



# ROULETTE MID-AIR

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On 15 December 1983 two Macchis of the Roulette aerobatic team collided near East Sale in Victoria. Both aircraft crashed and both pilots, who were flying solo, fatally injured.

The changeover of the 1983 Roulette team to the 1984 team had occurred on 21 October 1983. Roulette 1 was unchanged while Roulette 5 became the new Roulette 2. The remainder were all new to the Roulettes.

On 15 December the Roulette training sortie was the second "full show" practice and was briefed and authorized to fly not below 2,000 feet AGL.

The accident occurred in the middle of the display sequence. Following a porteous loop, Roulette 3 positioned himself for the inverted departure opposition pass with Roulettes 1 and 2. Roulettes 1 and 2 were to fly their opposition pass in line abreast formation from behind the crowd line. This manoeuvre was to be done at right angles to the simulated crowd line with the pass occurring in front of the crowd line. This manoeuvre had been part of the Roulette display sequence for over two years and no problems had been evident in that time.

Meanwhile Roulettes 4 and 5 had completed an opposition pass parallel to the display axis in front of the crowd line and were positioning behind the crowd line for the next manoeuvre. These pilots were not in a position to see the collision. Approximately 10-15 seconds after Roulettes 4 and 5 had completed their opposition pass, Roulettes 2 and 3 collided head on at a point over the crowd line.

Roulette 1 sustained no damage. The pilot of Roulette 2 was killed instantly and both aircraft broke up in flight.

During the break-up the pilot of Roulette 3, still restrained in his ejection seat, was separated from his aircraft. At seat separation, the barostat unit of his seat was activated; and, as the pilot was then released from his seat the main parachute was deployed, however, the seat remained attached to the parachute via the drogue bullet. The pilot landed safely in a swamp from which he was rescued initially by a local farmer's wife, then by Esso helicopter. The wreckage from both aircraft was strewn over a wide area approximately 1.5km long and 0.5km wide.

An Accident Investigation Team (AIT) was formed by DAFS and a Court of Inquiry was convened by the AOCSC to investigate the accident. The AIT commenced its investigation late that same afternoon.

Wreckage reconstruction and analysis found no malfunction or unserviceability of either aircraft which had any bearing on the accident. The analysis of the wreckage did show however that Roulette 3's aircraft (the inverted aircraft) was approximately 40 degrees nose down in relation to the horizon at impact.

Investigations centred on the reason Roulette 3 was 40 degrees nose down at impact and why Roulette 1 did not perceive that a collision was imminent and take evasive action from Roulette 3. Roulette 1 in fact noticed nothing unusual with the routine until a very short time before impact when he saw the silver underside of the Macchi rather than the yellow and white upper surface of the wing. This

occurred at too late a stage to carry out any manoeuvre or transmit a warning call. Roulette 1 did say however that when he had rolled out for the opposition pass, Roulette 3 was heading slightly off track. Therefore for the collision to have taken place, Roulette 3 must have carried out a track adjustment whilst flying inverted. One interpretation of the evidence was that perhaps this track adjustment may have distracted the pilot of Roulette 3 sufficiently to allow the nose to drop slightly. When this was perceived by the pilot he considered that a collision was imminent and decided to pull clear rather than push or roll upright and pull.

Another aspect examined concerned the ability of the human sensory system to perceive minor changes in relative motion. The aviation psychologist attached to the investigation provided evidence to show that the change in perspective from Roulette 3 as viewed from Roulette 1 during the initial stages of the manoeuvre could have been below the perception threshold, ie the change could be so small that although the eye could see it, it wouldn't be enough to trigger a response from the brain. Additionally, Roulette 1 may have expected to see Roulette 3 in a particular position which would have delayed recognition of a confliction.

Another possible explanation for Roulette 3's actions may have been that as this was his first solo for this particular sequence, when he first saw Roulettes 1 and 2 they would have been above him and descending to fly beneath him. This may have given him the impression that a collision was imminent.

Unfortunately no satisfactory explanation for this accident will ever be found and the lessons learned are therefore not as clear cut as they possibly could be.

Display formation aerobatics is a demanding and exacting profession. There is an element of risk as there is in all flying, but the margins for error are slimmer than in a lot of our roles. Our selection of crews for this type of flying must be stringent, their supervision must be exacting, their training must be sufficient and their flying professional. On this occasion all of these factors were examined and found correct, and yet, frustratingly, they could not on this occasion prevent a mid-air collision.

This type of accident, where no satisfactory explanation can be determined, fortunately is rare. The investigation and results are always published nonetheless for all aviators to read and digest in the hope that somehow lessons can be learned and as a result, similar accidents can be avoided in the future.