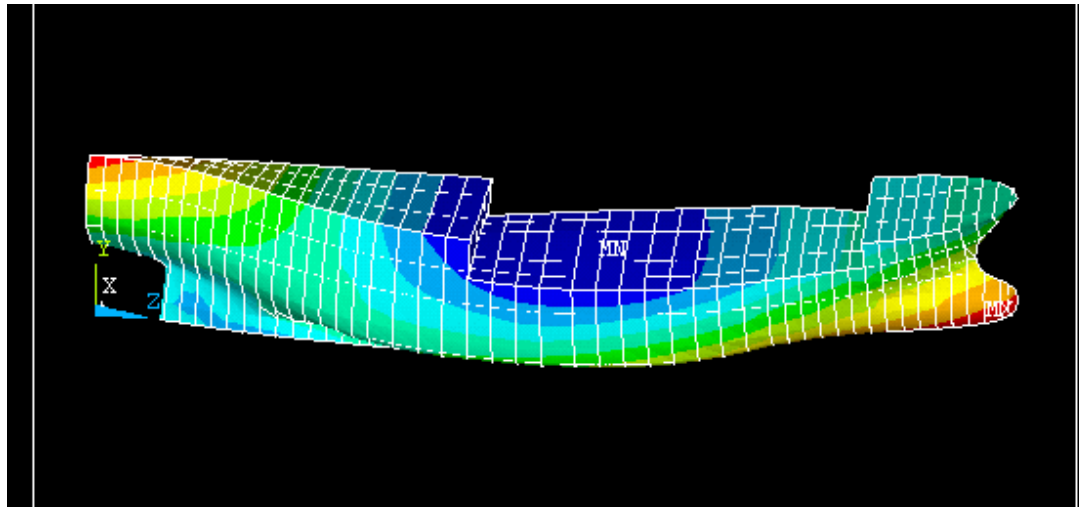


Advances in Simulation-Based Ship Design



Marcos Salas, University Austral of Chile, Valdivia, Chile
Karsten Fach, Ould El Moctar, Holger Mumm, Germanischer
Lloyd, Hamburg/Germany.

Main current applications

FEA Analysis

CFD Computer Fluid Dynamics

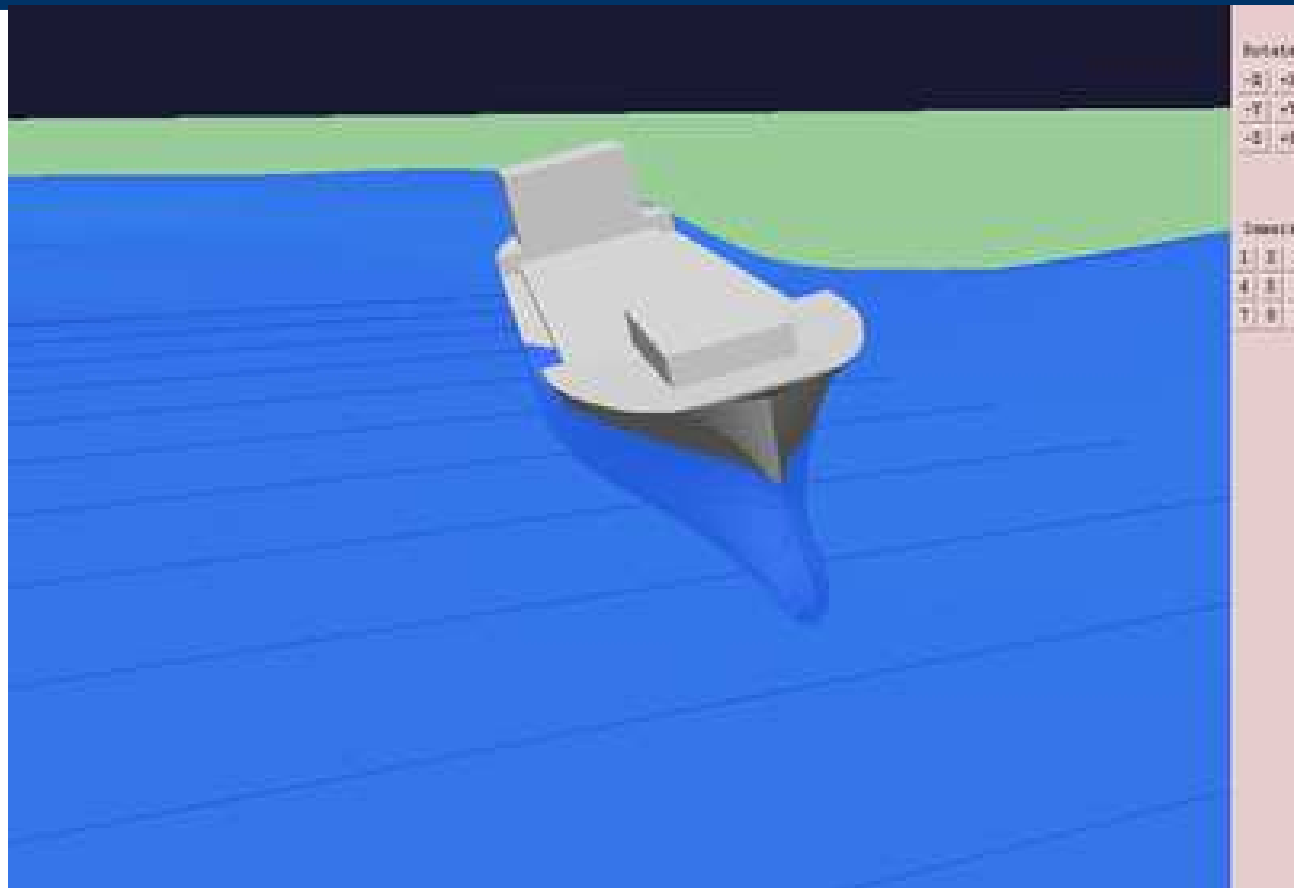
Fast grow in recent years due to enhanced hardware capabilities (machine power)

