characteristics of a building
(2013) *Energy Procedia*, 42, pp. 280-288. Cited 3 times.

Abstract
The coupling of a direct thermal calculation with an optimization algorithm to achieve the identification of the thermal characteristics of a building structure is presented in this paper. The resolution of the direct thermal calculation is based on an electric network representation, based on a numerical solution using the finite differences method. The optimization model minimizes a criterion such as « least squares » between the wished temperatures inside the building and the model respond (time domain) by an inverse iterative algorithm « Reflective Newton ». The proposed optimization model is then validated with an experimental case, a closed wooden structure with one heated side. © 2013 The Authors. Published by Elsevier Ltd.

Author Keywords
Building; Experimental; Optimization; Reflective Newton; Thermal

2-s2.0-84898744749
Document Type: Conference Paper
Source: Scopus
Access Type: Open Access

15) Nikiforova, T., Savytskyi, M., Limam, K., Bosschaerts, W., Belarbi, R.

Methods and results of experimental researches of thermal conductivity of soils
(2013) *Energy Procedia*, 42, pp. 775-783. Cited 9 times.

Abstract
To meet the challenges of earth sheltered and green roof buildings, application of the heat pumps that use the heat of soil it is necessary to have the thermo physical characteristics of the soils. The studies in this field are extremely insufficient. The purposes of this research are to research the thermo physical characteristics of different soil types and to develop methods for the soils thermal conductivity determination. The paper sets out the methodology of experimental studies of soils thermal conductivity. The analytical dependence for the heat conductivity coefficient determination for different types (sand, clay and loam) and humidity of soil is obtained. The dependence can be used for thermal-technical calculations of earth sheltered buildings. © 2013 The Authors. Published by Elsevier Ltd.

Author Keywords
Building; Conductivity; Earth sheltered; Experimental; Soil; Thermal

2-s2.0-84898732536
Document Type: Conference Paper
Source: Scopus
Access Type: Open Access

16) Leenknegt, S., Wagemakers, R., Bosschaerts, W., Saelens, D.

Numerical sensitivity study of transient surface convection during night cooling
(2012) *Energy and Buildings*, 53, pp. 85-95. Cited 10 times.

Abstract
The energy performance of night cooling depends largely on the convective heat exchange between thermal mass and room air. This is assessed with BES models, although they have an inaccurate treatment of surface convection by using surface-averaged values for the convective heat transfer coefficient, assuming perfectly mixed air as well as simplified dynamical behavior. Therefore, a clear insight in the local and transient behavior of the air-mass system during night ventilation is essential. This is studied here through transient 2D CFD simulations including conjugate heat transfer. A discussion of the transient flow development and resulting surface convection of one case is combined with a sensitivity study. This study analyzes the influence of eight modeling choices, namely discretization, near wall treatment, simulation time step, turbulence model, conjugate heat transfer, radiation, inlet and outlet location and geometry. It was found that the convective surface heat flux during night cooling can vary greatly over time. This transient behavior is therefore of great importance for the simulation of buildings with night ventilation, as well as for the design of night ventilation systems. The results are nuanced by the influence of different modeling choices on flow development. © 2012 Elsevier B.V.

Author Keywords
CFD modeling; Conjugate heat transfer; Convection; Night ventilation; Radiation; Unsteady RANS

Index Keywords
CFD modeling, CFD simulations, Conjugate heat transfer, Convective heat, Convective heat transfer Coefficient, Discretizations, Dynamical behaviors, Energy performance, Near-wall treatment, Night ventilation, Numerical sensitivity, On flow, Outlet location, Room air, Sensitivity studies, Simulation time, Surface convection, Surface heat fluxes, Thermal mass, Transient behavior, Transient flow, Unsteady RANS; Computational fluid dynamics, Heat convection, Heat radiation, Turbulence models, Ventilation; Cooling

2-s2.0-84864245395
Document Type: Article

Source: Scopus

17) Marinus, B.G., Bosschaerts, W., Roger, M.

Aerodynamic study of a 'humpy' propeller
(2012) *International Journal of Engineering Systems Modelling and Simulation*, 4 (1-2), pp. 27-35.

