



Payload Calculations

Refer to B727 Operating Manual - Addenda.

Introduction:

As an airline pilot, you are an approved load controller (ALC) under the regulations. This means that you must know how to load the aircraft, and in doing so not exceed any limits.

Normally in airline flying the airlines ALC will prepare the load sheet for you, detailing the payload and centre of gravity (C of G) position. In the ATPL examination you will be required to assess the maximum payload that the aircraft can carry from the departure airport.

Note: The calculation of the C of G position will be covered in the ATPL “Performance and Load exam” and the “Performance and Load course texts”, not the flight planning exam !

Abbreviations used:

BR: Brake release.

P/BRW: The limit weight based on aircraft takeoff/climb performance on the active runway.

BRW: The actual brake release weight having considered all limits, including performance and structural.

P/LW: The limit landing weight based on aircraft landing performance (max braking) on the active runway, assuming NO reverse thrust available.

MZFW: The absolute maximum limit weight without fuel load. This is effectively a spar stress limitation.

FOB: Fuel on board.

Flight fuel: The fuel required from brake release at departure to touchdown at destination.

FBO: Fuel burn-off (same as flight fuel).



There are only three things that make up the total gross weight (GW) of any aircraft. They are ...

- The aircraft airframe and it's crew. This is called the “Basic Operating Weight”.
- The weight of fuel on board.

The maximum payload can be limited by:

- a. The take off performance limits (P/BRW) imposed by the runway length, and climb limit capabilities assuming recognition of the failure of the critical engine at or after V₁ (decision speed).
- b. Any landing weight limits imposed by the destination runway length, or at the alternate (if required) .
- c. The fuel requirements for the flight, including the necessary reserves.
- d. The aircraft structural limitations, which are:



- The maximum zero fuel weight (MZFW), which for the B727 is 63, 502 kg.
- The maximum structural brake release weight, which is 89, 357 kg.

A typical ATPL exam type question will give you the P/BRW at the departure airport, P/LW (s) at the destination airport, and alternate (if required). It will also quote the flight fuel from departure to destination, and where required, destination to alternate. Armed with this information you must assess the maximum payload that can be carried.

A flow chart system is used in these training texts to guide you through the steps. No flow chart will be made available by CASA in the exam, so you must eventually understand the calculation routine.

For now simply follow the arrows and fill in the boxes. First some examples - refer next page !

Payload example No.1.

Data:

Departure airport "SUITABLE". P/BRW 86, 000 kg (ie: performance limited, not structurally limited).

Destination airport "SUITABLE". P/LW 72, 574 kg (ie: structurally limited using 30 flap).

Flight fuel from departure to destination is 12, 000 kg including approach/manoeuvre fuel.

Abnormal ops are NOT limiting.

Aircraft basic operating GW is 47, 000 kg (ie: the fleet average).

Carry minimum fuel required for this operation, as per company fuel policy (page 1-17).

Find: The maximum payload that can be loaded at departure airport ? _____ kg

Working:

Points to note.

- Departure airport is limited to 86, 000 kg by aircraft runway or climb performance. (Not structurally limited)
- Destination airport is limited by the 30 flap structural limit only (ie: 72, 574 kg - refer page manual page 1-1). It is not performance limited due to runway length.
- Destination airport is forecast to remain "SUITABLE", meaning that airport is forecast to be above alternate minima for the period of possible use. Therefore fuel to fly to an alternate is NOT required.
- Flight fuel is given as 12, 000 kg. This is all the fuel burnt from brake release at departure to touchdown at the destination, but NOT taxi or reserve fuel.
- Abnormal operations are NOT limiting. This means that the fuel required for normal operations from departure to destination exceeds that required for CPDP, and CP 1 Engine Inop fuel requirements.

We will always assess the flight assuming we get airborne at the maximum BRW from the departure airport, and check that in doing so we will not land at the destination overweight, or exceed the maximum ZFW.

Step 1. Working forward from the maximum BRW at departure airport.

Max BRW at Dep	86, 000
Minus flight fuel	12, 000
LW at Dest	74, 000
Max LW at Dest	72, 574
Over/Under by	1, 426 kg

So if we depart at the maximum BRW of 86, 000 kg from the departure airport, we will land over-weight at the destination airport.


Refer to next page for step 2 onwards.



Step 2. We must now add up the minimum amount of fuel which must be on board at BRAKE RELEASE. After that we can check whether, in leaving the departure airport at 86, 000 kg, we will exceed the maximum ZFW, which is 63, 500 kg for all B727 aircraft (refer limitation section manual page 1-1).

