This is an extract from David Howells book re the B707 jet upset in the vicinity of Jiwani.
Thank you to David for permitting its re-production

BAHRAIN BOMBER

The FO was doing command training. The second pattern of the training on the B707 started quite uneventfully. The flight left Sydney on 20 February 1969 and went to Singapore via Perth. The captain gave the F/O the first sector to Perth and, for some reason, did the next sector to Singapore himself.

The next night the flight set off to Bahrain via Bangkok in VH-EAB, and little did any of the crew suspect what fate held in store. The aircraft was for all practical purposes serviceable, but there had been a history in the Technical Log of comparison warnings between the artificial horizons for the Captain and First Officer. If the two instruments differ by more than five degrees a "clacker" alerts the pilots aurally and a red light alerts them visually. If there is a fault or power failure on a flight instrument it is normally accompanied by a flag which partially covers the offending dial.

The Engineer inspected the Technical Log, noted the previous history of defects, and ensured that the aircraft was serviceable and that the maintenance engineers had signed to that effect. The pilots were not informed of any detail, nor was there, at that time, any requirement for them to be informed. None of the pilots saw the Technical Log, nor again was there any requirement to do so.

The first leg to Bangkok was uneventful with the captain again giving the F/O the sector for training. The captain did the next take-off out of Bangkok for Bahrain at a weight of 290,000 pounds (132000 kilograms), which was well below the maximum of 336,000 pounds (152700 kilograms). This proved very fortuitous six hours and nine minutes later. There were sixty-two passengers and a crew of ten. The flight had still been uneventful when the aircraft passed over Karachi at 35000 feet (10600 metres). It was now the F/O's turn to try to get some sleep in the bunk that was just opposite the forward galley, and about twenty feet (6 metres) behind the flight deck door.

He had been dozing for some time when he felt the aircraft start to turn to the left, and his initial reaction was that they were avoiding some weather. The turn continued and he then thought that

the Bahrain weather had deteriorated and that they were returning to Karachi to pick up some more fuel. Then the mach/airspeed warning bell started to ring. This is the warning that the aircraft is exceeding its legal maximum speed. It is factored slightly before the aircraft will sustain structural damage of serious or fatal dimensions; AND THE BELL KEPT RINGING.

He recalled, "I dived out of the bunk and landed on the galley floor, but I was not able to regain my feet at all. We found out later that there was 4.57 G on the aircraft at that stage so that, in effect, my "G" factored weight was just under 400 kilograms. No wonder I couldn't stand. The noise was now deafening, there were screams and yells coming from the passenger cabin, and all the time that mach/airspeed bell was ringing incessantly. So I started to crawl towards the flight deck. The Chief Steward had been sitting on the jump seats with one of the hostesses, and they were both on the floor trying to get up. It was still impossible to stand so I crawled over them, managed to open the door to the flight-deck and struggled into the Second Officer's seat behind the Captain. Some short time later the aircraft started to porpoise quite violently. From my position I could see both the Captain's, First Officer's and standby instruments. It was not very difficult to see where the problem lay and to give advice what control inputs would rectify the problem. The captain's artificial horizon was stuck indicating 30^0 degrees of right bank, and the F/O's horizon and the standby horizon agreed with each other. There were no warning flags on any instrument."

Fortunately, his service flying training enabled the F/O to fly with limited instruments, so he told the captain just to get the airspeed to stop. If one raises the nose of an aircraft to stop the airspeed increasing, the moment the speed increase stops is when the aircraft is flying level. With the aid of the other serviceable instruments control of the aircraft was regained. The descent had been arrested at 16800 feet (7600 metres) and 40 seconds had elapsed since the beginning of the incident. As one could can imagine, there were four very shaken crew members when the recovery was complete.

The aircraft appeared to be undamaged so, after some discussion, the captain decided to climb back to 35000 feet (10600 metres) and continue on to Bahrain where there were maintenance facilities, hotels and a QANTAS base.

Once they were established in the cruise, the captain decided to go back to the passenger cabin to check on the fate of the passengers.