Abstract
A detailed aerodynamic study of a 'humpy' high-speed propeller is presented. This propeller is the result of a bi-disciplinary optimisation procedure and features blade segments of wider chord bordered by narrow segments. The aerodynamic consequences of these regions are investigated and correlated to the aeroacoustic properties by comparison to an equivalent blade without hump. Copyright © 2012 Inderscience Enterprises Ltd.

Author Keywords
Aeroacoustics; Aerodynamics; Chord; Propeller

Index Keywords
Chord, High-speed, Optimisations; Aeroacoustics, Propellers; Aerodynamics

2-s2.0-84857287834
Document Type: Article
Source: Scopus

18) Mattheijssens, J., Marcel, J.-P., Bosschaerts, W., Lefeber, D.

Oscillating foils for ship propulsion
(2012) *WIT Transactions on Ecology and the Environment*, 160, pp. 139-147.

Abstract
The high propulsive efficiency, the fast manoeuvrability and the low noise production of the propulsion of marine animals inspired the development of a new ship propeller. This text describes the design of a flapping foil ship propeller and the experiments performed on it. The flapping foil propeller mimics the tail fin of fish that swim at high speed, like tunas or sharks, in at least two ways: the hydrodynamics and the resonant driving mechanism. The motion of the foil is a combination of a heaving and a pitching oscillation, with a phase difference. The wake behind the tail of a fish has a special structure called the reversed von Karman street. If the motion parameters are well chosen, the wake behind the flapping foil has a similar structure, resulting in positive thrust force and high propulsive efficiency. The driving mechanism uses flexibility to exclude the need for one of the two actuators. The influence of the free surface and the oscillation frequency on the performance are investigated. © 2012 WIT Press.

Author Keywords
Biomimetics; Oscillating foil; Ship propulsion; Swimming

Index Keywords
experimental study, oscillation, performance assessment, ship design; Animalia, Chondrichthyes, Scombridae

2-s2.0-84865741301
Document Type: Article
Source: Scopus

19) Leenknegt, S., Wagemakers, R., Bosschaerts, W., Saelens, D.

Improving the modelling of surface convection during natural night ventilation in building energy simulation models
(2011) *Proceedings of Building Simulation 2011: 12th Conference of International Building Performance Simulation Association*, pp. 2233-2240. Cited 4 times.

Abstract
The performance of night ventilation to cool buildings is highly sensitive to the convective surface heat flux. As a result, simulations in BESmodels may largely over- or underestimate the real cooling potential of this technique. To assess this, a series of transient 2D CFD-simulations, including thermal mass in floor and ceiling, are made with variation on ACH, inlet temperature and inlet location. It is shown that the location of the inlet strongly influences the surface averaged convective surface heat transfer coefficients at the ceiling. The prediction of the transition from forced to natural convection is important. It is shown that the dimensionless Richardson number at the inlet could be a good indicator.

Index Keywords
CFD simulations, Cooling potential, In-buildings, Inlet temperature, Natural night ventilation, Night ventilation, Richardson number, Surface convection, Surface heat fluxes, Surface heat transfer coefficient, Thermal mass; Computer simulation; Buildings

2-s2.0-84870223840

Document Type: Conference Paper
Source: Scopus

20) Marinus, B.G., van den Braembussche, R.A., Bosschaerts, W., Roger, M.

Multidisciplinary optimization of propeller blades: Focus on the aeroelastic results
(2011) *47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit 2011*, . Cited 2 times.

Abstract
Concurrent aerodynamic, aeroacoustic and aeroelastic optimization of transonic propeller blades is performed with a Multi-Objective Differential Evolution technique. The optimization process relies on a metamodel to deliver performance estimates as well as on recurrent Computational Fluid Dynamics, Computational Hybrid Aeroacoustics and Computational Structural Mechanics simulations in order to safeguard the accuracy. The innovative design parameters for the radial distributions of sweep, twist, chord and thickness as well as for the shape of the two airfoil sections used to manufacture the blade, consist in the control points of a b-spline parameterization of these curves. The optimization results are discussed in terms of aerodynamic and aeroelastic performances with a limited discussion of the aeroacoustic behavior. © 2011 by B.G. Marinus, M. Roger, R.A. Van den Braembussche and W. Bosschaerts.

