Limited Supplementary Analysis
of the

Catastrophic Accident involving Piper PA-31 Navajo New Zealand, 17 Dec 2002

Harry Horlings
Avio*Consult*, an independent aircraft expert and consultant
The Netherlands
www.avioconsult.com

The accident

Shortly after takeoff, the left engine quit operating for unknown reasons. The pilot feathered the propeller and returned to the airport for landing.
During the final turn, control was lost and the airplane crashed. According to the report, "*the control loss occurred because the pilot probably let the airspeed fall below the minimum single-engine control speed, which brought about an uncontrollable yaw and rapid roll towards the inoperative left engine*".
The final turn, a left turn, was a turn into the dead engine while the speed was obviously near or below the minimum control speed V_{MCA}. If indeed the other engine was set to provide high thrust for maintaining the required flight path, the *actual* V_{MCA} might have increased to a much higher value than the flight manual listed V_{MCA}, because the turn was into the dead engine. The increase of *actual* V_{MCA} above the indicated airspeed led to an uncontrollable airplane instantaneously, and not only because *"the pilot probably let the airspeed fall below the minimum single-engine control speed"*. A recovery at this low altitude and while maintaining the power setting was and will never be possible.
The airspeed indicator must have been provided (i.a.w. FAR 23) with a red radial line indicating V_{MCA}. But what airplane manuals and placards on the instrument panel do not tell (yet) is that this line is valid only if the bank angle is the same as was used to determine V_{MCA}. A manufacturer may select a bank angle of max. 5 degrees (away from the failed engine) to determine V_{MCA}, but there is no requirement to publish the actual bank angle used for the red-lined V_{MCA} to be valid. Five degrees away from the failed engine will always be safe, though. Not all pilots know or realize that V_{MCA} is no more than a minimum control speed for maintaining straight flight while banking a few degrees away from the inoperative engine and start to maneuver while the power setting on the remaining engine is high, after which control cannot be maintained (if the other variables that have influence on V_{MCA} happen to be at their worst case value too).

Cause of the accident

To the opinion of Avio*Consult* the accident happened because the pilot turned the airplane at too low a speed, in the direction of the inoperative engine, while the power setting on the operating engine was high. These conditions increased *actual* V_{MCA} to a value much higher than the flight-manual listed and red-lined V_{MCA} and higher than the indicated airspeed. Loss of control became unavoidable. Under these circumstances, control can only be regained by quickly increasing the speed or, if the altitude is low, by decreasing the power temporarily just a little bit to decrease the yawing moment, after which *actual* V_{MCA} will decrease as well and control might be regained while at the actual indicated airspeed. Power can be increased again as soon as 5 degrees away from the inoperative engine is established.
.
The pilot is not to be held responsible though; airplane flight manuals, student pilot text books and flight schools do not warn pilots for this V_{MCA} increase. It is a long forgotten but still very actual and life-threatening 'phenomenon'. Nevertheless, all experimental test pilots and flight-test engineers know about this, because it is observed every time a V_{MCA} is (properly) determined during experimental flight-testing on any multi-engine airplane.
Similar accidents can be prevented in the future if pilots read the Report '*Airplane Control after Engine Failure*' or attend the accompanying lecture by Avio*Consult* and if airplane manufacturers, flight manual writers and flight schools use the many recommended improvements included in the report. ■