It seemed logical, in view of the faulty dial on the Captain's instrument panel, that the F/O should sit in the First Officer's seat. The captain wanted the normal cruise speed so the E/O set the thrust for this. After a little the F/O's nerve failed, and he asked the E/O to reduce the speed by about twenty five

knots to a speed which put the least strain on the aircraft. While the aircraft was ostensibly undamaged, there could have been some stress damage and may have only needed some very small increase in loading to cause structural failure. The captain came back to the flight-deck a little time later and, when the F/O told him what he had done and why, was quite happy about it. He did the landing into Bahrain.

Ambulances met the aircraft but, in fact, only one person was injured. A man, one of the few persons who did not have their seat-belts loosely fastened, found himself up on the roof during the porpoising. He said later that he thought he was in heaven as he could see all the other people down below! When the negative G came off the aircraft he came down to earth very rapidly. He hit the top of his head on the corner of an ashtray on the armrest. The scalp wound required seventeen stitches. Sir Marcus Oliphant, the late Governor of South Australia, was in the first class section. He told us that, during the incident, he spent some of the time doing calculations how long it would take to hit the sea.

An almost unbelievable occurrence was related later by one of the cabin crew when we settled back in the cruise. A young woman had been sitting right down the back of the aircraft with a very small baby on her lap. After the "high dive" she contacted the cabin crew in a very distressed state, asking where her baby was. She didn't look pregnant, and at first the crew thought she was hysterical. However, it did not take too long to convince them that she did have a small baby in her arms and that it had now disappeared. As one can imagine, the state of the cabin was one of total chaos with debris everywhere. A search for the baby was started and sometime later, under piles of cushions, trays etc., it was found next to the class divider. It had floated up out of it mother's arms, forward along the full length of the economy cabin. When the negative G had come off, it had descended to the floor to be then covered by the cabin trash. It had been fast asleep the whole time and was quite uninjured.

Once all the passengers had been cared for the writing of the reports commenced. The captain was on the phone to Sydney, and Sydney had been on the phone to Boeing. The crew had landed in Bahrain about 1am local time and were still up at 10am. The aircraft had been grounded and the crew were all held out of service pending the full investigation. The F/O remembered that he woke up about 5pm and just started shaking uncontrollably. He couldn't stop and it lasted for about 30 minutes. After that he was fine, and has never had any symptoms since. So much for the lack of counselling. Nowadays there would have been a cast of untrained thousands trying to offer advice how to recover from trauma and stress.

Two days after the incident the various representatives arrived. Boeing sent structural engineers, QANTAS sent electricians and maintenance engineers, and Australia had sent Department of Transport investigators. The aircraft had suffered virtually no damage at all, apart from a few rippled hat-racks.

As mentioned earlier, the weight was a vital factor in our survival. If the weight had been 250,000 pounds (114,000 kilograms) instead of 211,000 pounds (96000 kilograms), our factored "G" weight with 4.57G would have been 1,144,000 pounds (520,000 kilograms). There would have been no way that the aircraft would have remained intact. It would have disintegrated at about 25000 feet (7600 metres).

The interrogation started, but very little extra information was forthcoming. The passengers had all continued to their destinations, and the cabin crew had been flown back to Sydney. The flight recorder "black box" had been removed and taken to Canberra for analysis. For most of the time it was pouring with rain with typical Gulf weather in February - quite frequent thunderstorms - so the waiting was very tiresome. Then the captain got a call from one of the instrument engineers saying that he thought he had duplicated the fault, and would we come out to the airport. So off the pilots went to the hangar where VH-EAB was parked. The ground engineer went down in the Lower 41, an area below the flight deck where all the electrical equipment is situated. After much fiddling he called out from the depths of the aircraft, "Is that what you saw?" The captain looked at his artificial horizon and saw that it was now indicating 30^0 of bank to the right, the standby horizon was indicating straight and level as was the First Officer's instrument. The "clacker" was sounding and the light was flashing, indicating the difference between the two dials. They immediately asked what he had done and were told that there was a loose wire in the power source to the Captain's horizon. The captain agreed that the fault had been duplicated, and the mystery of what had caused the instrument to malfunction was solved.

So the cause of the incident had been found but what had actually happened? Sometime after the crew got back to Sydney the flight recorder had been analysed and the readout was available. Herewith a quote in part from the official report.

INTERPRETATION.

3.1 Prior to the incident the aircraft was nominally at Heading variation between 260^0 and 280^0 occurred, probably 35000 feet at a indicated speed of 277 knots (M.810). Associated with passage over Jiwani.