Index Keywords
Aeroacoustic behavior, Aeroelastic optimization, Computational structural mechanics, Innovative design, Multi-disciplinary optimizations, Multi-objective differential evolutions, Radial distributions, Transonic propellers; Aerodynamics, Computational aeroacoustics, Computational fluid dynamics, Design, Evolutionary algorithms, Multiobjective optimization, Propellers, Propulsion; Aeroelasticity

2-s2.0-84880647305
Document Type: Conference Paper
Source: Scopus

21) Marinus, B.G., Roger, M., Van den Braembussche, R.A., Bosschaerts, W.

Multidisciplinary optimization of propeller blades: Focus on the aeroacoustic results
(2011) *17th AIAA/CEAS Aeroacoustics Conference 2011 (32nd AIAA Aeroacoustics Conference)*, . Cited 11 times.

Abstract
Concurrent aerodynamic, aeroacoustic and aeroelastic optimization of transonic propeller blades is performed with a Multi-Objective Differential Evolution technique. The optimization process relies on a metamodel to deliver performance estimates as well as on recurrent Computational Fluid Dynamics, Computational Hybrid Aeroacoustics and Computational Structural Mechanics simulations in order to safeguard the accuracy. The innovative design parameters for the radial distributions of sweep, twist, chord and thickness as well as for the shape of the two airfoil sections used to manufacture the blade, consist in the control points of a b-spline parameterization of these curves. The optimization results are discussed in terms of aerodynamic and aeroacoustic performances with a limited discussion of the aeroelastic behavior. © 2011 by the author(s).

Index Keywords
Aeroacoustic performance, Aeroelastic behavior, Aeroelastic optimization, Computational structural mechanics, Multi-disciplinary optimizations, Multi-objective differential evolutions, Radial distributions, Transonic propellers; Aerodynamics, Aeroelasticity, Computational fluid dynamics, Design, Evolutionary algorithms, Multiobjective optimization, Propellers; Computational aeroacoustics

2-s2.0-84883127793
Document Type: Conference Paper
Source: Scopus

22) Vyvey, P., Bosschaerts, W., Villace, V.F., Paniagua, G.

Study of an airbreathing variable cycle engine
(2011) *47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit 2011*, . Cited 1 time.

Abstract
This paper describes the simulation of the Revolutionary Turbine Accelerator in the software EcosimPro. The Revolutionary Turbine Accelerator is a Variable Cycle Engine developed by NASA and General Electric in frame of the Next Generation Launch Technology program. A first simulation was done in EcosimPro by the Von Karman Institude; this paper in particular describes a simulation done using libraries from the European Space and Propulsion System Simulation. Results of the simulation are described and compared to results from the first simulation. Based on these results, a weight analysis of the Revolutionary Turbine Accelerator was performed. © 2011 by the American Institute of Aeronautics and Astronautics, Inc. All rights reserved.

Index Keywords
Air breathing, General electrics, Next generation launch technologies, Propulsion system, Revolutionary turbine accelerators, Variable-cycle engines, Von Karman, Weight analysis; Engines, NASA, Propulsion, Turbines; Computer software

2-s2.0-84880677994
Document Type: Conference Paper
Source: Scopus

23) Recker, E., Bosschaerts, W., Hendrick, P.

Large Eddy Simulation of mixing in a round jet in cross-flow
(2009) *39th AIAA Fluid Dynamics Conference*, art. no. 2009-3561, . Cited 1 time.

Abstract
With the final objective of optimizing the "Micromixing" combustion principle with means of the commercial CFD code STAR-CD, Large Eddy Simulation (LES) is used to study passive scalar transport and mixing in a round jet in a laminar cross-flow. Simulations were performed at a jet to cross-flow momentum ratio of 5.7, and a Reynolds number of 5000 based on the jet velocity and jet exit diameter. An attempt is made to provide a criterion for optimal structured meshing for Jets in Cross-flow (JICF). The performance of a structured grid based on the Taylor microscales is investigated and has been found successful. Mean and turbulent statistics are compared to data from the experiments by Su & Mungal (2004) and to Direct Numerical Simulation (DNS) performed by Muppidi & Mahesh (2006-2007). The mean scalar field from the simulation shows a very good agreement with the experimental and the DNS results. The fluctuating field terms show some differences. Given the uncertainties in the experimental configuration, overall, the agreement is quite reasonable. This study confirms the ability of the commercial CFD code STAR-CD to reproduce complex flow phenomenon. More generally, the simulation rational will form the baseline for future "Micromixing" combustion simulations. Copyright © 2009 by the authors.

