

TRAGEDY AT COOLANGATTA



Photo credit: Jack Petersen

Sixty years on, *Flight Safety* writer, Macarthur Job, looks at how a loading problem led to one of Australia's worst civil aviation accidents.

Queensland Airlines' Lockheed Lodestar VH-BAG, parked in front of Brisbane's Archerfield Airport terminal in the late 1940s.

THE ACCIDENT

The regional routes flown by Brisbane-based Queensland Airlines were prospering by early 1949. As usual, the service from Brisbane to Coffs Harbour via Coolangatta and Casino and return on Thursday, 10 March 1949 was to be flown by one of the company's Lockheed 18 Lodestars.

Lodestar VH-BAG carried a crew of three: captain, first officer and flight attendant. Departing from Brisbane's Archerfield airport at 7.45am, VH-BAG's southbound flight was normal in every way, and it landed at Coffs Harbour at 9.20am. The day was fine and clear, with a light breeze from the east.

After the southbound passengers alighted, the oil company agent refuelled the Lockheed. The Lodestar was fitted with four wing tanks installed inboard of the engines on either side, and 100 gallons of 91 octane avgas was pumped into the two forward tanks, almost topping them up. Eight passengers boarded the aircraft, and their luggage loaded into the roomy nose compartment.

The Lodestar took off at 9.50am, landing at Casino 35 minutes later. Three passengers disembarked, and another six, all booked to Brisbane, joined the flight. Again their luggage was

loaded into the nose compartment. At 10.35 the aircraft took off again and after a further 25 minutes, arrived over Coolangatta.

Coolangatta aerodrome then was on the site of the present airport near the township of Bilinga, but consisted only of three relatively short unpaved strips cut from the surrounding coastal scrub. Two of them were on the approximate alignments of today's runways, with the third intersecting strip (today a taxiway) running in an easterly direction towards the beach.

Overflying, the Lodestar made a left-hand circuit and touched down smoothly into the east. Taxiing ahead to the strip intersection, it turned left and continued to the north-western end of what is today's Runway 32, shutting down in front of Queensland Airlines' small airport terminal. The occupants disembarked, four of the passengers leaving the aircraft.

For the remaining leg back to Archerfield, another 11 passengers joined the flight, making a total of 18. They included the chief pilot, his wife and two infant sons, who had been holidaying. The company's traffic manager, visiting Coolangatta, also wanted to travel back to Brisbane, but on boarding, he found all 16 passenger seats occupied, with the two children sitting on their parents' laps. After having words with the captain, he stepped out again, saying he would return by car. Bystanders gained the impression the captain refused to take him standing behind the pilots, and that an argument had ensued.

At 11.15, when the Lodestar had been on the ground for less than a quarter of an hour, the engines were started, and the machine taxied away to the western end of the east-west strip. The aircraft did not appear to pause near the threshold, but began its takeoff into the east almost immediately.

Becoming airborne about half way along the strip, it continued to fly close to the ground as it accelerated. Then, as the undercarriage retracted, it began to climb. The angle of climb appeared normal at first, but within seconds, those watching from the terminal were flabbergasted to see the Lodestar nosing up into an impossibly steep climb. 'What the hell's the matter with him?' the airline driver cried out in alarm.

With the engines still at take-off power, the climb continued to steepen as the aircraft gained height. Some watching thought it would go over on its back, but when abnormally nose-up at between 200 and 300 feet, its starboard wing dropped and the machine lost height. The wing was picked up as the Lodestar 'hesitated slightly'. Then the port wing dropped steeply and the machine entered a curving descent to the left, gradually assuming a more level attitude as it did so at low speed. Regaining a flat attitude still well above the ground, it dropped almost vertically into a swampy area between the airstrip and the beach, hitting the ground heavily on its belly and exploded into flames, thick black smoke billowing skywards as fire engulfed the wings and fuselage.

Deeply shocked, the groundsman and agent's staff grabbed fire extinguishers, jumped into a car, and sped to the blazing wreckage. But there was nothing they could do. Although the swamp was covered in shallow water, the ferocity of the flames prevented them approaching to play foam on the fire. The Coolangatta fire brigade arrived shortly afterwards, dousing the blaze with high pressure foam, but it was a full hour and a half before it was extinguished. All but one of the bodies, found under water beneath the fuselage, were burnt beyond recognition.

