

AIB Bulletin

5/86

No: 5/86

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This Bulletin contains facts relating to the accidents which have been determined up to the time of issue. This information is published to inform the public and the aviation industry of the general circumstances of the accidents at the preliminary stage and must necessarily be regarded as tentative and subject to alteration or correction if additional evidence becomes available.

Short extracts can be published without specific permission providing that the source is duly acknowledged.

No: 5/86

Ref: 1a

Aircraft type and registration: BAC 1—11, type 510 G-AVMY

No & Type of engines: Two Rolls Royce Spey 512-14E Turbine engines

Year of Manufacture: 1969

Date and time (GMT): 12 November 1985 at 1717 hrs

Location: Kastrup Airport, Copenhagen, Denmark

Type of flight: Public Transport

Persons on board: Crew — 6 Passengers — 48

Injuries: Crew — None Passengers — None

Nature of damage: Right main landing gear, right wing structure in the landing gear bay area, and superficial damage to the underside of the right wing

Commander's Licence: Airline Transport Pilot's Licence

Commander's Age: 52 years

Commander's Total Flying Experience: 11,546 hours (of which 3297 were on type)

Information Source: AIB Field Investigation.

The aircraft was on a scheduled flight from Copenhagen to Manchester. After start-up the aircraft was taxied normally to the holding point for runway 04R and held behind a DC9 aircraft. After the DC9 taxied onto the runway to take off the captain of the BAC 1-11 taxied the aircraft forward slowly to move into the position vacated by the DC9. Just after the aircraft started to move, the right main landing gear collapsed with a loud bang and the aircraft came to rest with its right wing tip on the ground. The commander shut down the engines but maintained cabin electrical services and left the aircraft by the rear stairs to inspect the damage. Considering that there was no evident risk of fire, he decided not to evacuate the aircraft until an airport bus arrived to take the passengers back to the terminal building.

