

COMMUNICATIONS
DE L'INSTITUT DE THERMIQUE APPLIQUÉE
DE L'ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE
PROF. DR. P. SUTER

- Nr. 1 *Albin Bölcs*: Theoretische und experimentelle Untersuchung der drallbehafteten Überschallströmung in einer Ringspaltdüse
- Nr. 2 *Jean-Claude Mévillot*: Risques d'obstruction, par de petites particules, des orifices d'aubes de turbines à gaz refroidies par film.
- Nr. 3 *A. J. T. Horváth*: Der Pumpvorgang von Verdichtern und Kreiselpumpen als nichtlineare Schwingung.
- Nr. 4 *Daniel Favrat*: Interaction entre une onde de choc oblique et une grille d'aubes fixes parcourues par un écoulement subsonique.
- Nr. 5 *A. Bölcs and T. Fransson*: Measuring Techniques in Transonic and Supersonic Cascades and Turbomachines (Proceedings of the Symposium held in Lausanne on November 18-19, 1976.)

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Nr. 5

Measuring Techniques in Transonic and Supersonic Cascades and Turbomachines

Proceedings of the Symposium held
in Lausanne on November 18-19, 1976

Editors

A. Bölcs and T. Fransson

JURIS-VERLAG ZÜRICH

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FOREWORD

The fourth meeting on "MEASURING TECHNIQUES IN TRANSONIC AND SUPERSONIC CASCADE FLOW" was held on the 18th and 19th november, 1976, at the EPF-LAUSANNE.

29 participants presented 19 contributions on the following topics: "Measuring with probes", "Laser anemometry in transonic fields", "New measuring techniques" "Instationary effects", followed by interesting discussions in a very open atmosphere, which is a characteristic of all these Symposia.

The following points, among others, revealed open problem areas, where further research is necessary: "High frequency flow field pulsation", "Measuring technique in instationary cascade flow", "Periodicity in plane cascades". Furthermore it was agreed on the importance of the severity and wide range of probe influence upon the flow field, when the probes extend through the whole channel. Thus wall measurements, global control and optical methods maintain their interest.

With the kind readiness of the authors, it is possible to print all contributions (with two exceptions, appearing as FFV-publications) in the present form, intended for distribution to the participants and other interested institutes. This limited publicity is chosen in order to preserve the spontaneity of the contributions to further meetings and the real workshop character with an active participation of everybody.

Dr. P.F. Chester, of Central Electricity Research Laboratories, has accepted to be the host for the next Symposium, which is to be held at Leatherhead, Surrey (England), in 1978/1979. Two to three years of interval was judged to be most useful by the participants. At this point, it may be of interest to give the list of all meetings held since the beginning, with a short mention of the topics:

1st Meeting, in 1969, at Von Karman Institute, Bruxelles
("Transonic cascades"; "Overpressure"; "Measurements behind cascades")

2nd Meeting, in 1971, at AVA, Göttingen
("Choice of measurement location"; "Instationary effects due to shock-boundary layer interaction")

3rd Meeting, in 1974, at ONERA, Paris
("Comparison of probe types"; "Blockage problems due probes")

4th Meeting, in 1976, at EPF-LAUSANNE
("Probes"; "Laser anemometry"; "New measuring techniques"; "Instationary effects")

For the EPF-L, it was an honour and a pleasure to act as an host at this meeting and to show that active transonic work is under way in Lausanne. We would like to express special thanks to Mr. Cosandey, President of the EPF-L, for financial support and to Dr. Bölcs and Mr. Fransson for all the organisation work.

Professor Dr. P. SUTER

CONTENT	page
C. Güdel	9
H. Gallus D. Bohn	31
F. Kreitmeier	55
K. Einsfeld	65
P. Schimming	73
C. Sieverding	83
H. Starken	87
A. Bölcs T. Fransson	103
J. Leynaert	117
R. Kiock	133
V.T. Forster	141
N.B. Wood	141

O. Lawaczeck	Comparison of 2-D-cascade-tests done in the VKI and AVA Cascade wind-tunnels	153
H. Heinemann	Comparison of 2-D and rotation measurements of cascades with flat plate profiles	155
G. Bois F. Leboeuf A. Compte K. D. Papailiou	Measurements of secondary flows in a transonic axial-flow compressor	157
K. Einsfeld	Analysis of the unsteady flow in a turbine stage with different methods	173

LIST OF PARTICIPANTS

BOHN Dieter	Dipl. -Ing. Institut für Strahlantriebe & Turbomaschinen Technische Universität Aachen 55 Templergraben (Postfach) D-5100 AACHEN (W. GERMANY)
BOIS Gérard	Ingénieur Laboratoire de Mécanique des Fluides Ecole Centrale de Lyon 36 Rte de Dardilly F-69130 ECULLY (FRANCE)
BÖLCS Albin	Dr. -Ing. Institut de Thermique appliquée EPF-L 33 av. de Cour CH-1007 LAUSANNE (SWITZERLAND)
EINSFELD Karl	Dr. -Ing. Institut für Aerodynamik & Gasdynamik Universität Stuttgart 21 Pfaffenwaldring D-7000 STUTTGART 80 (W. GERMANY)
FORSTER V. T.	Head Fluid Flow Laboratories GEC Turbine Generators Ltd Barton Dock Road URMSTON, MANCHESTER M 31 2 LD (ENGLAND)
FRANSSON Torsten	Dipl. -Phys. Institut de Thermique appliquée EPF-L 33 av. de Cour CH-1007 LAUSANNE (SWITZERLAND)
FRUEHAUF Hans-Heiner	Dr. -Ing. Institut für Raumfahrtantriebe Universität Stuttgart 31 Pfaffenwaldring D-7000 STUTTGART 80 (GERMANY)
GALLUS Heinz E.	Professor Dr. -Ing. Institut für Strahlantriebe & Turbomaschinen Technische Universität Aachen 55 Templergraben (Postfach) D-5100 AACHEN (GERMANY)