Several Commercial codes available

Advanced Simulation in the Work of a Modern Classification Society

- simulare - to reproduce
- Simulation is the reproduction of a system with its dynamic processes in a running model to achieve cognition which can be referred to reality (Society of German Engineers)
- to simulate - to imitate conditions of a situation or process", specifically "to produce a computer model of a process

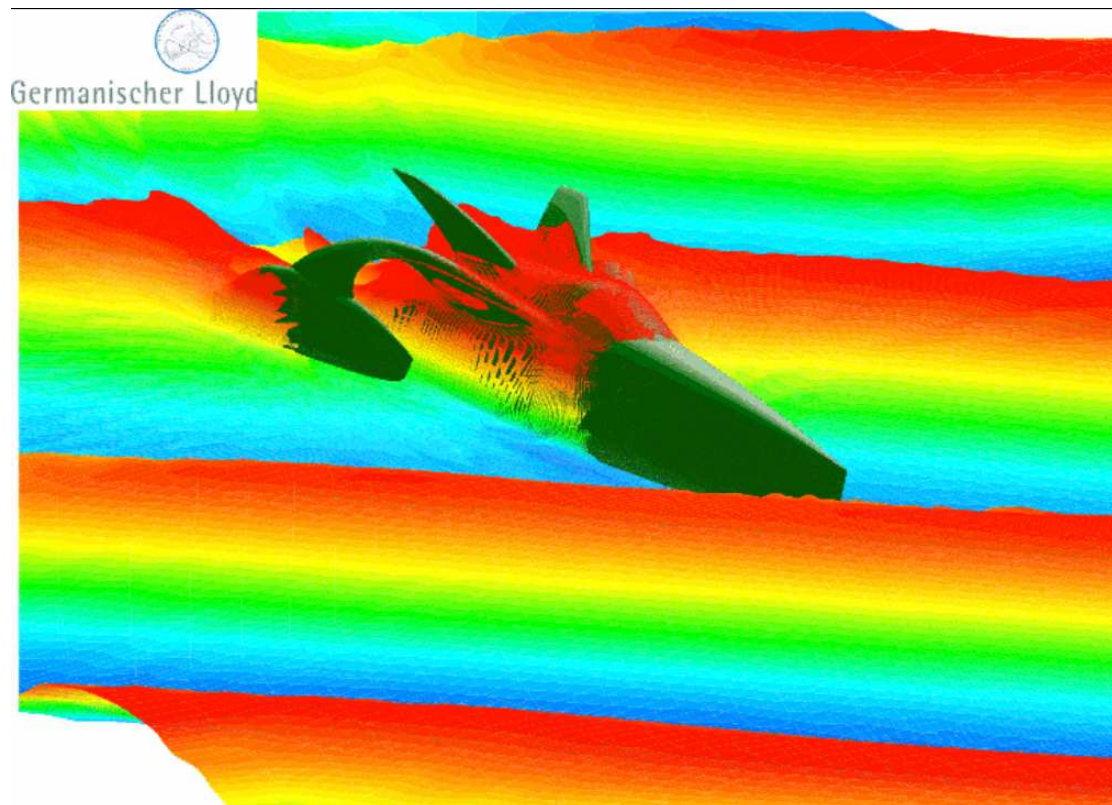
Seakeeping Non-linear strip method



Seakeeping Non-linear strip method

- **Better representation of coupled motions.**
- **Relatively fast (but data needs to be previously available)**