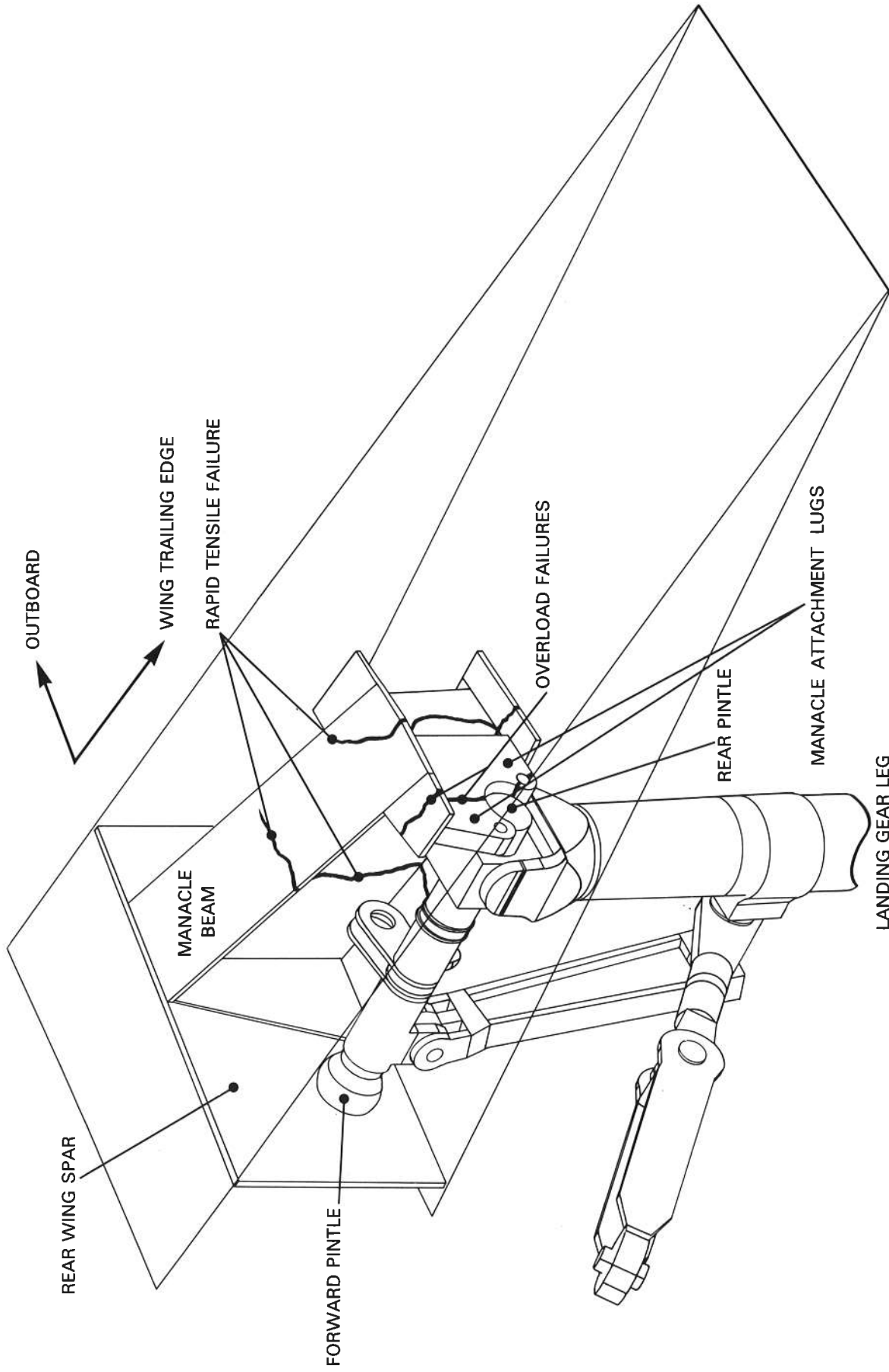
Detailed examination showed that the landing gear support beam (manacle beam) had failed due to stress corrosion. The failure of the manacle beam allowed forces to be applied on the manacle cap attachment lugs which were in excess of that for which they had been designed. The attachment lugs failed in overload allowing the rear landing gear pintle to move upwards. This upwards movement caused the landing gear to collapse rearwards which damaged the forward pintle bearing housing, but did not damage the integral wing fuel tanks. The failure of the manacle beam had been initiated at a small area of corrosion located approximately one inch aft of the forward edge of the bottom flange of the spanwise section of the beam, immediately inboard of the joint angles. The fracture area showed evidence of a slow crack growth mode originating at a bright flat area of fracture, roughly semi-elliptical in shape, which was typical of stress corrosion cracking. Although the fracture extending from the ellipse exhibited

progression/dwell marks, they had occurred in a predominantly tensile cracking mode. Unfortunately metallurgical examination of the failure could not determine the time taken for the crack to grow to a critical depth or the propagation time over the area of the progression/dwell marks. Evidence from the build-up of dirt along the crack line on the landing gear wing torsion box bottom stress plate indicated that an area of the manacle beam had had a crack present for some considerable time, 9 to 12 months or more.

