Piper Worrier

You're 500ft above downtown Cairns when your engine quits. What do you do?

Peter Roggenkamp

THE PIPER Warrior began its steady acceleration down Cairns Airport's runway one-five.

It was one of those special days that we are often blessed with here in Cairns: clear blue skies, the sea shimmering in the early morning sunshine and the mountains a myriad of rich greens behind the city.

At 65 knots I eased the control column back and felt the weight of the aircraft shift from wheels to wings.

A quick scan of the instrument panel confirmed all gauges in the green. I made a visual check for other traffic, retracted the flaps and trimmed.

All was well until, at around 500ft above the city of Cairns, the engine revs suddenly dropped from 2,500 to 1,200rpm.

I don't recall any feelings of panic. In fact, the first three thoughts that went through my mind were: "We'll have to make a forced landing across the inlet"; "Bugger, we'll get muddy in the mangroves", and; "It will be difficult to recover the aircraft."

Fortunately we were on a heading that would take us across Trinity Bay to a designated low-level training area. After doing the engine-failure-after-take-off and pre-forced-landing checks, some judicious massaging of the throttle afforded a slight rise in engine power.

In the meantime I made a Pan call. It's funny what one thinks at such a time, but I do remember thinking, "is this a Mayday or a Pan call? As I still have some power, I'll give the Pan call." I advised Cairns Tower of the problem and they asked if I thought I could make it back to the runway.

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I had one passenger on board and he seemed outwardly calm. This gave me some confidence in my ability to get us safely back on the ground.

I remembered from my training that a 180-degree turn would use up about 300 very precious feet, however I decided to try

to make the runway even if I had to land downwind as my prime objective was to get over some open area rather than the city buildings and the people in the streets.

We made a 180-degree left turn that put us slightly to the eastern side of the extended runway centreline – over the sand and mud of a low-tide Trinity Bay. Importantly, we were away from buildings and people.

I felt that we could make a forced landing on the shore if we didn't make the runway.

Still jiggling the throttle we had short bursts of added power that thankfully reduced our rate of descent. I made a very close approach and turned base and final in one sweep almost at the northern threshold of runway one-five.

By this time I was pretty sure we weren't going to get muddy feet. But it wasn't until I saw the fire tenders and ambulances lined up at the threshold, lights rotating, that it hit me that they were there in case we crashed. This only made me concentrate harder and thankfully a safe landing was made.

Spark-plug fouling was later found to be the cause of the power loss. A student pilot had been practicing forced landings prior to our flight and had forgotten to clear the engine (by periodically opening the throttle) during his glide approach.

ANALYSIS > NO TURNING BACK

Josef Gostner

LET'S START with the pre-take-off checks. If the power reduction was caused by spark-plug fouling, as the author says, it should have been evident in the pre-take-off engine run-up.

Any residual plug fouling should have been cleared with judicious leaning of the mixture during the run-up. If the problem could not be fixed, the aircraft should have been referred to a licensed aircraft maintenance engineer for further action.

Even so, I have my doubts that spark-plug fouling was the cause of the problem.

The author says "some judicious massaging of the throttle afforded a slight rise in engine revs". This would seem to point to another cause; perhaps the engine was running too lean.

Safety brief: Did the pilot prepare a safety brief before take-off?

At 500ft in a Piper Warrior you have less than 50 seconds from engine failure to landing. And that's a best-case scenario. Not much time to devise a plan of attack and execute it.

However, if you have considered your options beforehand your chances of success increase dramatically.

A safety brief outlines what you will do if the engine fails on take-off or in the subsequent climb.

When preparing a safety brief consider the surrounding terrain and verbalise your actions before leaving the run-up bay.

For example, "If the engine fails at or below 300ft I will land straight ahead. Above 300ft I will land on that paddock. Above 600ft I will land on that golf course, etc."

The brief should also cover the aircraft's best-glide speed, the engine failure drill, and any actions that should be completed by another pilot, if there is one on board.

Turning back: In this case the pilot was successful in returning to the runway, no doubt assisted by the fact that he was left with some power (at least 1,200rpm) and unexpected "bursts of added power".

This should not be taken as evidence that this feat can be achieved easily. If the engine had failed completely, it's highly likely that he would have fallen well short of his target.

I have no argument with turning a small amount to improve your landing options. You can then reassess your altitude and your available landing areas and turn again if necessary.

> **"It is an ambitious and frequently fatal endeavour to attempt to get back to the departure runway following an engine failure after take-off."**

However, it is an ambitious and frequently fatal endeavour to attempt to get back to the departure runway (requiring a turn in excess of 180°) following an engine failure after take-off. There are several reasons for this.

First: In a glide, turning increases rate-of descent and shortens glide distance.

Second: Stall speed increases with increased angle-of-bank.

Third: For a significant part of the manoeuvre the pilot cannot see the landing area, making it difficult to visually assess whether or not the runway can be reached.

Fourth: The increased complexity of the manoeuvre, combined with the increase in stall speed and the likelihood that the aircraft will end up below the anticipated glide path, greatly increases the risk of stalling and spinning.

The US Federal Aviation Administration's Accident Prevention Program (www.faa.gov) offers some useful insights.

In a rate-one turn it takes 60 seconds to turn 180°. According to the FAA, an additional turn of 45° is required to get to the runway. That adds another 15 seconds to the total time required to turn to the runway. In total you need 75 seconds. In a Warrior your rate of descent in a straight glide is 500fpm, but increases to around 600fpm in a rate-one turn.

At that rate if your engine fails at 500ft you'll be on the ground in 50 seconds. Allowing five seconds to establish best-glide and the rate-one bank angle gives you 45 seconds to make the turn. But you need 75. You won't make it.

What about a rate-two turn? You only need 35 seconds for the turn but the rate-of-descent is now closer to 750fpm. From 500ft you'll be on the ground in 40 seconds.

Allowing five seconds reaction time you have exactly 35 seconds for the turn. That puts you right on the limit. A few knots above or below your best-glide speed or any other error and you're in trouble.

Let's try a rate-four turn. The complete turn will take around 16 seconds, though your rate-of descent jumps to 1,000fpm. At that rate you'll be on the ground in 30 seconds. Factoring a response time of five seconds gives you 25 seconds to make the turn. All up you've got nine seconds to spare if you don't make any errors.

But what happens to the stall speed in a rate-four turn?

At best-glide speed (73kt) the bank angle is 40°, which takes the stall-speed from around 56 to 64kt.

Do you really want to be below 500ft, in a 40° bank, with a meagre nine-knot margin above the stall?

I'll take the beach, the golf course, or the paddock any day.

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