

# Fuel alert

With fuel gauges hovering on empty, the crew of a Boeing 727 prepare for their fourth and final landing attempt.

## Tony Lucas

**I**N MORE THAN 20,000 HOURS OF short-haul airline flying throughout Australia one flight stands out above the others – the system failed terribly and I came within 15 minutes of running out of fuel in a perfectly serviceable airliner filled with passengers.

It was 1983 and I was scheduled to fly a Boeing 727-200 from Sydney direct to Perth. Strong winds were predicted for the flight and a 30-minute fuel holding requirement had been placed on Perth.

The combination of headwinds and holding made it unlikely that the B727 would be capable of carrying sufficient fuel for the flight, so a landing at Adelaide to uplift additional fuel was planned. Before completing the flight plan, I referred the matter to the airline's operations centre so they could rearrange the day's aircraft movement schedules.

After landing at Adelaide it was necessary to make a new flight plan as headwinds had added an extra 27 minutes flight time to the journey. We departed Adelaide with an endurance of 315 minutes – 205 minutes flight time, normal fuel reserves including 30 minutes mandatory holding, plus an extra 15 minutes. The extra 15 minutes of fuel would ultimately prove vital to the flight.

Initially, enroute progress at FL290 (29,000ft) was marginally better than planned with the aircraft arriving at the

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second reporting point seven minutes early. However, because of increasing cloud and associated turbulence, the aircraft was climbed to FL310. The ride was smoother and a cruise speed of Mach 0.80 could be maintained with very little increase in fuel consumption. Although this was not the optimum level for cruise, passenger comfort was a prime consideration and FL310 was maintained although the wind was now shown to be almost directly on the nose – 280 degrees at 195kt causing a loss of almost all the time we had saved.

**Revenue fuel:** Fuel conservation had become an item of concern to the airline. It was claimed that some pilots were carrying excess fuel, causing aircraft to operate beyond desired weight limits by transporting non-revenue payload.

Notices were sent out reminding crews of the need for discretion in deciding a final

fuel figure before flight. In following these edicts there were some unfortunate instances of aircraft needing to divert because of a shortage of fuel that they otherwise would have carried. It was not until one of the creators of this fuel policy did indeed find himself in this same situation that the issue of notices to pilots mysteriously came to an end. To this day some airlines are still making similar demands on their pilots.

At any time an aircraft is airborne it is totally dependent on operational information being passed to it by air traffic control. This applies particularly to weather changes affecting the destination which should be available through VOLMET or, closer to an aerodrome, ATIS.

On this flight VOLMET gave no indication of a weather change at Perth. When approaching Perth, at about 100 miles, ATIS was checked and no deterioration was indicated.



#### WHAT WENT WRONG?

A fourth approach was made on runway 24, followed by a landing in slightly-improved conditions but well outside the crosswind limits of the aircraft. The low fuel quantity left no choice but to land.

During normal flight at constant power settings a record of fuel consumption was maintained by the known parameters: flow rates and tank quantity indications. In this instance our manoeuvres around Perth were at low levels with varying power settings because of the missed approaches and turbulence, so an accurate assessment of remaining fuel could not be positively determined.

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**Running on empty:** Although there were 110 minutes of fuel available on arrival overhead Perth, only 15 minutes remained after landing – hardly sufficient for any aircraft, let alone an airliner carrying fare paying passengers. These 15 minutes equalled the excess fuel carried over and above flight planned figures, considered unnecessary by certain individuals. This so-called “non revenue” fuel permitted that critical extra time in the air.

Passenger disembarkation was delayed for some time while an ambulance attended to a suspected heart attack case. Several others required a continuous supply of oxygen for a prolonged period. It was necessary for the crew to remain with the aircraft for over one hour monitoring the management of distressed passengers.

How did this incident occur? Why was I not informed of the weather conditions around Perth? And the obvious question – why didn't I divert to Kalgoorlie where the weather was marginally better?

A diversion to Kalgoorlie was certainly a matter seriously considered, but during our unsuccessful attempts to land other aircraft had managed to arrive on their first attempts so Perth should have been okay. Kalgoorlie was a suitable alternate but the limited runway length would have imposed a take off weight restriction resulting in minimal fuel uplift and hence reduced the holding time back at Perth. Furthermore, approach facilities at Perth included two ILSs.

**Missed approach:** At about 70 miles the aircraft's weather radar showed what appeared to be storms around Perth. As we had not been advised of the existence of a weather-related problem Perth ATC was queried about the presence and location of storms, but indicated they were unaware of storms in the area. We began to suspect the reliability of our radar but as we continued the descent significant contouring was noted.

An approach was attempted on runway 02 but was abandoned because of severe gusts, turbulence and crosswind. Another approach on to this runway proved equally unsuccessful. A third attempt to land was then made on runway 24 but due to heavy rain causing severely reduced visibility, turbulence and crosswind, another missed approach was made.

By this time the fuel state was becoming critical. The fuel gauges were bouncing

around near the low stops and the low-fuel-quantity warning lights were illuminated. Making a missed approach in these circumstances required a technique different to a normal initial climb. The aircraft could not be put into its normal nose-up attitude because of the possibility of fuel starvation and any movement of the power levers had to be slow and progressive, again to prevent fuel starvation.

