NAFLIC

National Association For Leisure Industry Certification

Standards & Related Documents Sub-Committee

TECHNICAL BULLETIN - MAY 1997

149. Aeroplane Roller Coaster Accident

We have been informed by Mr Mike Anderson, of the Interlink Group, of an accident in France involving a small, suspended car, roller coaster known as the "Aeroplane". This was originally designed and manufactured by Big Country Motioneering Ltd in about 1990.

The ride used to carry single two-seater cars having freedom to swing sideways. However these were subsequently changed for larger four-seater vehicles. From the information available it seems possible that the loaded mass of the modified car was larger than for the original vehicle. It is also thought that the modifications resulted in a faster ride. It is not known whether the track and structure were re-assessed for the changed conditions at the time of the modifications.

The track rail was attached to each main support column by way of two bolts. The accident, which resulted in minor injuries, occurred after the failure of both bolts at one of the columns. This allowed the rail to drop and a car was derailed. Analysis of the bolts showed that one of them had experienced fatigue and had probably failed quite some time before the second bolt gave way.

We are reminded of several general issues which may or may not be relevant in this case :-

- From the fatigue point of view, the dominant structural forces and stresses are normally broadly proportional to loaded car mass and to the square of car speed. Modifications which increase these quantities will result in higher structural stresses than the original design made allowance for. Persons carrying out modifications of this type need to recalculate the ride dynamics and mechanical / structural analysis.
- In most bolting arrangements the application of correct bolt tensioning torques will ensure that bolts do not experience significant fatigue stress ranges, i.e. bolt fatigue will not occur if they are tightened to the correct torque setting.
- Bolt torques need to be checked periodically in case there is any tendency for them to loosen (e.g. as a result of vibration). Guidance on this should be in the Instruction Manual.

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