Boeing 737-300, G-ODSK

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Aircraft Type and Registration:	Boeing 737-300, G-ODSK
No & Type of Engines:	2 CMF56 turbofan engines
Year of Manufacture:	1997
Date & Time (UTC):	17 March 1998 at 1040 hrs
Location:	London Heathrow Airport
Type of Flight:	Public Transport
Persons on Board:	Crew - 8 - Passengers - 76
Injuries:	Crew - None - Passengers - None
Nature of Damage:	Structural damage in the area of the forward cargo door and to a baggage belt loader vehicle
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	48 years
Commander's Flying Experience:	12,500
	Last 90 days - 80 hours
	Last 28 days - 20 hours
Information Source:	AAIB Field Investigation

The aircraft was parked on Stand B6 with the crew preparing for departure when a baggage belt loader vehicle, which was manoeuvring in the area of the forward cargo door, struck the aircraft causing structural damage to both the aircraft and the vehicle. The vehicle driver stated that the brakes did not function as the vehicle approached the aircraft. Examination of the vehicle showed that the forward left-hand disc brake caliper unit had completely detached, severing the brake system hydraulic pipes in the process. Only one of the two caliper mounting bolts was recovered at the scene.Examination of the caliper unit found that the lower of the two screws attaching the brake caliper to the stub axle had worked loose in service and had completely unscrewed from the stub axle lug. Because of the loss of the lower screw, all of the braking loads had then been carried by the top lug which had suffered progressive failure, most probably due to a fatigue mechanism. The caliper had then rotated with the disc plate, breaking off the rigid brake fluid pipes between the pipe support bracket and the brake caliper. The vehicle's brakes were then rendered inoperative due to the loss of the brake fluid.During the examination of the brake unit and its assembly onto the stub axle the following points of sub-standard engineering practise were noted:The screws used to attach the caliper to the stub axle were threaded along their entire length. The load that these screws would be subjected to in-service would be primarily shear load. It is not good engineering practice to use screw-threads to carry shear loads; plain shank bolts should be used in such applications. It was noted that only 3 threads of the caliper attachment screws were engaged in the threads in the stub axle. Where fasteners screw into nuts or threaded

lugs it is good engineering practise to have the minimum number of threads engaged which equates to 1.25 times the diameter of the screw/bolt, which in this case was equal to approximately 8.5 threads. It is also normal to allow for at least 1.5 full threads to protrude beyond the outer face of the nut or lug after the joint is tightened. Between the head of the mounting screw and the caliper body there was a plain steel washer, a spring steel lock washer and a brake pipe support bracket manufactured from mild steel. The use of such multiple layers in applications such as this is normally avoided since such joints show an enhanced tendency to work loose in service due to relative movement between the layered elements.The baggage belt loader vehicle was of a new design and was one of four vehicles delivered to the operator during the third quarter of 1997. The operator had noticed over the period of operation of these vehicles that there appeared to be a tendency for these caliper attachment screws to lose their torque and so introduced an associated torque check during periodic maintenance. The last six weekly maintenance check was carried out on this vehicle on 21 January 1998 during which the caliper attachment screws were reported to have been re-torqued. Following this incident the operator has withdrawn all similar vehicles from service whilst the manufacturer reassesses the method of attachment of the brake caliper unit to the stub axle.