Index Keywords
CFD codes, Combustion simulations, Complex flow, Cross flows, Exit diameter, Final objective, Fluctuating fields, Jet velocities, Micro-mixing, Micro-scales, Momentum ratio, Passive scalars, Round jets, Scalar fields, STAR-CD, Structured grid, Turbulent statistics; Atmospheric boundary layer, Combustion, Computational fluid dynamics, Fluid dynamics, Gas dynamics, Internet protocols, Large eddy simulation, Mixing, Optimization, Reynolds number; Flow simulation

2-s2.0-78349284425
Document Type: Conference Paper
Source: Scopus

24) Marinus, B., Roger, M., Van Den Braembussche, R., Bosschaerts, W.

Truncated method for propeller noise prediction up to low supersonic helical tip Mach numbers
(2009) *15th AIAA/CEAS Aeroacoustics Conference (30th AIAA Aeroacoustics Conference)*, art. no. 2009-3330, . Cited 5 times.

Abstract
The present paper addresses a simple truncation technique applied to cope with the sonic singularity so that noise from propellers can be computed in the subsonic as well as transonic and low supersonic domain at low numerical cost. Based on Farassat's 1A formulation of the Ffowcs Williams-Hawkings (FW-H) acoustic analogy, the present method computes the pressure signal for loading and thickness noise from steady RANS computations for arbitrary observer locations, by a retarded-time approach in the time-domain. For cases where the sonic singularity does not occur, the method consists of Farassat's 1A formulation; in cases where the sonic singularity occurs, it switches to an approximate prediction. The results obtained with this truncated method are compared with a series of experimental results over a wide range of operating conditions for two advanced propfan blade designs. The comparisons state on the validity of the method for the relative assess- ment of different designs. Being inexpensive and reliable, though approximate, it is suited for propeller optimization in a multi-disciplinary environment. Copyright © 2009 by the American Institute of Aeronautics and Astronautics, Inc.

Index Keywords
Acoustic analogy, Blade design, Multi-disciplinary, Numerical costs, Operating condition, Pressure signal, Propeller noise, Thickness noise, Time domain, Truncation techniques, Williams; Aeroacoustics, Design, Mach number, Propellers; Time domain analysis

2-s2.0-78149456613
Document Type: Conference Paper
Source: Scopus

25) Robinson, A.E., Funke, H.H.-W., Wagemakers, R., Grossen, J., Bosschaerts, W., Hendrick, P.

Numerical and experimental investigation of a micromix combustor for a hydrogen fuelled μ-scale gas turbine
(2009) *Proceedings of the ASME Turbo Expo*, 5, pp. 253-261. Cited 2 times.

Abstract
This last decade has shown an increased interest in the downsizing of gas turbines to micro-scale. Their potential for high energy density makes them extremely attractive for small scale high power units as alternative to traditional unwieldy accumulators or as thrust systems in small robots and unmanned aerial vehicles (UAVs). Beneath great challenges with the rotating parts at this small scale, another crucial item is in fact the combustion chamber needed for a safe and reliable

operation. This paper presents a study to an alternative approach in μ-scale hydrogen combustion. The burning principle is based upon the so-called inverse micromix injection. In this non-premixed design, hydrogen fuel is introduced through a porous metal and injected in the axial direction into the combustion chamber. A CFD-model has been implemented to parameterise the different geometrical aspects of the combustion chamber and is set up as a 2D axis-symmetric model to allow for a rapid optimisation of the parameters. The flow calculations are done with a commercial CFD-software. The final optimised geometry showed stable combustion, a well suited temperature profile and acceptable wall temperatures. An overview on the influence of the critical design parameters for the different geometries is presented. Experimental investigations comprise a set of mass flow variations coupled with a variation of the equivalence ratio for each mass flow but always at ambient pressure conditions. With the data obtained by an exhaust gas analysis, a full characterisation concerning combustion efficiency and stability of the burning principle is possible. Combined with the wall temperature measurements, these results lead to a further validation of the CFD model. Copyright © 2009 by ASME.

