



PROCEEDINGS

*12th Symposium on Measuring Techniques
for Transonic and Supersonic Flow
in Cascades and Turbomachines*

Prague, Czech Republic

September 12-13, 1994

Institute of Thermomechanics
Academy of Sciences of the Czech Republic

TME 94.1



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January 15, 1995

Dear Colleague,

enclosed you will find the Proceedings of the 12th Symposium on Measuring Techniques for Transonic and Supersonic Flow in Cascades and Turbomachines.

Thank you for contributing to the success of the Symposium and for your cooperation.

It is my pleasure to announce that the next Symposium will be held at the ETH Zurich on September 5 to 6, 1996. Professor Dr. George Gyarmathy, who is the Organizer, will no doubt make it an exciting event worth attending.

With my best regards and wishes,

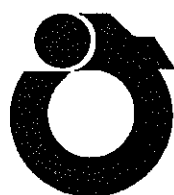
Sincerely,

Rudolf Dvořák

*13th Symposium on Measuring Techniques
for Transonic and Supersonic Flow in Cascades and Turbomachines*

Chairman: Prof. Dr. George Gyarmathy
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***12th Symposium on Measuring Techniques
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Prague, Czech Republic,
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Editor: Rudolf Dvořák

Institute of Thermomechanics
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1. Úvod
2. Základní pojmy
3. Základní rovnice
4. Základní řešení
5. Aplikace
6. Závěr

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P r e f a c e

The 12th Symposium on Measuring Techniques for Transonic and Supersonic Cascades and Turbomachines was held in the Institute of Thermomechanics (Academy of Sciences of the Czech Republic), in Prague on 12/13 September, 1994.

The purpose of these Symposia has always been to assess current advances in the measuring techniques, as well as to ascertain what work should be done in the future to improve these techniques. And, also last but not least, to exchange in a friendly and informal environment experience and knowledge in this field.

All the 38 participants did their best to fulfil this task. Their cooperation which I greatly acknowledge, together with a dedicated effort of Mr. Kvapilová, enabled me to present you now with these Proceedings - interesting collection of all papers presented.

The 13th Symposium in two years time will be organized by Professor George Gyarmathy at the ETH Zurich, and all those actively engaged in measuring techniques for transonic and supersonic cascades and turbomachines are cordially invited.

Rudolf Dvořák

***12th Symposium on Measuring Techniques
for Transonic and Supersonic Flow in Cascades and Turbomachines***

Prague, Czech Republic, September 12-13, 1994

Symposium Programme and Time Table

Monday, September 12, 1994

- | | |
|---------------|--|
| 8.00 - 9.00 | <i>Registration</i> |
| 9.00 - 9.15 | <i>Opening of the Symposium</i> |
| 9.15 - 9.40 | J. Amecke, P. Šafařík: DATA REDUCTION OF WAKE MEASUREMENTS WITH INJECTION OF ANOTHER GAS |
| 9.40 - 10.05 | C. Langowski: FILM COOLING OF AN ANNULAR TURBINE STATOR-FLOW VISUALIZATION OF COOLING AIR INJECTION AND ITS EFFECT ON THE AERODYNAMIC LOSS |
| 10.05 - 10.30 | H.G. Hosenfeld: VIBRATION EXCITATION OF TRANSONIC TURBINE BLADES IN A LINEAR CASCADE |
| 10.30 - 11.00 | <i>Coffee Break</i> |
| 11.00 - 11.25 | A. Bolcs, M. Norryd: DEVELOPMENT OF A SEALING CONSTRUCTION TO PREVENT LEAKAGE FLOW DURING TESTS IN A LINEAR CASCADE |
| 11.25 - 11.50 | W. Bosschaerts : TRANSONIC STEAM FLOWS: WAKE VISUALIZATION AND VELOCITY MEASUREMENTS BEHIND MODEL BLADES |
| 11.50 - 12.15 | M. Renner: FLOW AND WETNESS MEASUREMENTS IN A TRANSONIC STEAM TUNNEL WITH A SLOTTED NOZZLE |
| 12.15 - 13.45 | <i>Lunch</i> |