3.2 Immediately prior to the height loss, the tape height was 35700 feet. The heading changed from 280^0 to 275^0 degrees where the rate of turn increased to about 2^0 /second. By 260^0 the bank angle would have been in excess of 40^0 to the left.

3.2 A rapid altitude loss followed, increasing in rate with time in the first half of the episode. ***It was later calculated that the rate of descent had reached 84000 feet per minute at one instant.*** *Height loss was arrested at 16800 feet about 40 seconds after the start. During this:-*

- *Indicated airspeed increased from 277 knots to 475 knots.*

· *"G" was more than 1.0 throughout. It was 3.0G in 20 seconds and exceeded this for a further 17 seconds, peaking at 4.57G. (the aircraft had an effective weight of 965,000 pounds - Maximum allowed 336000 pounds). It was 2.5G when level in the pull out.*

· *The heading at pull-out was approximately east, having changed 180^0 through south from west.*

3.3 The sustained high G began to exceed 1.0 immediately the descent commenced, and was maintained until after the descent was arrested.

3.4 This implies a tight spiral or pitching in the vertical plane. It was probably a combination of both and mainly pitch in the final pull out.

The "G" factored "weight" must have exceeded 600,000 pounds for much of the descent, and there must have been fairly severe buffet.

3.4 There is however, indication that heading was relatively constant during the pull out which "bottomed" at 16800 feet. At this point the maximum speed during the incident of 475 knots indicated was being approached, being the equivalent of M.93. At this speed position error tends to be asymptotic and the speed would have been faster.

3.5 Having achieved the pull-out on a relatively steady heading, the aircraft ascended from 16800 feet to 21500 feet while the G decreased from 2.4 to normal 1.0 to -0.63 at 21500 feet. The aircraft started to descend again.

3.6 A condition of zero to negative G (-0.63 maximum) occurred in the round over above 20000 feet for about 10 seconds.

3.7 A second dive on a fairly steady heading returned the aircraft to a further pull out at 17000 feet giving +2.0 G. This pull-up caused a climb back to 20500 feet where relatively level flight was established.

Total time of the incident to this point was 2 minutes.

The above report is courtesy of QANTAS AIRWAYS

So that was what happened on that fateful night, but there still remained the question of how and why it happened. Like all accidents or major incidents, it was a series of events that combined to create a situation.

The first link in the chain of events was the faulty instrument. A long time later Flight Engineer John Bower told the F/O of a momentous event that occurred about six months before the incident when he was an apprentice electrical engineer. He was a very clever individual, and a top class Flight Engineer who, during his course, discovered that there was a basic flaw in the electrical wiring design of the

Boeing 707 artificial horizon. He found that if a certain fault occurred in the wiring of the instrument it would indicate 30^0 right bank with no warning flag.

He went to great lengths to get the problem fixed but to no avail. If the wiring defect had been corrected then the incident would never have happened. The first link in the chain had been forged.

The second link was that none of the pilots knew of the previous history of intermittent faults in the instrument. Obviously, in retrospect, there was an omission in the co-operation between crew members. Engineers would inform the captain of major items of interest to them, but nothing of engineering interest only would be passed on. In those days this was standard practice. Nowadays all pilots and flight engineers go through the Technical Log and Notices to Crew with a fine tooth-comb. If some mention had been made of nuisance comparison warnings between the two artificial horizons, then maybe, when the defect happened, the actions to control the aircraft would have been different. The second link had been completed.

Then there was the weather. It was pitch dark with no moon and, at the time of the incident, there was some light turbulence. There was no natural horizon outside so control of the aircraft depended solely on the flight instruments. If there had been a natural horizon, quite obviously control of the aircraft would have been easily maintained with outside reference without the misleading information on the flight-deck. The third link had been made.

As the aircraft passed over Jiwani, the S/O in the right hand seat, was sending the position report to Karachi. In those days part of the communication equipment was the Nav Com Log (NCL) This was a piece of medium gauge aluminium, approximately A4 in size, with a couple of alligator clips attached to hold the Airep, a met report, and the flight plan together with the deck log. The latter two were used to monitor the progress of the flight.