Seakeeping RANSE method



Sloshing

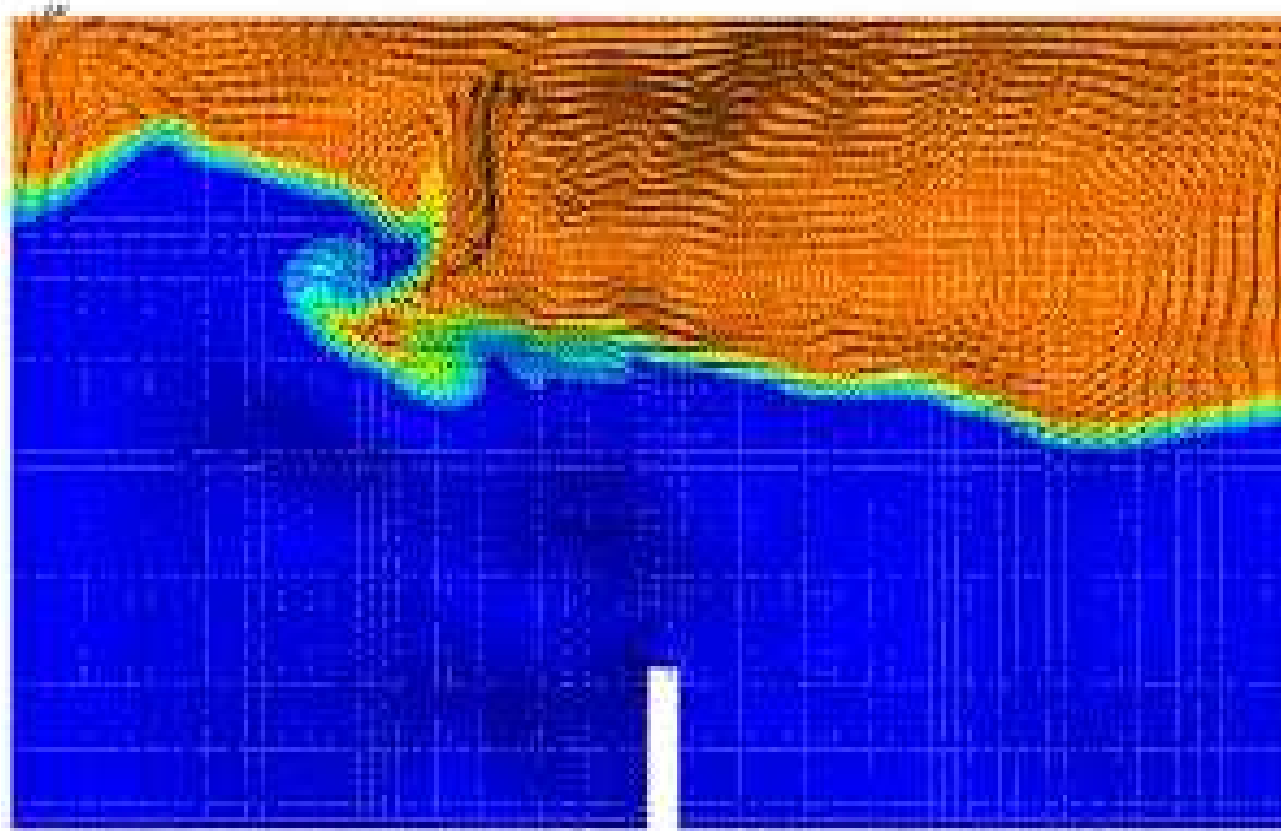
Strongly non-linear phenomenon

Spray formation

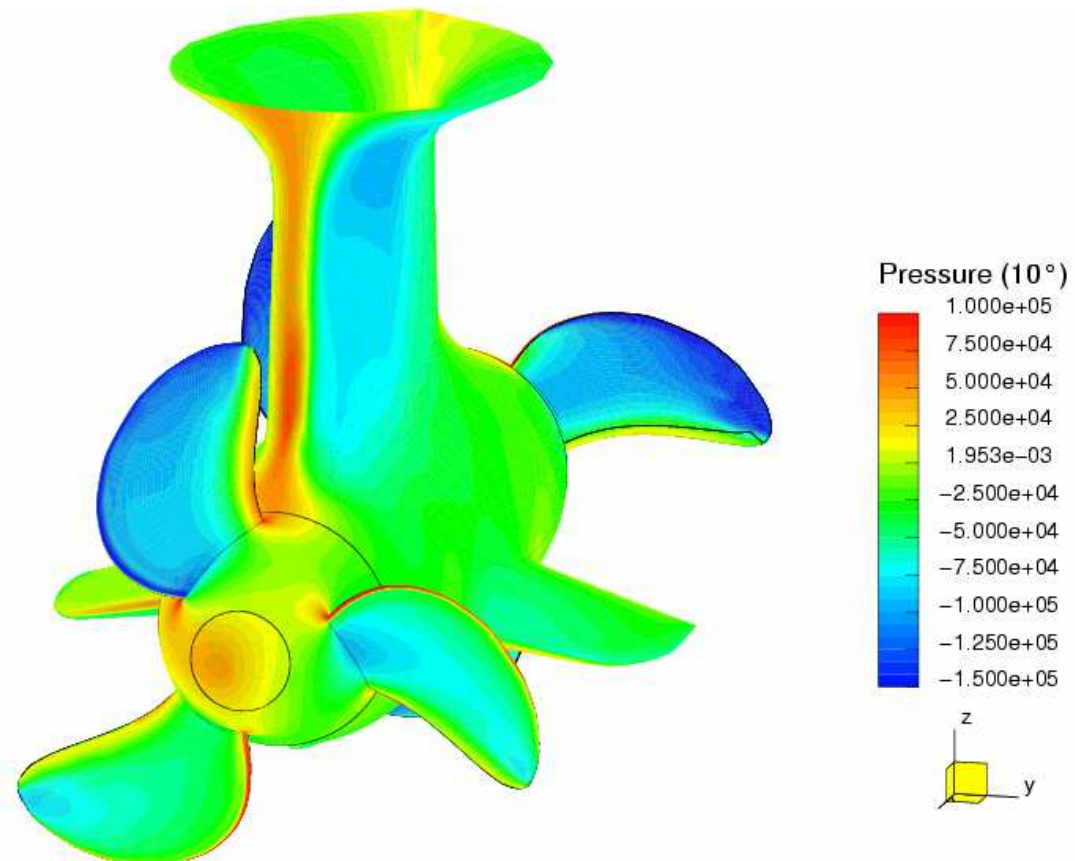
Wave breaking