News of the tragedy horrified the nation—at the time, with 21 fatalities, it was the second worst airline disaster in Australia's history. Public revulsion was all the greater because of the manner of the accident; the aircraft in seconds becoming a flaming coffin.

THE INVESTIGATION

Accident investigators arrived next morning from the Department of Civil Aviation. They found the Lockheed had struck the ground only about 100 metres beyond the eastern end of the strip. The machine had crashed at a high rate of descent, but at very low forward speed. Apart from extensive destruction by fire, there was vertical compression of the fuselage, and severe downward bending of the wings, engine mountings and tailplane.

No evidence could be found of any failure in the control system. The throttles were fully open, the magneto switches on, and the propellers in fine pitch. The undercarriage was retracted, but the flaps were extended 15 degrees. The disposition of the cables on the trim tab

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Queensland Airlines' Lockheed Lodestar VH-BAG undergoing servicing at Brisbane's Archerfield Airport.

Photo credit: Gus Grulke Collection

mechanism indicated a setting of about three divisions nose-up—a typical setting for *landing*. Examination of the victims showed that all had died instantly in the impact.

VH-BAG's up weight when it took off was slightly less than the maximum, and the loading figures used by Queensland Airlines and in the passenger waybill revealed only minor discrepancies. It was likely that VH-BAG's weight at take-off would have been under the maximum permissible 16,800 pounds.

CENTRE OF GRAVITY

VH-BAG's Certificate of Airworthiness (CofA) specified that its centre of gravity must lie between 28.5 per cent and 39 per cent of the wing's mean aerodynamic chord (MAC) (i.e. between those percentages of the average distance from the leading edge of the wing to its trailing edge). For calculating the centre of gravity, the Department provided a load chart with the CofA, with load sheets to use with the chart.

A Departmental aeronautical engineer determining VH-BAG's actual centre of gravity at the time of takeoff uncovered some dismaying inconsistencies. The load chart contained a number of errors, resulting from discrepancies between Lockheed 18 data supplied by the RAAF (on which the Department had based the chart), and original figures obtained from the U.S. CAA. The passenger seats were also 25mm further apart than indicated on the chart, resulting in a significant rearward movement of the centre of gravity with all seats occupied. The chart only provided for the aircraft's 'undercarriage down' condition, yet retracting the undercarriage moved the centre of gravity further rearward.

Because the disposition of the passengers in the cabin was uncertain, investigators calculated the most favourable and most adverse combinations, using the weights of all items making up the load. These indicated that VH-BAG's centre of gravity on beginning takeoff would have been at best 41.8 per cent MAC, and at worst 42.4 per cent MAC. But when the undercarriage retracted, these would have increased to 43.4 per cent and 43.9 per cent MAC respectively -- between 4.4 per cent and 4.9 per cent MAC tail-heavy.

STEEP CLIMB

The Lodestar's tendency to climb steeply after liftoff had been noticed on a number of occasions, particularly when the loading was tail-heavy. The company's operations supervisor recalled an instance with a captain under training. The Lodestar had a full complement of passengers, and he told the pilot he was checking that about 10 divisions of nose-down trim was necessary for takeoff with 15 degrees of flap.

The pilot under training however, wound on only about six divisions of nose-down trim, and the supervisor decided to allow the trainee to learn the lesson for himself. The ground run was normal, the airspeed increasing to 110mph without difficulty holding the aircraft down. But when the trainee allowed the aircraft to lift off, and climb at this speed, he was startled at the force necessary to hold the control column forward. The captain told him to apply more nose-down trim, and the aircraft then climbed normally. From the load sheet for this flight it was determined that, with the undercarriage retracted, the Lodestar's centre of gravity was just *behind* the stipulated rear limit.

At the next pilot's meeting, the operations supervisor pointed out the importance of at least 10 divisions of nose-down trim, together with the necessity to keep all load forward, with 16 passengers on board.

About a month before the accident, the company's senior check pilot also experienced a steep climb. The aircraft became airborne normally after a short run, but almost

immediately began to climb steeply. Even with both hands, he was unable to force the control column forward. When the airspeed had fallen to 85mph, rather than risk taking one hand off the wheel to adjust the elevator trim, he raised the flaps. This immediately altered the trim of the aircraft, the wheel moved forward, and the climb continued normally. Thinking this incident over, the check pilot thought he might have begun the takeoff with less than 10 divisions of nose-down trim. Even so, he was certain some nose-down trim was applied.