Index Keywords
Alternative approach, Ambient pressures, Axial direction, CFD models, CFD-model, Characterisation, Combustion efficiencies, Critical design parameters, Different geometry, Equivalence ratios, Experimental investigations, Flow calculations, Geometrical aspects, High energy densities, High-power, Hydrogen combustion, Hydrogen-fuelled, Mass flow, Micro-scales, Non-premixed, Optimisations, Porous metal, Reliable operation, Small robots, Small scale, Symmetric model, Temperature profiles, Thrust systems, Wall temperatures; Combustion chambers, Combustors, Computational fluid dynamics, Gas turbines, Hydrogen, Hydrogen fuels, Mass transfer, Remotely operated vehicles, Temperature measurement, Turbomachinery, Unmanned aerial vehicles (UAV); Combustion

2-s2.0-77953182665
Document Type: Conference Paper
Source: Scopus

26) Bosschaerts, W., Suy, O., Marinus, B.

Testing renewable energy equipment: Space heating and warm sanitarian water production Setup of a test facility (2003) *ESTECH 2003: 49th Annual Technical Meeting and Exposition of the Institute of Environmental Science and Technology. Proceedings Constamination Control Design, Test, and Evaluation Product Reliability*, pp. 387-397.

Abstract
Renewable energies are nowadays in the global spotlight. They can be used to generate electrical power on a large scale, but one should not forget domestic applications. Testing renewable energy equipment can be done outside, but for obvious reasons this most be done indoor also. Therefore one needs to simulate sunlight and thus lamps must be used. In order to fulfill the conditions imposed by the international standards, one must carefully examine what type of lamps can be chosen and how those lamps must be positioned in space. The present effort describes a methodology to set up an indoor test facility.

Author Keywords
Heat transfer; Irradiance model; Lamp; Renewable; Sunlight simulation

Index Keywords
Computer simulation, Energy utilization, Heat transfer, Mathematical models, Performance, Problem solving, Thermodynamics; Irradiance models, Sunlight simulation; Renewable energy resources

2-s2.0-1842611877
Document Type: Conference Paper
Source: Scopus

27) Bosschaerts, W., Suy, O., Marinus, B.

Testing renewable energy equipment: Space heating and warm sanitarian water production setup of a test facility (2003) *European Journal of Mechanical and Environmental Engineering*, 48 (2), pp. 109-120.

Abstract
Renewable energies are nowadays in the global spotlight. They can be used to generate electrical power on a large scale, but one should not forget domestic applications. Testing renewable energy equipment can be done outside, but for obvious reasons this most be done indoor also. Therefore one needs to simulate sunlight and thus lamps must be used. In order to fulfill the conditions imposed by the international standards, one must carefully examine what type of lamps can be chosen and how those lamps must be positioned in space. The present effort describes a methodology to set up an indoor test facility.

Author Keywords
Heat transfer; Irradiance model; Lamp; Renewable; Sunlight simulation

Index Keywords
Computer simulation, Electric lamps, Electric power generation, Equipment testing, Heat transfer, Large scale systems, Space heating, Standards; Irradiance model, Renewable energy equipment, Sunlight; Renewable energy resources

2-s2.0-0037810522

Document Type: Article
Source: Scopus

28) Bosschaerts, W., Suy, O.

Considerations with respect to renewable energy applications in Belgium and Europe
(2002) *European Journal of Mechanical and Environmental Engineering*, 47 (2), pp. 99-108.

Abstract
The sun is the ultimate source of coal, oil, and natural gas which is a fossilized solar energy, collected and stored in sedimentary rocks over hundreds of millions of years. Once they are used up, it will take a similar length of time for them to be replenished. Thus, people are still urged to use renewable energy sources because three reasons. One of the main reason is to simply reduce pollution in the environment.