- 13.45 - 14.10 N. Mandas, S. Cabitza: EXPERIMENTAL INVESTIGATION OF THE PERFORMANCE OF LINEAR NOZZLES CASCADES AT SUPERSONIC EXIT MACH NUMBER
- 14.10 - 14.35 P. Acton: THE GENERATION OF ISENTROPIC TURBULENCE IN THE HIGH-SPEED CASCADE WINDTUNNEL
- 14.35 - 15.00 R. Dénos, C. Sieverding: HIGH FREQUENCY TEMPERATURE MEASUREMENTS
- 15.00 - 15.25 A. Dannhauer : HEAT -TRANSFER MEASUREMENTS ON A PLANE TURBINE CASCADE
- 15.25 - 16.00 *Coffee Break*
- 16.00 - 16.25 S.M.Guo, M.C.Spencer, G.D.Lock, T.V. Jones: HEAT TRANSFER MEASUREMENTS USING THIN FILM GAUGES
- 16.25 - 16.50 H. Hodson, S. Friedrichs : THE MEASUREMENTS OF FILM-COOLING EFFECTIVENESS USING THE AMMONIA-DIAZZO TECHNIQUE
- 16.50 - 17.15 P. Jonáš, V. Řehák: SOME OBSERVATION ON THE UNIVERSAL FEATURES OF A ROW OF HEATED FILMS FOR THE SKIN FRICTION MEASUREMENT
- 17.15 - 17.40 Ch. Marty: TRANSONIC PROBE CALIBRATION WITH DRY STEAM AND WET STEAM
- K.S.Chana: UNSTEADY TEMPERATURE MEASUREMENTS USING FIBRE OPTIC PROBES AT DRA PYSTOCK
- 18.00 - 19.00 *Dinner*
- 19.00 + *Informal meeting of Symposium participants and accompanying persons*

Tuesday, September 13, 1994

- 9.00 - 9.25 A. Bolcs, N. Sayari, S. Pahuja: MEASUREMENT TECHNIQUES OF 3D FLOW-FIELD IN THE NEW AXIAL ROTATING TRANSONIC COMPRESSOR TEST FACILITY
- 9.25 - 9.50 W. Bramesfeld, W. Elmendorf, H. Kurz, H.E. Gallus : LASER-TWO-FOCUS MEASUREMENTS IN A SUPERSONIC COMPRESSOR STAGE
- EXPERIENCES AND NEW DEVELOPMENT
- 9.50 - 10.15 C.D. Sheldrake, R.W. Ainsworth : HOT WIRE ANEMOMETRY TECHNIQUES ON A ROTATING TURBINE EXPERIMENTS
- 10.15 - 10.40 F. Vaněk, J. Cibulka, V. Jelen : MEASUREMENTS ON ROTATING TURBOMACHINERY ELEMENTS USING A TELEMETRIC SYSTEM DEVELOPED IN THE INSTITUTE OF THERMOMECHANICS
- 10.40 - 11.00 *Coffee Break*
- 11.00 - 11.25 R.W. Ainsworth, J.J.M. Batt, J.L. Allen: THE CALIBRATION OF FAST RESPONSE AERODYNAMIC PROBES IN A TRANSIENT FACILITY
- 11.25 - 11.50 H.J. Humm, W. Gizzi, G. Gyarmathy : DYNAMIC RESPONSE OF AERODYNAMIC PROBES IN FLUCTUATING 3D FLOWS
- 11.50 - 12.15 P. Kupferschmied, Ch. Gossweiler, G. Gyarmathy: AERODYNAMIC FAST-RESPONSE PROBE MEASUREMENT SYSTEMS: STATE OF DEVELOPMENT, LIMITATIONS AND FUTURE TRENDS
- 12.15 - 13.45 *Lunch*

- 13.45 - 14.10 A.J. Main, C.R.B. Day, M.L.G. Oldfield, G.D. Lock :
CALIBRATION AND USE OF FOUR - HOLE PYRAMID
PROBE FOR LOSS MEASUREMENT IN A TRANSONIC
BLOWDOWN ANNULAR TURBINE CASCADE TUNNEL
- 14.10 - 14.35 R. Biswas: A SIMPLE FUZZY CONTROLLER TO BALANCE
PNEUMATIC MULTI-HOLE-PROBES
- 14.35 - 15.00 P. Zunino: NON INTRUSIVE MEASUREMENTS OF THE
UNSTEADY FLOW IN THE RADIAL GAP BETWEEN
CENTRIFUGAL IMPELLER AND VANED DIFFUSER
- 15.00 - 15.20 *Coffee Break*
- 15.20 - 15.45 R.M. Bell, L. Fottner : SCHLIEREN METHOD WITH
QUANTITATIVE EVALUATION BY DIGITAL IMAGE
PROCESSING
- 15.45 - 16.10 M. Funes-Galanzzi: STATOR/ROTOR INTERACTION
RESEARCH ADVANCES AT DRA PYESTOCK USING
PARTICLE IMAGE VELOCIMETRY
- 16.10 - 17.00 *Discussion and closing of the Symposium*

Note:

On the basis of the abstracts papers are very roughly grouped by their topics, and arranged to meet special requirements of the participants.

In the Proceedings the papers are arranged alphabetically, according to names of the first authors, and numbered successively.

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