Air entrapment

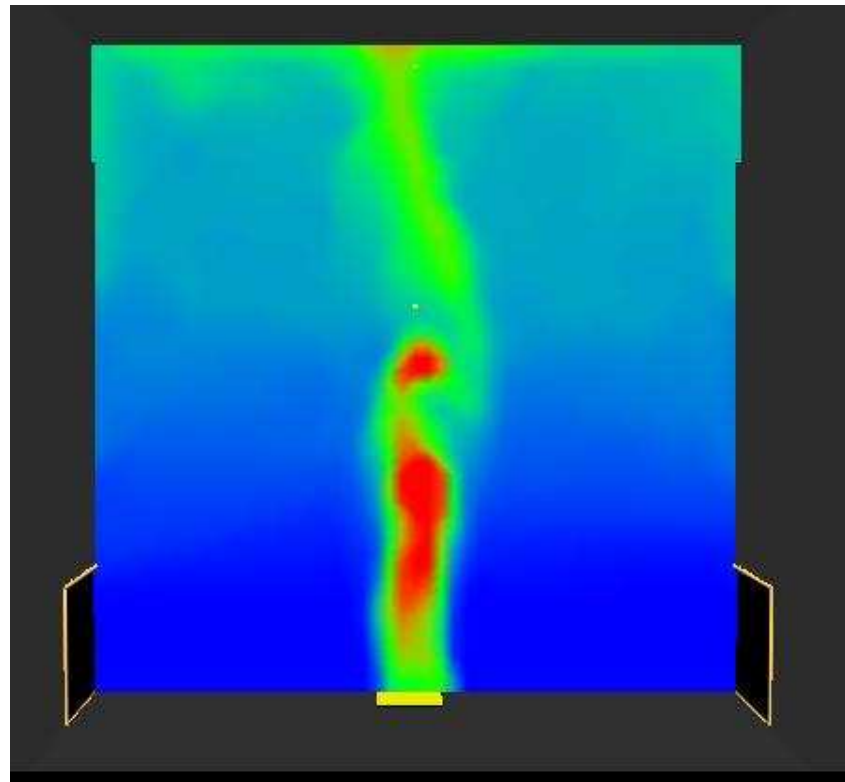
Sloshing



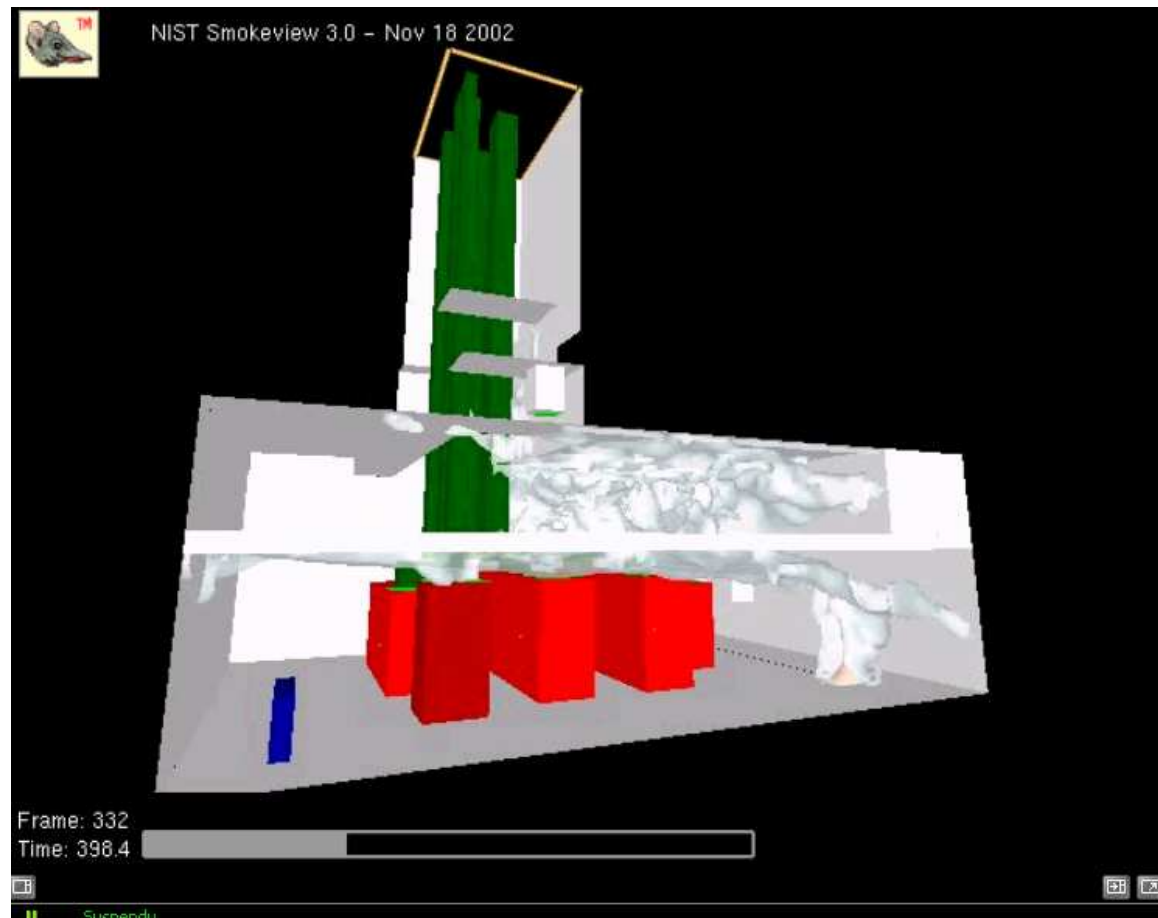
Rudder and propeller flow



Heat and smoke propagation of fires



Fire and smoke propagation



