EUROMECH Final Report

EUROPEAN MECHANICS SOCIETY

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

EUROMECH Colloquium No: 349

Title: Simulation of Structure Fluid Interaction in Aoernautics

Dates and location: September, 16th - 18th 1996, at DLR Research Center Got ingen, Germany

Chairman: Dr. H. Hönlinger (DLR)

Co-Chairman: Mr. J.P. Grisval (ONERA)

Is there need of another Colloquium on the same or a related subject? Which year? yes!   n 1998

Full registration fee.   120,-- DM

What other funding was obtained?   nothing from the industry

What were the participants offered?

Refreshments (coffee, tea), lunch at Sept. 16th, 17th, 18th, dinner at a restaurant on the 17th of Sept.

Number of members of EUROMECH (reduced registration fee):

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

Number of participants from each country:

Country		Country		Country	
Austria	____	Germany	22	Romania	____
Belgium	____	Great Britain	2	Russia	2
Byelorussia	____	Greece	____	Slovakia	____
Bosnia	____	Hungary	____	Slovenia	____
Bulgaria	____	Ireland	____	Spain	1
Croatia	____	Italy	____	Sweden	2
Czech Republic	3	Latvia	____	Switzerlan l	____
Denmark	1	Lithuania	____	Ukraine	____
Estonia	____	Netherlands	2	Yugoslavi	____
Finland	____	Norway	____	Others	6
France	9	Poland	1		
Georgia	____	Portugal	____	Total	51

Please turn

Euromech Colloquium 349
Structure Fluid Interaction in Aeronautics

The colloquium started with an overview presentation entitled „The Expanding Domain of Computational Aeroelastic Simulation". This paper addresses in particular aeroelastic phenomena which occur at high transonic speeds during flight. Shock boundary layer and elastic structure interactions as well as the structural response to flow separation effects were the main problems which were addressed. These problems have to be countered with modern CFD codes, fluid structure coupling methods, and high-performance computers.

The following five sessions of the colloquium were dedicated to unsteady aerodynamics, aircraft flutter phenomena, flutter analysis and numerical methods, fluid-structure coupling methods for aircraft applications, fluid-structure interactions for turbomachinery, and general problems.

In session I, the problem of the acceptance of current CFD methods for routine aeroelastic analyses was discussed. In view of the adaptability of the CFD codes or the lack of them, it was concluded that the further development of FEM compatible, unsteady aerodynamic methods for non-linear flight regimes is most desirable. The MDO (Multidisciplinary Design Optimization) environment will require both modern CFD codes and panel methods.

In session II, flutter prediction for the transonic speed range was the main topic. The comparison of standard flutter prediction methods employing subsonic and supersonic panel methods with either CFD methods or semi-empirical flutter methods with the ability to predict lowly-damped modes at subcritical LCO (Limit Cycle Oscillations) conditions covered the most part of the session.

Sessions III and IV were dedicated to the aircraft application of fluid structure coupling methods. Various coupling methods, directed towards the computation of unsteady separating and reattaching transonic flows and typified by self-excited shock-induced oscillations were described. Key elements of the methods like time-accurate Euler and Navier Stokes solvers and time-efficient implementation were also addressed.

Session V dealt with turbomachinery and related problems. As far as turbomachinery is concerned, the presentations concentrated not only on the study of the flutter behavior of plane cascades in the subsonic speed regime, but also on the fluid structure buffeting phenomenon. Important to mention is also an overview paper on the simulation of fluid structure interaction in bridges. The engineering of bridges supported by long span cables requires the in-depth knowledge of aeroelastic stability, vortex shedding excitation, and buffeting due to turbulence. The challenge of reducing the turnover time in the aeroelastic analysis of bridges is met by computer simulations of the flow structure interaction.

The theme of the colloquium was very much appreciated by all participants and resulted in interesting and engaging discussions between the scientists and application-oriented engineers.

13. 12. 96