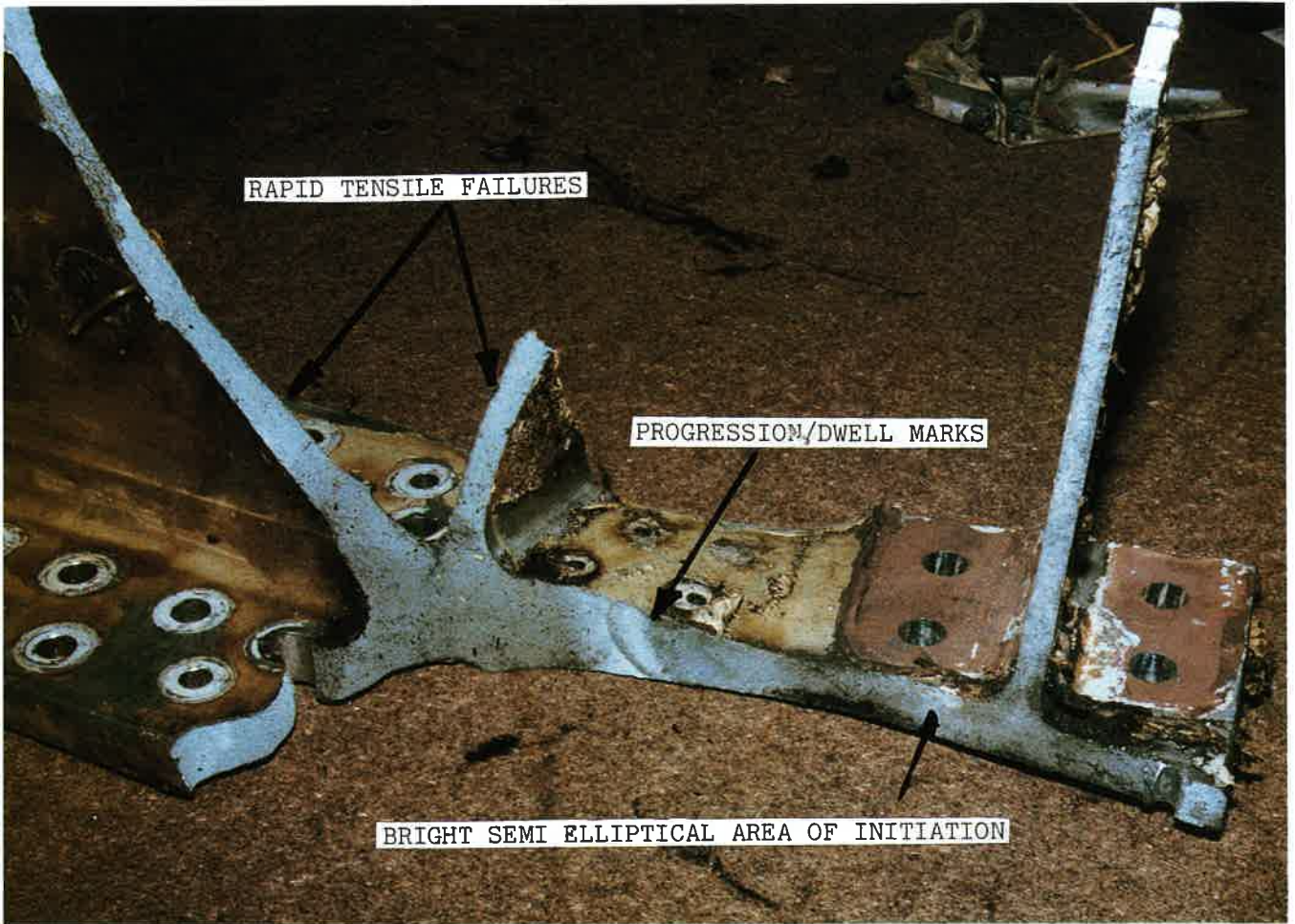
At the time of manufacture of this manacle beam, Alocrom 1200 was used as a surface protection treatment. The area of the beam where the initial crack formed from surface corrosion pitting had no protective paint (primer, finish and lacquer) present although there was evidence of the characteristic iridescent sheen typical of the expected thin Alocrom layer. It was possible that the continual presence of hydraulic fluid over the aircraft's life removed the protective paint in that area.

Detailed examination of the aircraft's flight data recorder, covering approximately the last 100 sectors that the aircraft flew, and the maintenance records for the aircraft since it entered passenger service showed no event that could have caused or aggravated the failure.

The manufacturers issued a Campaign Wire, classified as mandatory by the United Kingdom Civil Aviation Authority, requiring ultrasonic and eddy current non-destructive testing to be carried out on all aircraft fitted with the same type of manacle beam. To date no other cracked beams have been found.



BAC 1-11 RIGHT MAIN LANDING GEAR
 (Rear Pintle Manacle Clamp not shown)



BAC 1-11 FAILED MANACLE BEAM



BAC 1-11 FAILED MANACLE BEAM