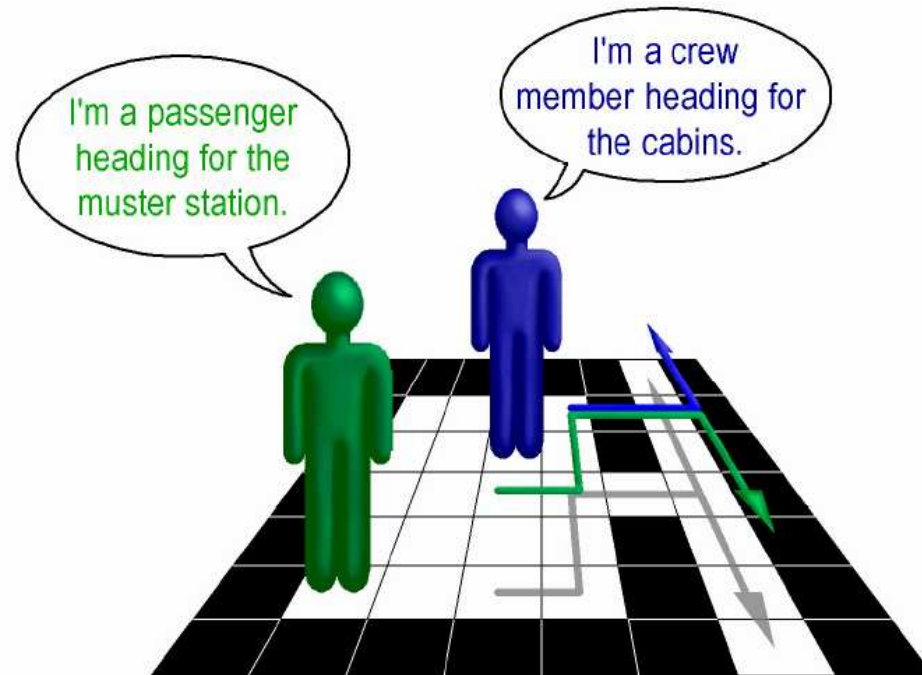
Heat and smoke propagation of fires



Could help designing escape routes

Assistance in efficient allocation of fire-proof resistant materials

