

Please send this report to the Secretary-General of EUROMECH, within one month after the Colloquium.

EUROMECH Colloquium No: 352

Title: Mean Flow Effects in Acoustics

Dates and location: 9-12 July 1996, Keele

Chairman: C.J. Chapman

Co-Chairman: -

Is there need of another Colloquium on the same or a related subject? Which year?

Another colloquium in about 10 years time?

Full registration fee: £80 registration, plus £150 food and accommodation

What other funding was obtained? Royal Society of London £500; London Mathematical Society £300; University of Keele £500

What were the participants offered?

Four breakfasts, two evening meals, one banquet, one strawberry and wine reception, continuous tea, coffee and biscuits, trips to the Mikado, Pirates of Penzance, Lord Wedgwood's pottery museum, Lord Lichfield's country estate, Chester Cathedral, thirty scientific presentations.

Number of participants from Keele (reduced registration fee) 10

Number of members of EUROMECH (reduced registration fee): 13

Number of day delegates (reduced registration fee) 4

Number of non-members of EUROMECH (full registration fee): 23

Total number of participants 50

Number of participants from each country:

Austria	_____	Germany	<u>3</u>	Romania	_____
Belgium	_____	Great Britain	<u>19+10</u>	Russia	<u>6</u>
Byelorussia	_____	Greece	<u>1</u>	Slovakia	_____
Bosnia	_____	Hungary	_____	Slovenia	_____
Bulgaria	_____	Ireland	<u>1</u>	Spain	_____
Croatia	_____	Italy	_____	Sweden	<u>2</u>
Czech Republic	_____	Latvia	_____	Switzerland	<u>1</u>
Denmark	<u>1</u>	Lithuania	_____	Ukraine	_____
Estonia	_____	Netherlands	<u>1</u>	Yugoslavia	_____
Finland	_____	Norway	_____	Others	<u>3</u>
France	<u>1</u>	Poland	_____		
Georgia	<u>1</u>	Portugal	_____	Total	<u>40+10</u>

Outside Great Britain	21
Great Britain, outside Keele	19
Keele	10
Total	<u>50</u>

Please turn

Scientific Report

Euromech 352 at Keele, 9-12 July 1996

Mean Flow Effects in Acoustics

Thirty scientific talks were given at Euromech 352, two of which (by P.O.A.L. Davies and R. Westley) included video movies illustrating wave generation and propagation in complicated flows. The talks fell naturally into eight groups.

(i) Aerofoils, blade rows, cascades, fans. The four talks by I. Evers, S.J. Majumdar, E.C. Nash and A. McAlpine, and N. Peake covered the effects of camber, thickness and angle of attack on the noise produced by convected disturbances striking a blade row; the effects of unsteady distortion on fan noise from aeroengines; and the effects of Tollmien-Schlichting waves on tone noise from aerofoils.

(ii) 'Analogies'. The three talks by P.E. Doak, G.M. Lilley and W. Möhring covered total enthalpy, turbulent jets, and variational principles.

(iii) Ducts, silencers, turbines. The eight talks by M. Brandes, C.J. Chapman, P.O.A.L. Davies, J. Hemp, G.C.J. Hofmans, B. Nilsson, C.O. Paschereit and D. Ronneberger covered the effects of absorbing lining, diaphragms, splitter plates, change in duct diameter, resonators, thermoacoustic oscillations, hyperbolic umbilic catastrophes, and shear layers, in ducts and turbines; and the design of ultrasonic flowmeters in ducts.

(iv) Elastic membranes, elastic plates. The three talks by W.R. Graham, A.D. Lucey, and I. Papanikolaou covered the noise produced by finite flexible plates in a mean flow, and by a pair of elastic membranes.

(v) Energy, reciprocity. The three talks by O.A. Godin, C.L. Morfey, and M.K. Myers covered flow reversal theorems, reciprocity principles for fluids and elastic solids, and exact energy balance relations.

(vi) Jets, mixing layers, streaming. The three talks by A.A. Aganin and V.B. Kuznetsov, E.J. Avital, and R. Westley covered the different types of jet produced by streaming (including jets with a potential core); direct numerical simulation of Mach wave radiation; and jet shock-cell acoustic radiation.

(vii) Moving sources. The two talks by V.A. Borovikov and L.H. Webster covered the resonance produced in a dispersive system when the initial source velocity equals the group velocity; and the sound field produced by a sphere moving underneath a water surface.

(viii) Wave interactions. The four talks by G.D. Chagelishvili, P.F. Dobbins, N.S. Grigorieva and G.P. Thomas covered interactions between acoustic and internal waves, between inertial and Rossby waves, and between fast magnetosonic and slow magnetosonic waves, in a mean flow; the effect of turbulence in limiting the resolution of sonar transducers; and interactions between water waves and currents.

Noteworthy features of Euromech 352 were the wide age range of the participants, from 15 years old to 80 years old, the large audiences at all the talks, always in the range 35-45, and the strong presence of scientists from the former Soviet Union (six Russians and a Georgian). In particular, V.A. Borovikov, O.A. Godin, and G.D. Chagelishvili have much to say that is of interest to Western scientists.

During the year spent arranging Euromech 352, it was clear that there is much interest world-wide in mean flow effects in acoustics, and that many scientists are doing excellent work in the subject. But the chairman also felt that some important ideas are under-used by this research community - in particular, ideas based on group velocity and wave interactions as expounded in many papers in the Journal of Fluid Mechanics in the last thirty years or so, especially by research workers on the dynamics of the atmosphere and oceans. Perhaps we could learn something about waves and mean flows from our colleagues in geophysical fluid dynamics.

C. J. Chapman

C.J. Chapman
30 July 1996