Our Wings Carry Your Dreams

Fuel Planning

Contents

Introduction 2
Legal Requirements 2
Cherokee Fuel System 3
Units of Measurement and Conversion Tables 4
Fuel Flow Rate 4
Fuel Starvation vs Fuel Exhaustion 5
Fuel Management in the Training Area / Circuit 5
Fuel Management on a Cross Country Flight 5
Alternate Requirements 6
Reference Material 6
Trivia 6

Introduction

Diligent fuel management is necessary on any flight, whether you are going to and from the Training Area or crossing the Pacific. You must ensure that you have enough fuel not only for the planned flight, but to respond to any contingencies that may come up, such as bad weather or a closed runway.

Because your aircraft fuel tanks are long and shallow, as well as the fuel moving around in turbulence, quantity measurement is much more difficult than in a car tank, and you *should not rely solely on your fuel gauges.* The gauges are only there to confirm what you have already measured and planned.

In the USA, the NTSB reports that 95% of fuel related incidents in GA planes were related to 'pilot error', rather than the result of system failure.[1]

A Cherokee at the end of Taxiway E on Bankstown, crashed due to fuel starvation.

Image Source: Sydney Morning Herald

An Air Canada 767, the "Gimli Glider", which landed safely on a disused air force base after running out of fuel mid-flight due to a misfuelling.

Image Source: Wikipedia

Legal Requirements

Under CAR 234 and Instrument CASA 29/18, you *must* carry fuel for the following:

(a) taxi fuel; and

(b) trip fuel from take-off; and

(c) holding fuel (as required); and

(d) variable fuel reserve (if specified in Table 1); and

(e) alternate fuel (if required); and

(f) final fuel reserve; and

(g) additional fuel (if applicable).

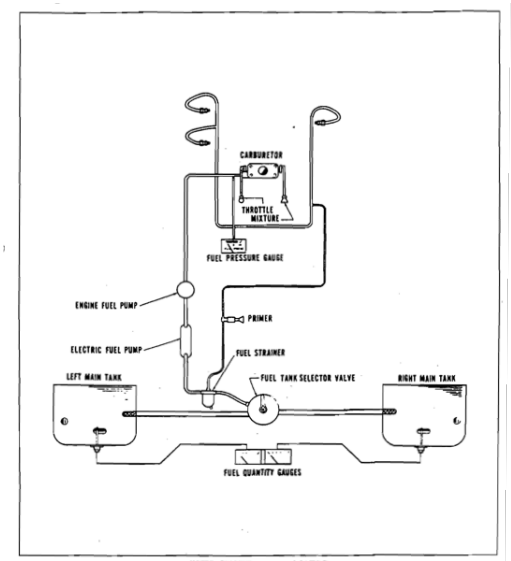
[1] https://www.ntsb.gov/news/press-releases/Pages/pr20170829.aspx

The key point from this, for your private or instructional flight, is that you need fuel for your flight, plus *30 minutes of final reserve* fuel, under Table 1 of CASA 29/18. For an IFR or NVFR flight in a small aeroplane, this increases to 45 minutes.

The significance of the fixed fuel reserve is that if you are not able to land with your final reserve intact, you must declare a fuel emergency. You cannot plan to burn the final reserve. This will be explained in my detail in your navigation training.

However, depending on the flight, it is usually prudent to carry more than this minimum fuel!

Cherokee Fuel System



FUEL SYSTEM SCHEMATIC
Figure 7-9

The Cherokee has a simple fuel system with one tank on each wing, fed to the engine by an engine-driven fuel pump, and/or a backup electric fuel pump (normally used for starting, take-off and landing).

Each tank has a usable capacity of 24 US gallons (91 litres).

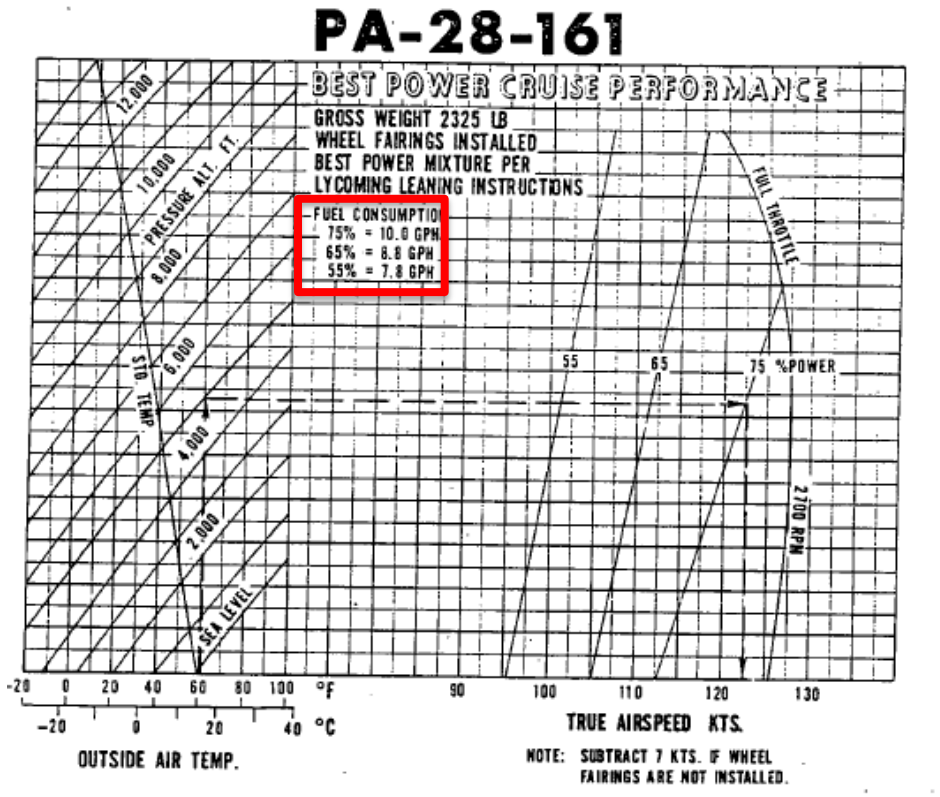
On the left hand side of the cockpit, next to your leg, there is a three point selector to change tanks, or switch the fuel off (not to be used in flight). Ensure that the selector is in the correct position.