Index Keywords
Biomass, Costs, Electricity, Energy conservation, Energy utilization, Fossil fuels, Geothermal energy, Hydroelectric power, Nuclear fuels, Power generation, Solar energy, Wind power; Belgium, Europe, Non-renewable resources, Solar heating system, Warm sanitarian water; Renewable energy resources

2-s2.0-0036610191
Document Type: Article
Source: Scopus

29) Bosschaerts, W., Servais, Ir.P.

Simulations des écoulements autour des microUAV: Correction des résultats obtenus en laboratoire
(2001) *European Journal of Mechanical and Environmental Engineering*, 46 (2), pp. 137-141.

2-s2.0-0035361731
Document Type: Article
Source: Scopus

30) Bosschaerts, W., Decuypere, R.

Experimental study of a steam turbine blade wake
(1997) *Proceedings of the 1997 2nd European Conference on Turbomachinery - Fluid Dynamics and Thermodynamics, Antwerpen, Belgium, 5-7 March 1997*, pp. 89-98. Cited 1 time.

Abstract
The flow downstream the trailing edge of a steam turbine is very complex. The behavior of the flow can, at this moment only be studied experimentally, since even for one phase flows the conventional mixing length and 2-equations turbulence models are unable to simulate the wake flow correctly. In this paper an attempt is made to decompose the complex problem into smaller separate problems. Therefore a model blade is tested in a steamtunnel. The thickness of the model blades trailing edge is chosen such that the ratio between the blade chord and this thickness is 0.02 (what is a typical value for real sized turbine blades), however the training edge thickness of the model blade equals 5 mm such that the flow phenomena are more visible: in size as well as in frequency. With a very fast visualisation technique the unsteadiness of the flow is shown when the flow at the trailing edge is in near sonic (sub- and super-) conditions. For supersonic Mach numbers (above 1.2) the base pressure region appears much more stable and can be seen as a combination of two backward facing step flows. Therefore the backward facing step was tested in the steam tunnel and the position of the reattachment point as well as the strength of the aerodynamic shocks determined. Finally the combination of the backward facing step and the model blade allows a more realistic simulation of the flow at the trailing edge of a real transonic steam turbine blade since on one side of the blade an aerodynamic shock interacts with the boundary layer.

Index Keywords
blade, conference proceeding, experimental study, steam turbine, wake

2-s2.0-0031291431
Document Type: Conference Paper
Source: Scopus

31) Bosschaerts, Walter

Calculation of the performance of a blade cascade
(1988) *European Journal of Mechanical and Environmental Engineering*, 32 (3-4), pp. 99-105.

Abstract
In this article it is proven that even very classical methods using modern calculation tools can solve some problems very efficiently. Those modern tools can sometimes transform complex procedures into elegant algorithms. In this text some

ways are shown to determine the performances of a blade. In some cases a very classical method can be used: in this contribution it is shown when and how it can be done.

Index Keywords
Mathematical Techniques--Algorithms; Turbomachinery

2-s2.0-0024027851
Document Type: Article
Source: Scopus

32) Bosschaerts, W.R.M., Sieverding, C.H., Arts, T.

COMPARISON OF TWO EXPLICIT EULER SOLVERS WITH A HYBRID APPROACH TO CALCULATE TRANSONIC CASCADE FLOWS WITH EMBEDDED SHOCKS.
(1987) *I Mech E Conference Publications (Institution of Mechanical Engineers)*, pp. 323-329.

Abstract
Numerical methods for calculating mixed subsonic-supersonic flows by solving the Euler equations are an integral part of transonic turbine design systems. Yet, there are some problems when using an Euler solver: the lack of conservation, the total pressure in subsonic regions, the failure of predicting accurately shock intensity and losses and a rather long computing time. At present the method of characteristics is still the only method to provide an accurate solution of supersonic flow fields. Hence a combination of this method with an Euler solver, providing correct starting conditions in the throat region, can help to overcome these problems. In this paper two different Euler solvers will be discussed and the hybrid method combining an Euler code with the method of characteristics are presented.