GOUDA Samy Professeur
Institut d'Aérodynamique EPF-L
En Vernay
CH-1024 ECUBLENS (SWITZERLAND)

GRANSER Dietmar Dr. -Ing.
Kraftwerk Union
35 Wiesenstr.
D-433 MÜLHEIM/RUHR (W. GERMANY)

GÜDEL Christian Dipl. -Ing.
SULZER BROTHERS LTD
Strömungslabor 1504
CH-8401 WINTERTHUR (SWITZERLAND)

HALL David Moreton Assistant Head
Theoretical Aerodynamics Group
GEC Turbine Generators Ltd
Barton Dock Road
URMSTON, MANCHESTER M 31 2 LD (ENGLAND)

HEINENAMM Hans- . Dipl. -Ing.
Joachim Deutsche Forschungs- & Versuchsanstalt
für Luft- & Raumfahrt e.V.
Aerodynamische Versuchsanstalt
10 Bunsenstr.
D-3400 GÖTTINGEN (W. GERMANY)

KOLLER F. Dipl. -Ing.
BROWN BOVERI & CIE - OERLIKON
Abt. TCT 14
CH-8050 OERLIKON (SWITZERLAND)

KREITMEIER Franz Dipl. -Ing.
BROWN BOVERI & CIE
Abt. TX-2
5401 BADEN (SWITZERLAND)

LAWACZECK O. Dr. -Ing.
Deutsche Forschungs- & Versuchsanstalt
für Luft- & Raumfahrt e.V.
Aerodynamische Versuchsanstalt
10 Bunsenstr.
D-3400 GÖTTINGEN (W. GERMANY)

LEYNAERT J. Chef de division
ONERA
29 av. de la Division Leclerc
F-92320 CHATILLON (FRANCE)

KIOCK Reinhard Dr. -Ing.
Institut für Aerodynamik
DFVLR Flughafen
D-33 BRAUNSCHWEIG (W. GERMANY)

MARETTO Luigi A. Dott. Ing.
Ansaldo Nucleare S.G.P.
DRS / LAB.
Via Pacinotti 20
I-16151 GENOVA (ITALY)

NOVAK Otakar Dr. -Ing.
BROWN BOVERI & CIE
Abt. TX / Labor Thermische Maschinen
CH-5401 BADEN (SWITZERLAND)

PAPAILIOU Kyriacos Professeur Dr. -Ing.
Laboratoire de Mécanique des Fluides
Ecole Centrale de Lyon
36 Rte de Dardilly
F-69130 ECULLY (FRANCE)

SCHIMMING Peter Dipl. -Ing.
Institut für Luftstrahlantriebe
DFVLR Linder Höhe
Postfach 906058
D-5000 KÖLN 90 (W. GERMANY)

SEROVY George K. Professor Dr.
Iowa State University
c/o La Martinière
38 av. du Château
F-92190 MEUDON (FRANCE)

SIEVERDING Claus Professeur
V K I
72 Chaussée de Waterloo
B-1640 RHODE ST GENESE (BELGIUM)

STARKEN Hans Dr. -Ing.
Institut für Luftstrahlantriebe
DFVLR Linder Höhe
Postfach 906058
D-5000 KÖLN 90 (W. GERMANY)

- STÜSSI Heinrich Dipl.-Ing.
SULZER BORTHERS LTD
Abt. 5 / Thermal Turbomachinery
Escher Wyss Platz
CH-8005 ZURICH (SWITZERLAND)
- SUTER Peter Professeur Dr.-Ing.
Institut de Thermique appliquée EPF-L
33 av. de Cour
CH-1007 LAUSANNE (SWITZERLAND)
- SATOR Franz Georg Dr.-Ing.
Institut d'Aérodynamique EPF-L
En Vernay
CH-1024 ECUBLENS (SWITZERLAND)
- WOOD N. B. Dr.-Ing.
Central Electricity Generating Board
Kelvin Avenue
LEATHERHEAD SURREY KT 22 7SE (ENGLAND)

Development and Application of a Conventional Combined Pressure,
Temperature and Angle Probe with Small Dimensions

by
C. Güdel

1. INTRODUCTION

The development of modern axial compressor stages called for the provision of suitable probes, enabling the flow field to be measured - in particular between the individual blade rows too. Although the inherent problems of pneumatically indicating probes for measurements in rotary machines were known (i. e. unsteady impingement), this conventional metrology was retained. Another technique would in fact have been very welcome for measuring unsteady flow phenomena, but hot wire probes have too short a life under the flow velocities encountered, while the laser technique was not yet ripe for application at the time of this development project.

2. REQUIREMENTS

To accommodate all aspects (metrology, space conditions, reliability), probes meeting the following demands were needed:

- Small dimensions, to enable them to be traversed in an axial gap of 12 mm between rotor and stator blades maintaining a minimum safety clearance of about 3 mm. Fig. 1 shows the situation with an existing probe at the time and the new type to be developed.
- Simultaneous detection of:
 - total pressure and static pressure,
 - total temperature,
 - flow angle.

This was necessary in view of the large number of detail measuring points and the high operating costs of the test machine.