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Stab in the dark

An aerial tragedy is narrowly avoided, no thanks to poor maintenance.

THIS INCIDENT took place in early 2001. I was at an airport in country NSW when someone asked me to help push a Piper PA-28 out of a maintenance hangar. The aircraft had undergone extensive maintenance, including removal and replacement of both fuel tanks and a periodic inspection.

It was just after last light and a pilot was waiting to fly the aircraft to its home base on the coast. He was anxious to leave as soon as possible as he had plans for that evening.

The aircraft had not been test flown and the fuel bowsers at the airport were not available, as the fueller had gone home.

The engineer in charge made the decision to fuel the aircraft in the dark by draining fuel from other aircraft in and around the hangar. Plastic containers were used and decanted into the Cherokee.

While the aircraft was fuelled, the final checks were completed in the dark.

Meanwhile, the engineer/owner of the maintenance organisation was in his office making out the maintenance release to speed up the departure of the aircraft. He had suggested adding "just enough fuel" for the flight back to home base.

Fortunately, there was another pilot involved in the "push out". He wisely suggested that the tanks should be filled. He was quite insistent, as the aircraft had just undergone extensive maintenance.

I have since wondered if the young pilot has ever thought of the possible outcome had the tanks been left with "just enough fuel" for the trip.

The maintenance release was given to the pilot on the undertaking that he "do a circuit" before departure to "make sure things are OK".

These shortcuts hardly ever pay off.

The pilot did his circuit and headed off. As it turned out, he was lucky not to keep a completely different appointment.

A couple of days later, I heard that the aircraft had landed with two empty tanks.

Apparently, the fuel lines to the tank had not been tightened on assembly. Given that the aircraft was refuelled and "checked" in the dark, it's not surprising that the leak was not detected earlier.

One can only guess at the result if minimum fuel had been carried. I was told that the operator of the maintenance organisation "did up" the fuel lines. Obviously not.

I later asked him about the potential disaster. His response left me speechless: "It would have been much worse if I hadn't insisted on full tanks."

I wonder if he believed this. I don't think so. This incident was the culmination of a number of factors, and but for the insistence of the other pilot to fill the tanks, it would have ended tragically. In my opinion, the main causes of the incident were:

- unrealistic time of completion given to aircraft owner;
- anxious pilot rushing to get back to base for a reason that did not justify the risk.
- fuel lines not tightened;
- aircraft not checked in the lights of the hangar for fuel leaks;
- no run-up and subsequent checks carried out; and
- maintenance release incorrectly issued to pacify pilot.

Name withheld

ANALYSIS People, systems and safeguards

AFTER THE EVENT, it is easy to identify the superficial causes of this incident. Certainly, if the tanks had been filled with fuel and properly tested, it's likely the fuel leak would have been detected and the incident avoided. Likewise, if the job had not been so rushed, it's probable the fuel line would have been properly tightened in the first place.

However, knowing this does little to prevent similar incidents occurring in the future. We need to ask why this situation developed as it did and consider what safeguards could be put in place to ensure it doesn't happen again.

The analysis of this event can be broken down into two highly interrelated elements: systems and people.

Systems Systems are influenced by many things, such as maintenance procedures, staff experience, the work environment, and management's attitude to safety. Good systems are able to deliver consistently safe outcomes. Any system, be it a safety management, maintenance or business system, should have at least the following qualities:

- It should be understood by those who use it.
- It should be practical and not encourage work arounds or shortcuts.
- It should be in a cycle of continuous improvement.
- It should be robust, and trap or mitigate possible mistakes.
- It should be owned by those who use it but be the responsibility of one person in authority.
- It should be independent of individuals. If someone leaves, their departure should have no effect on the system.
- It should consistently deliver the desired outcomes.
- Its effectiveness should be constantly evaluated, with feedback provided to staff and management as required.

Generally, the best systems are those that have been built in-house to suit the organisation, though this is not always possible.

Good systems are also well documented. This organisation would have benefited from documented processes to:

- accept the aircraft and provide the customer with a realistic estimate of the time and resources required to complete the job
- advise the customer of a realistic job-completion date
- issue and control the required paperwork
- install fuel tanks. (The maintenance manual should have provided such processes)
- ensure that all maintenance has been properly carried out, including required testing
- issue the maintenance release.

An effective maintenance system would have given the customer a more realistic expectation of the job's completion date. This would have removed the pressure to rush the job, and increased the chances that the maintenance would be completed safely.

Additionally, a documented system could have been used to educate the customer that certain processes are not optional: for example, the fuel tanks had to be filled and checked for leaks, and the fuel gauges calibrated before release.

> "Systems rely on people and while systems are usually good at resisting pressure, people are not."

It could be that these processes were in place. If they were, the system was not a good one because it failed to deliver a safe aircraft. How can this be? Because systems rely on people and while systems are usually good at resisting pressure, people are not.

People Generally, people want to do the right thing. In this case, the customer applied pressure and the people in the system responded by taking shortcuts to please him.

As the author correctly notes, shortcuts hardly ever work out. So why take them? Why would a professional engineer not carry out a leak and system check on the fuel system? There could be many reasons, including:

- fatigue. (It was the end of the day);
- pressure from the customer;
- an attitude that the risk is low so it will be okay;
- ignorance or absence of the procedure;
- employer pressure;
- self pressure ("I'm late for an appointment");
- the culture of the organisation. ("We always take shortcuts and get away with it"); and
- lack of personal/professional discipline.

A good system can foresee and manage all of these issues. For example, the effects of fatigue can be mitigated by insisting on the use of checklists, increasing staff numbers at times when people are likely to be tired, increasing the number of independent checks, or rescheduling safety-critical tasks to periods of higher alertness, say between the hours of 7am and 5pm.

Furthermore, safety management systems integrate elements like incident reporting and analysis, regular safety meetings, surveys and suggestion systems, communication systems and quality processes, so organisations learn from their mistakes and constantly improve their processes.

Commercial pressures can have a significant effect on aviation safety. In this case, pressures may have included:

- the cost in time (and possibly money) to get access to the fuel bowsers;
- overtime considerations; and
- the organisation may have quoted a fixed price for the job.

Good business systems can ensure that the business is profitable and therefore minimise commercial pressures. Unprofitable businesses face immense pressure to take shortcuts in the false hope of saving money. Unfortunately, some maintenance organisations fall prey to these pressures. In the end, if the attitude of an organisation (or at least its owner) is "How do we get around the rules?", then no system will make it safe.

So what can you do? If you are concerned about the safety practices of an organisation speak up and report the facts to the Civil Aviation Safety Authority's confidential safety hotline on 1800 074 737.

Finally, CASA has produced a series of booklets on safety management systems. Aimed at small and medium aviation businesses, they contain valuable advice on setting up and maintaining a safety management system. To obtain copies, contact Safety Promotion on 131 757 or download the booklets at www.casa.gov.au/avreg/business/sms.

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