Asked if he had ever noticed a tendency towards instability in flight, the senior check pilot recalled an occasion when, with a full load of passengers, no luggage in the nose compartment, and only a light fuel load, he found it impossible to trim the aircraft to fly level. Constantly 'hunting' longitudinally, it was unpleasant to fly.

Information was sought from the U.S. CAA, and from the Lockheed Aircraft Corporation, on the handling characteristics of the Lodestar aircraft with the centre of gravity behind the rear limit. This established that the centre of gravity rear limit had been amended from 40.6 per cent MAC to 39 per cent. From this, the investigators concluded that VH-BAG's longitudinal instability would reach dangerous proportions at 43.4 per cent MAC, the probable position at the time of the accident.

LOAD CHART

The investigators now turned their attention to the grave error in VH-BAG's load distribution, and to what extent the company's practices had contributed to it. A clause in the Certificate of Airworthiness stated: 'The aircraft must be loaded in accordance with the attached load chart which is part of this Certificate.' Furthermore, the Departmental load sheets for calculating the centre of gravity, using index units derived from the load chart, stated: 'Index units MUST be supplied except where an approved loading procedure or approved loading slide rule is in use.' But because an Air Navigation Order covering this requirement had not yet been written, the procedure was still not mandatory.

The operations supervisor told the investigators that although a load chart was 'always carried on the aircraft'; the pilots were familiar enough with the aircraft to be able to load it by reference to the load sheet which showed the weight of passengers, luggage and freight. The senior check pilot enlarged on this, explaining that pilots followed 'general rules' for loading. The nose compartment was filled first, the No 2 compartment from the

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The Lockheed's twin-finned tail assembly survived the fire, but shows downward distortion from the high vertical impact.



The burnt-out remains of the Lockheed, after it fell almost vertically into swampy ground.

front next and so on, irrespective of passenger load. The passenger load was disposed about the main spar, filling the front seats first. The front fuel tanks were also filled first. The senior check pilot said that the load chart was never used on regular schedules as 'there was not sufficient time'. He believed the general rules for loading were adequate, except when heavy freight was being carried.

This was obviously not so. In view of the time VH-BAG had been in service, the variations in load encountered, the instances of rear centre of gravity instability experienced, and the quite unremarkable loading at Coolangatta which produced such dire consequences, it seemed likely that VH-BAG had been flown in a dangerously tail-heavy condition on numerous occasions.

Why then was the crew unable to correct the powerful nose-up tendency after the takeoff from Coolangatta when others had 'got away with it'? Did some other factor exacerbate the tail-heavy condition, preventing the crew from taking action to avoid the accident?

The investigators believed the answer was the setting of the elevator trim. The position of the trim tab cables on the mechanism's spool suggested the take-off could have begun with the elevator trim still in the position to which it was adjusted for the landing at Coolangatta. If this were the case, the crew would have had no hope of applying sufficient forward force on the control column to prevent the nose rising steeply as the machine accelerated after takeoff. The experiences of the senior check pilot and the operations supervisor showed that, when taking off with a rearward centre of gravity and 15 degrees of flap, the aircraft exhibited a nose-up tendency that was difficult to overcome, even with some nose-down trim. With the trim inadvertently left in a nose-up setting, it would be impossible.

Why the crew overlooked such a vital action remained unanswered. Though it was not the company's practice to use any form of check list,

all crews followed a standardised checking procedure. There was evidence that the captain and traffic manager had quarrelled immediately before VH-BAG taxied away from the terminal, but any bearing this might have had on the oversight remained a matter of conjecture.

THE RECOMMENDATIONS

The investigators' report concluded with two principal recommendations:

- ▶ That all airlines be subject to periodic checking by Departmental officers to ensure that no company practice was 'contrary to the interests of safety'.
- ▶ That responsibilities for the safe loading of aircraft, and the procedures to be followed, be defined in Air Navigation Orders and promulgated without delay.

Their report made no mention of the loose system of cockpit checking that contributed to this tragedy. But this, with other disasters overseas resulting from the neglect of vital pre-take-off actions in modern complex aircraft, would eventually point the way for the adoption of tighter, more positive systems based on some form of written check list. 🚧



Undercarriage down, the Lockheed prepares to land. Note the extended wing flaps.