A further distraction was created by the possibility of fuel being drawn away from the collector boxes located in the main tank systems. Negative G-loadings could have forced the small amount of remaining fuel away from its normal supply route – again adding to the possibility of fuel starvation.

During these manoeuvres the aircraft had been struck by lightning twice but fortunately a check of systems revealed no failures.

**Disciplinary action:** Initial investigation revealed that the incident was caused by a combination of many factors. Standard procedures at the time required the timely pre-flight and/or in-flight notification of relevant information. The amended TAF and SIGMET indicating the presence of very strong winds and thunderstorms were not directed to me. (This information was available at about the time I was preparing to take off from Adelaide some 3hrs 30mins before arrival at Perth.) As a result disciplinary action was taken and suitably worded instructions issued to obviate any future failings. The officers concerned acknowledged their failure and were counselled accordingly. Action was also proposed to install more dedicated equipment between the MET weather station and the radar approach controller.

Upon further investigation it was discovered that a request for activation of terminal area thunderstorm service (TAT) was directed to the Met Bureau's office some hours before my arrival at Perth but was denied on the basis of the priorities as laid down by the Bureau and their other work commitments. An examination of procedures had been carried out, aimed at improving the service.

It was claimed that the actions taken had redressed the deficiencies and improved procedures at Perth. Existing instructions were considered satisfactory provided that they were properly carried out.

## ANALYSIS

### Contingency planning

*Bruce Byron*

IF THIS INCIDENT OCCURRED TODAY, I would like to think that any investigation by the airline's safety department would cover all aspects of the operation, including the policies that governed the operation.

Fuel policy is a crucial safety tool in any operation. To be effective, fuel policy should be clear, unambiguous and not subject to informal rule bending or amendment. By the sound of it, this pilot was required by the existing policy to carry flight fuel of 205 minutes, 30 minutes of mandatory holding plus "normal" reserves of 65 minutes. The extra 15 minutes of margin mentioned by the pilot brought the total to 315 minutes on board.

Reserves of 65 minutes are not unusual for airline jet operations on a trip of that length and would be specified in the company fuel policy. However, it is clear that the pilot felt some pressure not to carry the extra 15 minutes of margin fuel. It seems that this pressure was a result of



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action by company operations management and doesn't indicate an appropriate safety culture at that level of the company.

A more appropriate attitude would be for management to set an appropriate standard through the published fuel policy – the "normal" reserves – and then indicate support for pilots who carry additional fuel when necessary. On the other side of the coin, pilots who "tanker" extra fuel well in excess of normal reserves should be prepared to objectively justify their case. If all pilots are always carrying extra gas it probably indicates that company fuel policy needs a close look by the operations quality assurance department.

**Weather forecasts:** The issue of weather forecasts was emphasised by the pilot. If a revised forecast was available on departure from Adelaide, it should have been passed to the pilot. In that sense the system failed.

But flight crews must remember that the system is not limited to third parties; pilots are also part of the system. On all long distance flights, it is good practice to check the TAF through ATC even if the one issued before flight covers the arrival time.

Since the original forecast required 30 minutes holding due to weather, there should have been some uncertainty in the minds of the pilots that should have

prompted such a request.

The remaining issues really relate to decisions by the crew, and knowing when to make them.

Although the aircraft experienced very high headwinds enroute it still arrived "overhead" Perth with 110 minutes of fuel – presumably at the top of descent. Consequently, the flight up to that point was going roughly to plan and had consumed the expected 205 minutes of flight fuel. For that reason the crew probably, and quite understandably, were comfortable with the fuel situation. However as all jet operators know, descent into thicker air means increased fuel consumption if you need to do anything other than a cruise descent and landing.

**Decision points:** Whether we like it or not, descent to lower altitude presents increased risks and reduced margins. The descent point should be one of those key decision points of any flight. In most cases the decision is easy: weather is great, fuel is on plan, so keep going downhill. The important point is that the situation is reviewed and a decision made – on every flight, at every descent point.

On this flight the decision should not have been so easy. An old TAF indicated holding, there was no updated TAF (even though the ATIS indicated the status quo) and the radar showed storms in the area. Even though there was initial uncertainty about the storm indications, their existence was soon confirmed. At this point the progress of the flight should have been reviewed, rather than continuing descent into levels of increasing fuel consumption.

There may not have been enough information to justify a divert to Kalgoorlie at that point, but there was arguably enough to justify a hold at a medium level while they sorted it out. While they clearly had enough fuel to divert from mid-descent, it would have been useful to work out how much fuel they needed to divert from circuit height in the event of a miss.

As it turned out, that's the situation that presented itself next. Any missed approach is a point where a decision must be made (although the planning must be done beforehand) such as working out how much fuel is required for diversion from circuit height. Rather than consuming valuable fuel on repeated circling approaches, there may have been other options. The issue is to know when to review the progress of the flight and to define a diversion point.

Flying involves making decisions in the air, but making the decision can be made a lot easier by thinking the options through ahead of time and defining those points when decisions must be made.

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