



# Case study

## RNLI ergonomic seat

### THE CHALLENGE

The lifeboat crews of the Royal National Lifeboat Institution (RNLI) often operate in extremely challenging weather conditions, and they need the very best wheelhouse seats on their All-Weather Lifeboats (ALBs) to provide protection from wave impact and vibration.

With this in mind, Frazer-Nash were commissioned propose a solution which would mitigate the impact of this harsh environment, and reduce the risk of personal injury to their crew.

### OUR SOLUTION

We began by assembling test equipment capable of withstanding the harsh marine environment which enabled us to collect a mass of vibration and shock load data. We then developed dynamic models of the lifeboat and its wheelhouse seating system, and validated the data against these models. However, the relative effects of these motions on the human spine were not readily understood, so we created a bio-fidelic human spine model and subjected this to the load data to this model.

Applying classic fatigue prediction methods to data for human tissue, we were able to estimate the possible rates of relative injury for different suspension seat concepts. We found that strong marine craft with rigid hulls and a great deal of reserve buoyancy may pass considerable wave-slam forces (*encountered during the rough seas in which they are required to operate*) straight through to their occupants.

It soon became clear a new suspension system could provide even greater protection to the crew. Our design used a carefully damped and progressive sprung suspension system with a particularly long travel.

We developed a prototype of this concept which was then rigorously tested by the RNLI. Vibration measurements demonstrated that the design was effective. The seat is now in production and being installed in the new RNLI Tamar Class lifeboats, as well as other rescue craft. The programme shows how advanced engineering analysis can inform and support the development of higher performance systems.

### Client

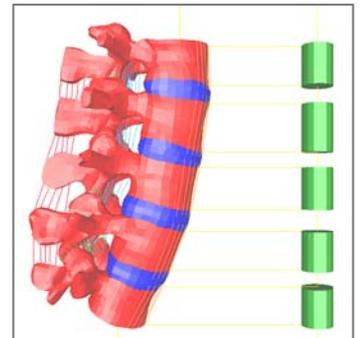
Royal National Lifeboat Institution (RNLI)

### Business need

Investigation into vibration and shock loading when riding in a lifeboat to result in an improved seat design to maximise the safety and comfort of lifeboat crew

### Why Frazer-Nash?

We possess expertise in analytical modelling, mechanical and structural design using CAD tools and innovative design concepts



The lifeboat controls have been integrated with the chair in the cockpit of the lifeboat.

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