As the S/O was sending the report, he had held the NCL in the beam of the map light, and as a result, his instrument panel was obscured. As the aircraft rolled to the left he was still sending the position. When the over-speed warning started and he saw his instrument panel, he could see that the aircraft was almost inverted, in a steep dive, and it was corroborated by the standby instruments. The captain's instruments still indicated a level turn to the right.

At extreme attitudes artificial horizon indications are notoriously difficult to interpret, so it would not have been unreasonable to have initially thought that all three instruments were in error. However, if the S/O had seen the start of the manoeuvre there would have been no difficulty on his part

to prevent the episode in the initial stage. Consequently the fourth link had been manufactured.

The comparison warning was fitted on the aft centre console between the pilots. When the warning went off, the captain probably looked down and slightly behind him to check what was occurring. The warning was cancelled and when he looked back at his instrument panel he saw that the aircraft was now in a 30^0 bank to the right with no warning flags on any instrument. So the auto-pilot was disconnected and the aircraft was rolled to the left to correct the indicated right bank. In fact, the aircraft had been flying straight and level, but was now rolling to the left with the instrumentation still indicating a turn to the right. More left aileron was applied until the aircraft was almost inverted and in a steep dive. If, in that fateful second, the captain had not looked away to check the warning, and had seen the fault instantly manifest itself, he would have immediately rejected the indication as impossible for the aircraft to achieve, and done nothing as it was only an indication fault. Now the final link in the chain was complete. If any of the links had been broken prior to the incident it would never have happened.

QANTAS eventually sent the crew back to Sydney as passengers, for they were still held out of service pending the outcome of the Board of Inquiry. They were all treated very much like lepers as nobody wanted to talk to them for fear of being contaminated with their bad luck. Every day or so they would ring in to find out what was going on, but to no avail. This went on for two months while all the various bodies analysed and sifted the evidence. The flight data recorder had to be read and transcribed into details which everybody could understand. The captain and his wife were kind enough to invite the rest of the crew to their place for dinner and drinks which was a great morale booster. Ultimately, they were told the result of all the deliberations.

The captain had to do some training. The S/O and E/O were absolved of any wrong doing, and the F/O got a reprimand for reducing the minimum cost cruise speed back to a least load speed, a difference of only 27 knots. Nobody could believe it. He was not even on the flight-deck for approximately the first half of the incident, yet he was the only one to be punished.

Before they could go back to work they all had to be officially notified of the results of the inquiry. The F/O had the extreme good luck to have as his “accused friend” Captain Barry Ellis. He was an old friend from London days, and was a highly competent and well-respected Captain. The Australian Federation of Air Pilots (AFAP) insisted that they be represented at these interviews so Barry went in with him.

The opening of the harangue was prefaced by "Engineer Officer ….." The F/O was about to correct when the F/O felt a nudge from Barry. The situation was absolutely ludicrous. The lecture went on for about three or four minutes When asked if he had anything to say, he was speechless. Barry had better control than he and replied that it was not the F/E to whom he was talking, but the F/O. He couldn't believe it when the whole thing was read again, but with the correct addressee!

Thus QANTAS returned them to service, but the F/O still had the reprimand hanging over him. His licence had lapsed so he was issued with a Student Pilot Licence to enable him to do training. The first trip the company could find for him was back from Avalon to Sydney. Captain Bert Smithwell, of Electra fame, gave him the sector which he would normally have done for his own practice, so it was a very generous gesture on his part. So his licence was still not renewed. Four days later, on 29 April, he renewed it with Barry Ellis at Avalon, and followed it with another two hours practice, so after ten long weeks he was legal to continue flying.

The whole incident was closed as far as he was concerned, but on 24 July 1969 QANTAS upheld an appeal by the AFAP on his behalf against his reprimand. It had only succeeded by the most persistent efforts of Bert Smithwell and his AFAP team, and culminated in a trip to Canberra by them to lobby the Minister of Civil Aviation, Senator Cotton. Now it really was finally over.

The aftermath of it all was somewhat less satisfactory in one sense. The captain did some more training. After many tyres deflated on completion of the landing on a short sector from Kuala Lumpur to Singapore, his retraining was terminated and he became a First Officer. He later took early retirement and returned to "civilian" life.

The S/O eventually rose to the dizzy heights of Manager Flight Simulators. The E/O became a Senior Check Flight Engineer.