OĞUZ UZOL

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Department of Aerospace Engineering
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EDUCATION

Doctor of Philosophy, Aerospace Engineering, December 2000
The Pennsylvania State University, University Park, PA
Dissertation: "Novel Concepts and Geometries as Alternatives to Conventional Circular Pin Fins for Gas Turbine Blade Cooling Applications"
Thesis Advisor: Professor Cengiz Camci

Master of Science, Aeronautical Engineering, July 1995
Middle East Technical University, Ankara, Turkey
Thesis: "Quasi-Three Dimensional Numerical Design of Turbomachinery Blades"
Thesis Advisor: Professor Sinan Akmandor

Bachelor of Science, Aeronautical Engineering, July 1992
Middle East Technical University, Ankara, Turkey
Special Study: "Preliminary Design and Performance Analysis of a Turbojet Engine", 1992
Project Work: "GE-J79 Engine Compressor Performance Calculation and Optimization
At Low RPM values", 1st Air Support and Maintenance Center, Turkish Air Force, 1992

RESEARCH EXPERIENCE

Visiting Researcher

Whittle Laboratory, Department of Engineering, University of Cambridge, (Summer 2006).

Investigation of unsteady-wake separated boundary layer interaction using Particle Image Velocimetry.

Post-Doctoral Fellow

Department of Mechanical Engineering, Johns Hopkins University, Baltimore, MD (2001–2005). Supervisors: Professor Joseph Katz and Professor Charles Meneveau

Experimental investigation of complex flow phenomena within axial turbomachinery

Two-dimensional and Stereoscopic Particle Image Velocimetry measurements are performed within the entire second stage of a two-stage axial turbomachine. The experiments are performed in a facility that allows unobstructed view of the entire flow field, facilitated using transparent rotor and stator and a fluid that has the same optical index of refraction as the blades. Highly complex, unsteady, turbulent and three-dimensional flow phenomena such as wake-wake, wake-boundary layer, wake/blade-tip vortex interactions are investigated in

great detail. Distributions of both the turbulent and deterministic stresses are obtained within an entire turbomachinery stage.

Graduate Research Assistant
Department of Aerospace Engineering, Pennsylvania State University, University Park, PA (8/1996 – 12/2000). Advisor: Professor Cengiz Camci

Heat transfer and pressure loss characteristics of novel pin fin concepts

In-line and staggered arrays of short cylindrical pin fins with circular cross-sections are one of the most common types of internal cooling devices used for gas turbine blade cooling. This study investigates the heat transfer enhancement and pressure loss characteristics of various new pin fin shapes and concepts as alternatives to conventional circular pin fins. These include various elliptical pin fins such as Standard Elliptical Fin (SEF) and N fin (based on NACA symmetrical airfoil series) as well as various "Oscillator Fins", which are fluidic oscillators with a self-oscillating jet inside. Experiments include measurements of convective heat transfer coefficients on the endwall within the wakes using Liquid Crystal Thermography, total pressure loss surveys by Kiel probe traverses, Two-dimensional Particle Image Velocimetry (PIV) measurements within the wakes at mid-plane of the test section and flow visualization studies. Some computational results are also obtained using the commercial CFD package FIDAP by FLUENT Inc.

Aerodynamic loss characteristics of a turbine blade with trailing edge coolant ejection

The internal fluid mechanics losses generated between the blade plenum chamber and a reference point located just downstream of the trailing edge are investigated for a turbine blade trailing edge cooling system. The discharge coefficients are presented as a function of the free-stream Reynolds number, cut-back length, spanwise rib spacing, and chord-wise rib length. The results are presented in a wide range of coolant to free-stream mass flow rate ratios. Two-dimensional Particle Image Velocimetry experiments and total pressure surveys in the near wake of the blade are performed to investigate the external loss characteristics. Numerical simulations of the flow field are also performed for qualitative flow visualization purposes.

Research Assistant
Department of Aeronautical Engineering, Middle East Technical University, Ankara, Turkey (9/92 – 7/95). Advisor: Professor Sinan Akmandor.

Quasi-three-dimensional numerical design of turbomachinery blades

A very fast, loosely-coupled, quasi-three-dimensional design system is constructed for the preliminary prediction of the turbomachinery blade shapes. It is obtained by coupling a duct-flow solver and a blade-to-blade solver. The duct-flow solver is used for calculating the upstream and downstream radial evolutions of the flow variables. The blade-to-blade solver is a two-dimensional transonic Euler solver which uses intrinsic streamline grid, a cell-centered finite volume scheme and Newton-Raphson linearization technique. A sample design is accomplished for a rotor and a stator blade. The blade-to-blade solver is applied to two analytical test cases for the verification of the analysis and design capability and an experimental rotor test case for the verification of the modification of the code for the rotating frame of reference. Being an inviscid

solver and the lack of possibility of the three-dimensional effects due to the loose coupling of the duct-flow solver and the blade-to-blade solver are the main drawbacks of the method.

TEACHING EXPERIENCE

Instructor
Department of Aerospace Engineering, Middle East Technical University, Ankara, Turkey (2005-present),

AE 532 Advanced Aircraft Engine Design – Fall 2006
AE 334 Propulsion Systems I – Spring 2006
AE 709 Turbulence Modeling For Engineering Flows – Spring 2006
AE 261 Statics – Fall 2005

Turkish Military Academy, Ankara, Turkey
Fluid Mechanics – Spring 2006

Teaching Assistant
Department of Aerospace Engineering, Pennsylvania State University, University Park, PA

AERSP. 406W Structures and Dynamics Laboratory (Fall 1998, Spring 1999)
AERSP. 410 Aerospace Propulsion (Fall 1997).

Particle Image Velocimetry lectures and demonstrations for various classes such as:
AERSP. 508 Foundations of Fluid Mechanics
AERSP. 405W Aerodynamics Laboratory
AERSP. 412 Turbulent Flow

Teaching Assistant
Department of Aeronautical Engineering, Middle East Technical University, Ankara, Turkey (9/92 – 7/95)

AEE 334 Propulsion Systems I
AEE 435 Propulsion Systems II
AEE 474 Aircraft Engine Design

SUMMER INTERNS
Turkish Aerospace Industries (TAI), Ankara, Turkey (8/91 – 9/91)
1st Air Force Support and Maintenance Center, Eskisehir, Turkey (8/90 – 9/90)

PUBLICATIONS
(Please see the attached list)

AWARDS AND HONORS

"3D Measurements of the Mean Velocity and Turbulence Structure within the Near Wake of a Rotor Blade,", Soranna, F., Chow, Y. –C, Uzol, O., Katz, J., ASME Fluids Engineering Division, Knapp Award for the Best Paper in Conference, 2006.

"Preliminary Study of Active Flow Control Around An Isolated Airfoil"
Uzol, O., Klaput T., 1st Place in Engineering
12th Annual Graduate Research Exhibition
March 1997, Pennsylvania State University

NATO-A1 Scholarship, TUBITAK, July 1995

"Anti-Convulsion Effect of Valeriana Officinalis"
Uzol O., Orge O., Ankara Fen Lisesi, Honorable Mention in Chemistry,
Annual Research Exhibition among High School Students organized by TUBITAK
June 1988

PROFESSIONAL ASSOCIATIONS
Member of American Society of Mechanical Engineers (ASME)
Member of American Institute of Aeronautics and Astronautics (AIAA)

ACTIVITIES AND HOBBIES
Playing guitar.
Radio controlled modeling
Robotics
Scale modeling
Reading
History

REFERENCES

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