Twin trouble

If your engine fails after take-off, should you close the throttles and land straight ahead or try to climb away?

Stephen A. Thompson

IN 30 YEARS of general aviation and airline flying, I had not experienced the slightest hint of an engine malfunction. Yet late one February afternoon in 1997, all my years of training for such an event were put to the test.

It had long been my conviction that the pre-take-off briefings given by some multi-engine pilots were unduly pessimistic and lacking in understanding of the purpose and capabilities of multi-engined aircraft.

I well remember hearing a pilot about to depart from Essendon's Runway 26 in a Beech Baron state that he would close the throttles and land straight ahead if the aircraft suffered an engine failure below 400ft AGL. This seemed an unnecessarily risky course of action. More than 2,000m of sealed runway is ample for such an aircraft to accelerate to best-single-engine-rate-of-climb speed (over the runway), thus placing the aircraft in a position where an engine failure can be managed while continuing the take-off, obstacles considered of course.

There are certainly times when a total engine failure necessitates closing the throttles and landing straight ahead, but one is in a far better position to do this if the aircraft wheels are on, or very close to, the runway. However, in most twins, it is quite possible to maintain V_{yse}, retract the gear and feather, with as little as 100ft between you and the runway.

The following incident illustrates these points.

The company that I was working for at the time, maintained an excellent standard in pilot training, as did TAA, a former employer, and it was through these agencies that I credit the happy outcome of what could easily have been a disaster at Gunpowder Aerodrome in north-west Queensland.

The aircraft, a Beechcraft C90 Kingair, was fitted with auto-feather, and I armed it prior to take-off as per normal procedures.

The airstrip was 1,300m long, of unimproved surface and 800ft above sea level. Because of rising terrain surrounding the strip, landings were only to be made on 27 and take-offs on 09.

As a normal climb out after take-off would clear all obstacles with both engines operating normally, I rotated at 104kt and retracted the gear at positive climb indication. Almost immediately the left propeller auto-feathered. I confirmed that the torque had fallen, carried out the phase-one actions and checked aircraft performance. Airspeed was 107kt and altitude was being maintained, but there was nothing in reserve to facilitate climb.

A quick glance up ahead at the rising terrain made me realise that the safest course of action was to manoeuvre for

landing on 27 if that was possible. The other option was a controlled crash into timbered slopes.

The next three minutes or so seemed like an eternity. Terrain and timber flashed past the windows as I extracted all the circling room that existed in that little basin without banking so steeply as to induce a stall. This was one occasion when the wisdom of that requirement for all aircraft to have a serviceable stall warning device fitted and operating on every flight was driven home to me. There was little time to consider the effect of the angle of bank in that situation and the intermittent sounding of the stall warning was a priceless benefit. Despite our periodic grumbling and some temptation to cut corners with equipment serviceability at times, the Civil Aviation Orders and Minimum Equipment List are worth their weight in gold.

On very short final there appeared some fat in the airspeed and I lowered approach flap and gear. A few seconds after lock-down I flared and landed. Reverse pitch on the good propeller was not much use due to the inducement of yaw, so medium level wheel braking was all that was left to stop with. Fortunately the touch-down was made with sufficient strip remaining.

Needless to say, my passengers (a doctor and nurse) and I were delighted to be back safely on terra firma. I was in no doubt as to the outcome if the aircraft had not had sufficient speed to maintain altitude and to manoeuvre at the time of engine failure.

My policy is therefore to remain on the runway until I reach single-engine-best-rate-of-climb speed unless obstacles dictate otherwise, in which case an engine failure would place us in the same situation as those in a single-engined aircraft – a forced landing.

ANALYSIS > WHAT WOULD YOU DO?

Staff writers

The most important task in any emergency is to "fly the aircraft". In the conditions, the pilot must have flown with considerable precision to manoeuvre the aircraft safely onto the ground, maintaining best-rate-of-climb speed and balanced flight in the process.

He had obviously pre-considered the engine failure case, and on this occasion had wisely decided that landing straight ahead was not a viable option while any better alternative existed. In this case, that alternative was to continue the take-off and manoeuvre for a landing on the reciprocal runway. He flew accordingly, and achieved a satisfactory outcome.

The pilot's phase one actions were the first critical step, designed not only to ensure maximum climb performance, but also to ensure that the engine had in fact failed. For example, a common reason for activation of autofeather on rotation, is an insufficiently tensioned power lever friction nut. This can allow the power lever to be retarded by acceleration and vibration when the pilot's right hand moves to the gear selector, to a point where the reduced torque is sensed as an engine failure, and autofeather is activated. (If the engine is still operating, immediate movement of the power lever to maximum power, the first item on the phase one checklist, restores power immediately, even if the propeller has stopped rotating.)

Checklist actions also include securing the shut-down engine which guarantees maximum available performance and (in this aircraft) silences the undercarriage warning so it cannot be confused with the stall warning (which has a similar sound) so the pilot can concentrate on accurate flying with reduced performance.

The C90's flight manual indicates that a single-engine-climb gradient of (about) three degrees should have been available under typical temperature conditions with such a light load. It's all too easy to be wise after the event, and the prevailing circumstances of terrain and weather may well have supported the pilot's decision.

However, if an aircraft can maintain terrain clearance while turning through more than 180 degrees in (presumably) low-level turbulence, might there not have been an equivalent or higher possibility of climbing straight ahead, turning only enough to avoid the higher terrain, and flying to a more welcoming airfield?

Whatever the answers to those questions, reviewing any such incident gives all pilots an opportunity to ask themselves: "Given the known conditions, would I have made the same decision? A better one? Or a worse one? What is my criteria for aborting or continuing a take-off? And: "How well equipped would I have been to consider all the options at a split-second's notice?"

Reviewing such issues at leisure, and debating them with your peers and mentors, may well benefit you one day when the chips are unexpectedly down.