Passenger evacuation



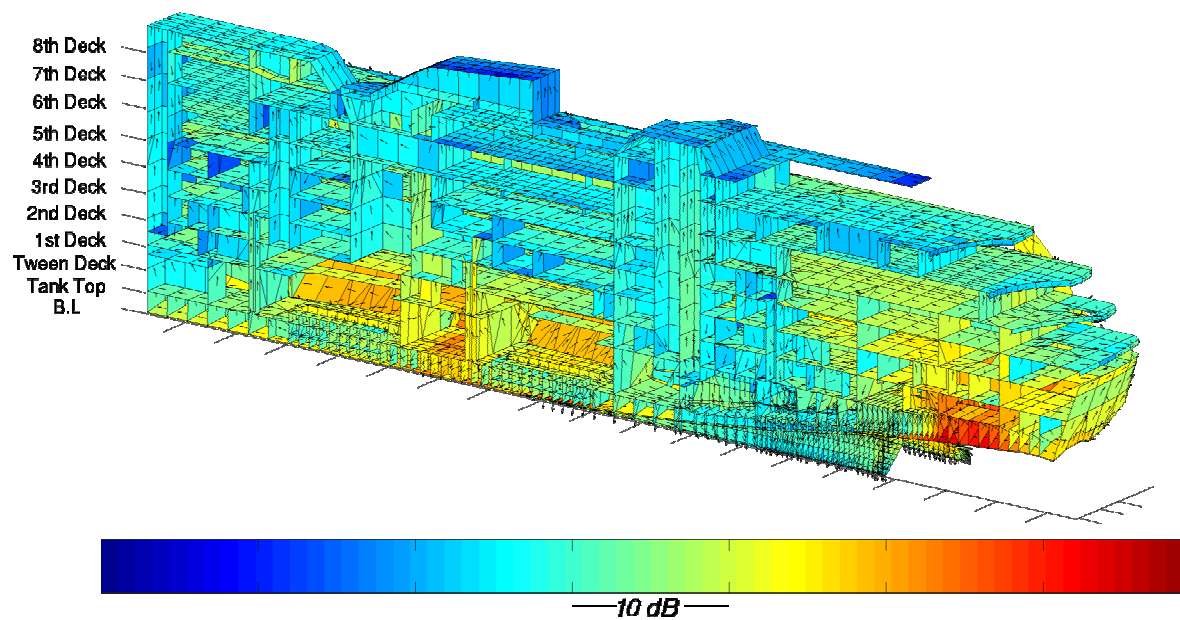
Passenger evacuation



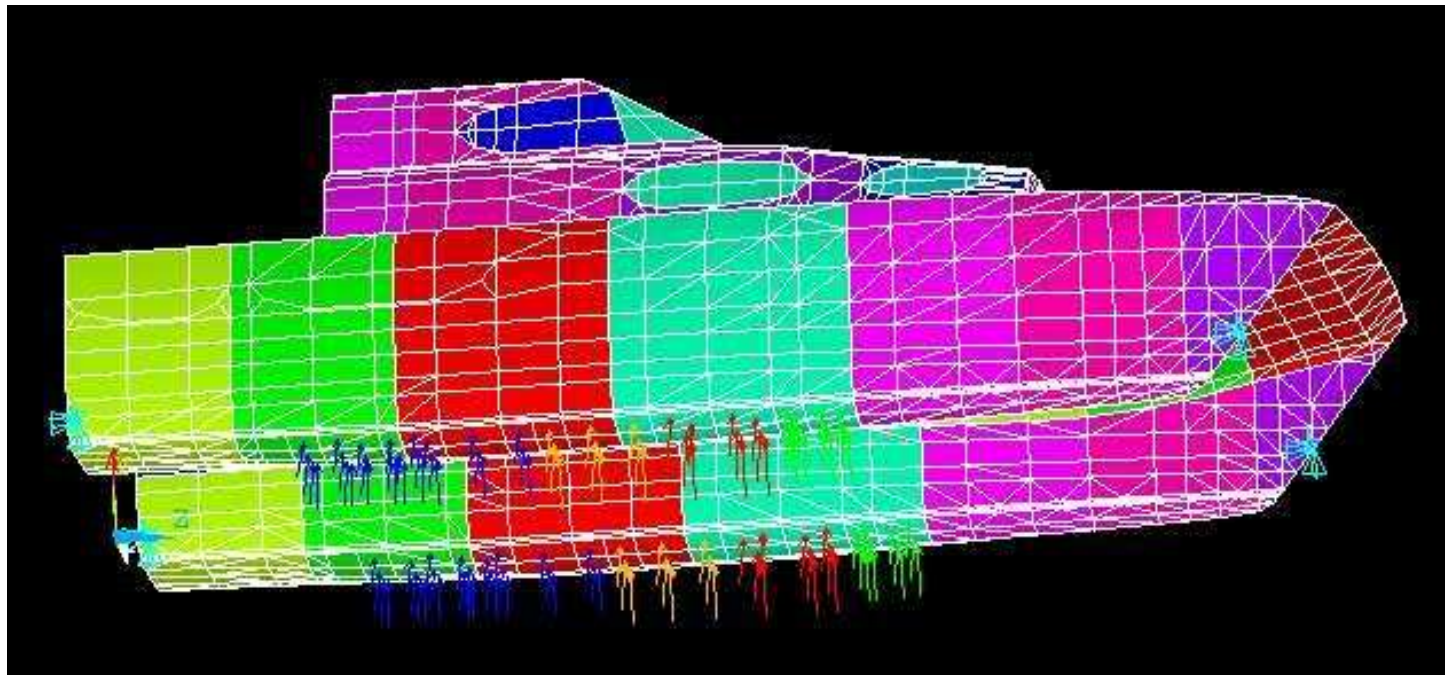
Could help designing escape routes