Index Keywords
FLOW OF FLUIDS - Transonic, MATHEMATICAL TECHNIQUES - Numerical Methods; EMBEDDED SHOCKS, EXPLICIT EULER SOLVERS, METHOD OF CHARACTERISTICS, RUNGE-KUTTA COMPARISON, TRAILING EDGE FLOW, TRANSONIC TURBINE DESIGN; TURBOMACHINERY

2-s2.0-0023561055
Document Type: Conference Paper
Source: Scopus

33) Bosschaerts, W.R.M., Sieverding, C.H., Arts, T.

Comparison of two explicit Euler solvers with a hybrid approach to calculate transonic cascade flows with embedded shocks.
(1987) ((Cambridge, U.K.: Sep. 1-3, 1987), Bury St. Edmunds, U.K., Mech. Engng. Publications Ltd., 1987, Pap), .

Abstract
Numerical methods for calculating mixed subsonic/supersonic flows by solving the Euler equations are an integral part of transonic turbine design systems. There are some problems when using an Euler solver: the lack of conservation the total pressure in subsonic regions, the failure of predicting accurately shock intensity and losses and a rather long computing time. At present the method of characteristics is still the only method to provide an accurate solution of supersonic flow fields. Hence a combination of this method with an Euler solver, providing correct starting conditions in the throat region, can help to overcome these problems. In this paper two different Euler solvers will be discussed and the hybrid method combining an Euler code with the method of characteristics are presented.

2-s2.0-85040887092
Document Type: Article
Source: Scopus

34) Decuypere, R., Bosschaerts, W.

UTILISATION OF LASER DOPPLER AND LASER TRANSIT VELOCIMETERS IN SUPERHEATED, SATURATED AND WET STEAM FLOWS.
(1985) *American Society of Mechanical Engineers, Fluids Engineering Division (Publication) FED*, 33, pp. 35-42.

Abstract
A laser doppler (LDA) and two types of laser transit velocimeters (LTV) have been used in steam. The facility comprises a two-dimensional tunnel and a small instructional turbine. For the LTV's only the back scatter alignment is applied, while both forward and back scatter configurations are examined for the LDA. In contrast to the LTV, the laser doppler system requires seeding. A pneumatic atomizer produces water droplets upstream of the measuring station. A computer program accounts for droplet evaporation. This allows the ideal initial droplet diameter to be calculated.

Index Keywords
ANEMOMETERS - Laser Applications, NOZZLES, STEAM - Fluid Dynamics; DROPLETS, SPRAY NOZZLE, VELOCITY DISTRIBUTION; VELOCIMETERS

2-s2.0-0022269320
Document Type: Conference Paper
Source: Scopus

35) Decuypere, R., Bosschaerts, W.

MICROCOMPUTERS AND APPROPRIATE SOFTWARE PERMIT ACCURATE PRESSURE DISTRIBUTION FROM LOW COST TRANSDUCERS.
(1984) pp. 1. 99-1. 115.

Abstract
Experimental flow research and process regulation need the pressure to be known in a considerable number of points of the flow field. Basically there are three possible ways of measuring a pressure cost price Firstly a pressure probe, connected to a transducer, may be mounted on a carriage in such a way that the probe head follows a specified path. For some applications the wall static pressure distribution is of a particular interest. In such cases it is common practice to scan the pressure holes by connecting them successively to a single transducer. The investment for a scanner and a single transducer may be considerably lower than for the third alternative, wherein each pressure tap is equipped with its individual transducer. Due to the uncertainty about the behaviour of a pneumatic scanner in such unfavourable conditions, the third possibility is sometimes advisable. Obviously, when the number of pressure taps is high, the transducer cost price becomes of the highest importance. Other consequences of this solution are a time consuming calibration procedure and cumbersome interfacing problems, on both soft and hardware levels, when data are to be transfered to a recording device. This technique is also very useful for investigation of instationary phenomena. This paper discusses various application considerations in terms of transfer functions, calibration of reference transducer, software descriptions, and related subjects. 2 refs.

Index Keywords
COMPUTER SOFTWARE, COMPUTERS, MICROPROCESSOR, FLOW OF FLUIDS - Pressure Measurement; PRESSURE DISTRIBUTION, PRESSURE TAPS, SINGLE TRANSDUCER, WALL STATIC PRESSURE; PRESSURE TRANSDUCERS

2-s2.0-0021728494
Document Type: Conference Paper
Source: Scopus