Units of Measurement and Conversion Tables

Your ERSA has a number of conversion tables that you need to be familiar with as unfortunately in aviation we commonly use a mixture of USA units of measure (US gallons marked on fuel gauges and feet for vertical distances/heights) and the metric system we are more familiar with (metres for horizontal distances and litres for ordering fuel for instance).

Fuel Flow Rate

For a flight to the Training Area for one hour, you need a legal minimum of 1.5 hours of fuel - one hour of flight time, and half an hour of reserve (as well as maybe 2 US gallons for start, taxi and run ups). However, you need to know what this translates to in terms of litres.



The performance tables under Section 5 of the Pilot Operating Handbook give you the fuel flows for different percent power settings, *assuming a correctly leaned new engine at the appropriate RPM for that percent power setting*.

For a typical flight to the Training Area, where you are not leaning the mixture, you can plan safely at 10 gallons per hour. This also provides a buffer for your climb.

Fuel Starvation vs Fuel Exhaustion

There are two concepts you will come across relating to fuel mismanagement; fuel starvation and fuel exhaustion.

Fuel starvation is a situation where there is still fuel in the aircraft, but it is not getting to the engine, such as due to a blocked fuel line, fuel pump failure, or more likely, due to *not changing the fuel tank*.

Fuel exhaustion is a situation where there is no fuel left in the aircraft. This can usually be avoided by diligent fuel planning.

Fuel Management in the Training Area / Circuit

Normally, in the circuit or Training Area, you should aim to switch tanks approximately every *30 minutes.* This ensures that the lateral fuel imbalance does not get too large.

You can use the timer on the ADF to assist you in remembering to change tanks.

When returning from the Training Area, as part of your FMQDA checks, you should switch to the fullest tank.

Fuel Management on a Cross Country Flight

	120		120	
	LEFT TANK		RIGHT TANK	
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				
ON				
OFF				

Fuel Plan	1st Leg Gals	1st Leg Time	2nd Leg Gals	2nd Leg Time
Climb				
Cruise				
Alternate				
Sub Total				
Variable Reserve				
Fixed Reserve	9	45	9	45
Holding				
Taxi				
Fuel Reqd				
Margin				
Endurance				

	120		120	
	LEFT TANK		RIGHT TANK	
ON	2300	120		
OFF	2330	90		
ON			2330	120
OFF			0030	60
ON	0030	90		
OFF				
ON				
OFF				
ON				
OFF				

Fuel Plan	1st Leg Gals	1st Leg Time	2nd Leg Gals	2nd Leg Time
Climb	–	–		
Cruise	18	105		
Alternate	5	30		
Sub Total	23	135		
Variable Reserve	–	–		
Fixed Reserve	9	45	9	45
Holding	–	–		
Taxi	1	–		
Fuel Reqd	33	180		
Margin	8	48		
Endurance	41	228		

Fuel planning on a navigation flight is more complicated and will be covered by your instructor during the navigation briefing.

We have here examples of empty and completed fuel plans from a navigation flight. As you can see, you need to create a detailed fuel plan to ensure that you will have sufficient fuel on board, and then keep a log, once enroute, of when you change tanks, in order to determine the next change required and fuel remaining onboard.

Alternate Requirements

In some cases, due to weather at your planned destination, you may need to carry additional fuel for an alternate. Where required, you should have enough fuel to fly to your destination aerodrome, and then from 1500 feet above your destination aerodrome to the alternate and land. This does not prevent you from trying to land at the original destination, but you must have enough fuel to get to the alternate.

See the Alternate Requirements mini brief for more information on when we need an alternate.

Reference Material

CAAP 234-1(2)

CAR 234

CASA Instrument CASA 29/18

Trivia

The so-called Gimli Glider, which performed a forced landing due to running out of fuel, was only fuelled with approximately a quarter of the fuel required for flight, due to an incorrect conversion involving gallons, pounds and litres. Although we flight plan in gallons for our Cherokees, you almost always order fuel in litres. Be careful!!!