Useful information based on past accidents
and survivability analysis

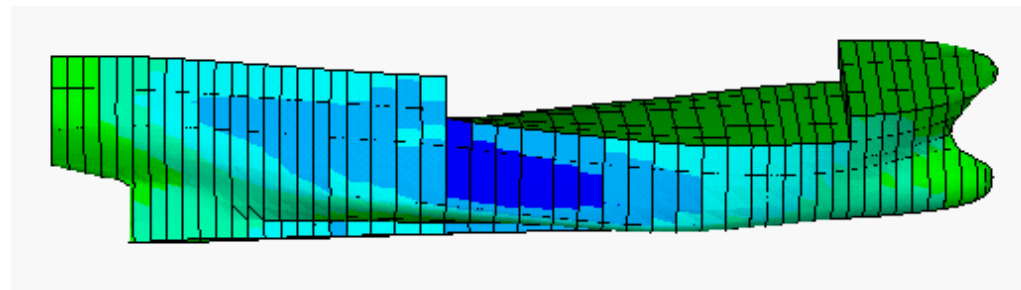
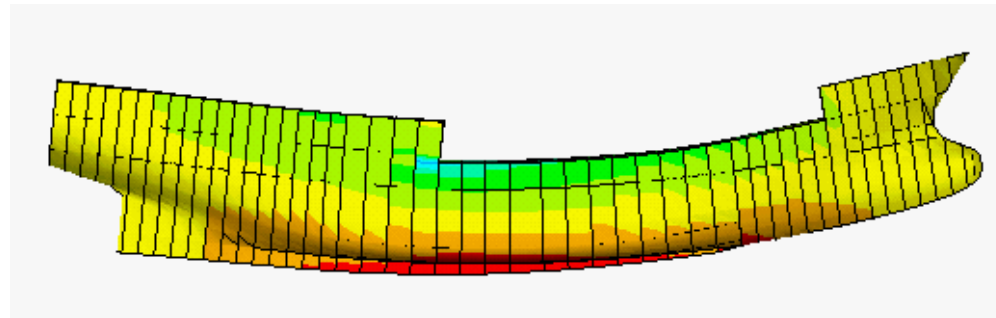
Prediction of structure-borne noise distribution



