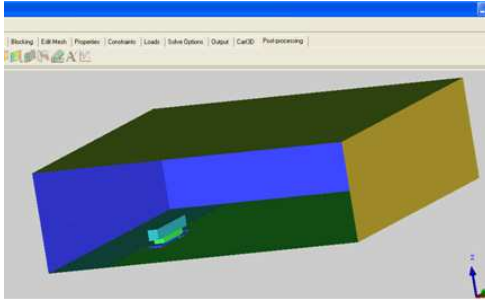


**BlueBEAR** provides a substantial computing resource that properly supports the research work of research staff and students at Birmingham. It provides a cost effective facility that optimises the effectiveness of research and ensures the University continues to be a world-class academic learning and research environment.

## Aerodynamic Shape Optimization of a Freight Train Subjected to a 30 °Side Wind with CFD



### Background

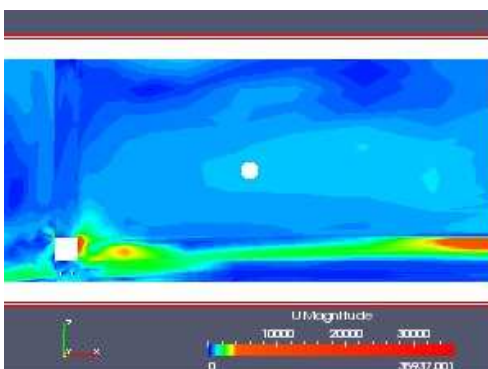
During the world wide there is a trend of increasing train speed, which brings series of associated problems. One of these is the increasing significance of aerodynamic forces which leads the trains' unsteady besides the drag force's increase. In that huge wind area especially in recent years the accidents which caused by side wind occurred frequently. A freight train, compared with passenger train, will not meet the serious safety problem. However it may be overturned by the side wind. The vehicle and rail track will be destroyed. It will need to pay time and money to be rebuilt. This is not good to the development of railway business.

### Work Plan

The object in this project is a container train, composed of an upperbox, a lower box, a chaste and 4 wheels, which is subjected to 30 degree side wind at the speed of 20 meters per second. Hence the train will be loaded with drag, lift, and lateral pressure and rolling moment at the same time. To see which shape leads to which result to the train, two parameters are to be verified. R1 is the radius between roof and side wall. R2 is the radius between end wall and side wall. The R1 and R2 will have three values-- 0, a quarter and a half of width of end wall. The different nine combined geometries were to be simulated.

### Conclusion

During the simulation, the system showed some cells had high aspect ratio and highly skew faces were detected which impaired the quality of the result. It is hoped that after the block of the model is modified, the flow field can be smoothly gotten.



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### Product Used

Ansys ICFM-CFD  
Ansys CFX  
OpenFOAM

### Funding

The Birmingham Centre for Rail  
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