# Stabiliser fins

**SUBJECT VESSEL TYPE**
Passenger/Ro-Ro ship

**ISSUE**
Stabiliser fin failure

Two retractable stabilising fins were attached to the sides of a Ro-Ro cargo and car carrier where, by adjusting the angle of attack, they could provide a variable lifting force to reduce vessel roll.

After three years in service one of the stabilisers was found to be missing, having failed due to fatigue some time before.

By examining the remaining part of the fatigued stabiliser stock at the Lloyd's Register Materials and NDE Laboratory it was found that a fatigue crack had grown from a single initiation point, 5 mm below the shaft surface, in the fusion zone between a weld and the base material. Welded regions often show characteristic non-uniformities and inclusions at the base material interface. It was also found that no heat treatment had been undertaken to eliminate residual stresses. These residual stresses can often encourage crack growth.

It was calculated that the shaft had a low factor of safety against the bending loads imposed on the shaft due to roll of the ship in service. The low factor of safety was apparent from the fatigue pattern as the fatigue crack had propagated for only 15% of the shaft diameter before rapid brittle fracture finally occurred.

During the initial stages of crack growth there were three distinct bands of relatively slow propagation interspersed with two narrow bands of more rapid propagation. These changes in crack growth rate indicated significant changes in service loading, such as loading induced by especially rough sea conditions.

Recommendations were made that the stabiliser stocks on sister vessels should be examined visually and by non-destructive testing for the presence of cracks. Recommendations were also given to fitting shafts with an increased operating margin against imposed bending loads.

**LESSON**
*Poor manufacturing practises and component selection can often lead to early failure during service life. Understanding the mechanisms of failure can lead to more robust solutions.*