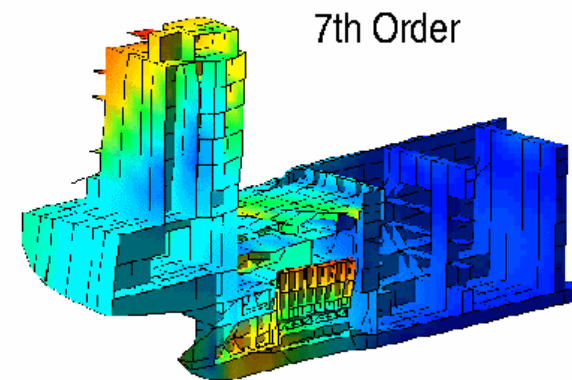
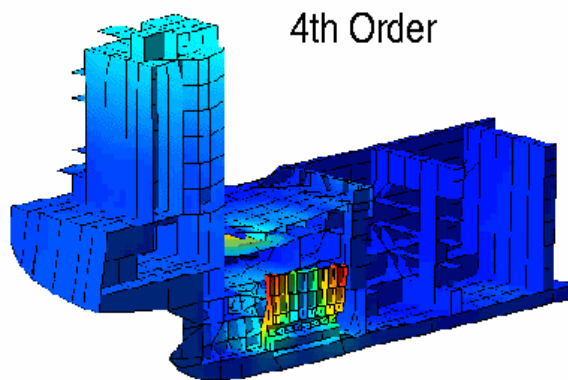
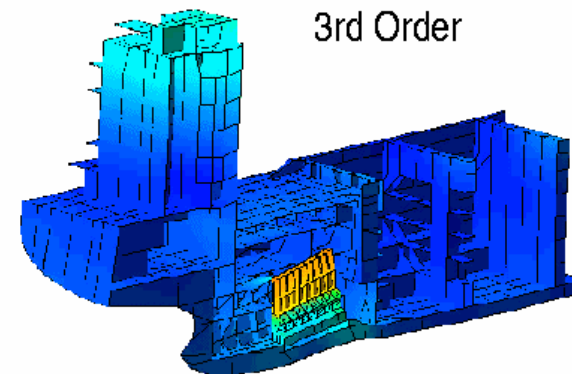
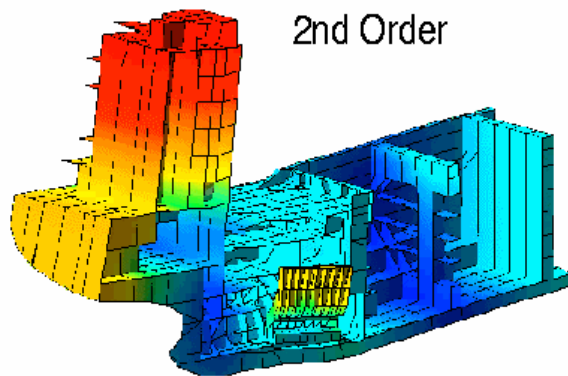
FEA Structural Analysis of a Composite Catamaran



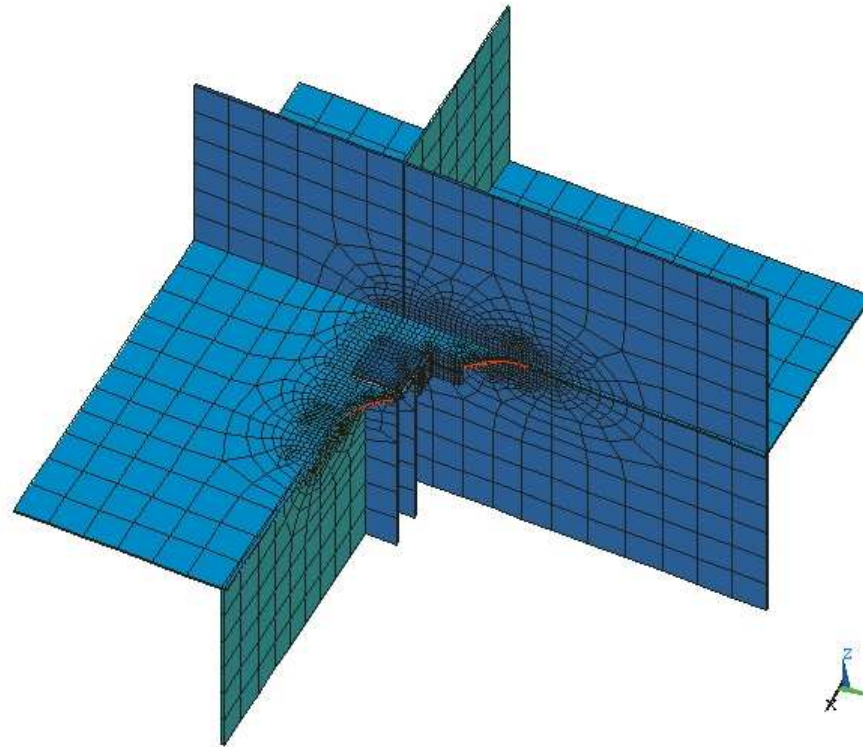
FEA Global Vibration of a Fishing Vessel



Local FEA of vibrations of ship aftbody and deckhouse



Detailed FEA model of hatch corner



Conclusions

- **Direct calculations can be used for numerous applications**
- **Comparisons with full scale tests show very good results**
- **In order to get good result you need experience**

Conclusions

- **From our point of view lots of expensive failures could have been prevented by direct calculations**
- **On the other hand, should we perform expensive direct calculations for everything?**

Acknowledgements

- **The authors are grateful to Prof. Volker Bertram, from ENSIETA FRANCE, for his support to this joint paper.**
- **Contributions from many researchers namely Christian Cabos, Stefan Nusser, Ulf Petersen, Helge Rathje, Pierre Sames, Leshan Zhang.**