Normal operations fuel summary at BR.

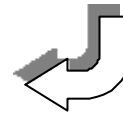
Item	Kg
Flight Fuel	12, 000
V/R 10%	1, 200
Fixed Reserve (N/ops)	3, 300
Wx Hold (at dest)	NIL
Traffic Hold (at dest)	NIL
WIP Hold (at dest)	NIL
Final Taxi (at dest)	100
Min FOB @ BR	16, 600 kg

 Step 3. Check ZFW at BR at departure.

Item	Kg
Max BRW	86, 000
Minus FOB at BR	16, 600
ZFW at BR	69, 400
MZFW	63, 502
Over/Under by	5, 898



So if we depart at the maximum BRW of 86, 000 kg from the departure airport, we will exceed the maximum ZFW by 5, 898 kg.



Step 4. Comparing the overweight landing exceedance of 1, 426 kg, with the ZFW exceedance of 5, 900 kg, it is obvious that the ZFW exceedance is greater than the LW exceedance. If we now reduce the BRW by the larger of these two exceedances (ie; 5, 898 kg), we will take care of the lesser landing weight exceedance.

P/BRW	86, 000 kg
Minus largest exceedance	- 5, 898 kg
Revised BRW	80, 102 kg



Note: ZFW is the limiting factor here. This means that the maximum payload can be carried. The payload is always the difference between the ZFW and the basic operating GW.



Payload is always the difference between the ZFW and the Basic Op GW !

Step 5. Find payload using revised BRW.

Item	Kg
Revised BRW	80, 102
Minus min FOB at BR	16, 600
ZFW	63, 502
Minus basic Op	47, 000
Payload	16, 502

Answer !



Points to note:

- It is really important that you learn the structure and logic of the above steps. In the payload summary just imagine a B727 has taxied out from the terminal building and is lined up for takeoff, sitting on a set of scales. A fuel truck arrives and drains all the fuel out of the aircraft tanks. The scales now register the weight of the aircraft without any fuel in it (ie: the zero fuel weight). Next, the aircraft structure disappears, leaving the passengers, their baggage and freight sitting on the scales. This is the payload.
- You must know the company fuel policy from page 1-17 of the manual, and know how to apply it. You should have done the “fuel policy assignments” before attempting these payload questions.
- On short flight sectors with minimal fuel requirements, you will almost certainly be ZFW limited, and so be able to carry the maximum payload. On longer flight sectors the high fuel requirements may mean trading off payload for fuel. Remember, uplifting the correct fuel is the most important aspect, whatever additional weight capacity is left will be payload. The sign of a great aircraft is that it can carry it’s maximum payload over a great distance (ie: be ZFW limited everywhere it goes, not by runway limits).



We always check the ZFW at BR, when the wing spar is under lift stress !



Extra fuel = less bums on seats = less revenue !

Payload example No.2.

Data:

Departure airport “SUITABLE”. P/BRW 88, 000 kg (ie: performance limited, not structurally limited).

Destination airport “ACCEPTABLE” for the period of possible use becoming “SUITABLE” with holding fuel to cover INTER weather deteriorations below alternate minima. Additionally 15 minutes traffic holding is required. P/LW 70, 000 kg (ie: performance limited by runway length, NOT structurally limited).

Flight fuel from departure to destination is 15, 000 kg including approach/manoeuvre fuel.

Abnormal ops are NOT limiting.

Aircraft basic operating GW is 47, 100 kg.

Carry minimum fuel required for this operation, as per company fuel policy (page 1-17).

Find: The maximum payload that can be loaded at departure airport ? _____ kg

Working:

Step 1. Working forward from the maximum BRW at departure airport.

Max BRW at Dep	88, 000
Minus flight fuel	15, 000
LW at Dest	73, 000
Max LW at Dest	70, 000
Over/Under by	3, 000 kg

Refer to next page for step 2.



Step 2. Assess min FOB for normal ops at BR.

Normal operations fuel summary at BR.

Item	Kg
Flight Fuel	15,000
V/R 10%	1,500
Fixed Reserve (N/ops)	3,300
Wx Hold (at dest)	2,000
Traffic Hold (at dest)	1,000
WIP Hold (at dest)	NIL
Final Taxi (at dest)	100
Min FOB @ BR	22,900 kg

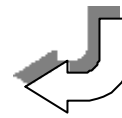


Step 3. Check ZFW at BR at departure.

Item	Kg
Max BRW	88,000
Minus FOB at BR	22,900
ZFW at BR	65,100
MZFW	63,502
Over/Under by	1,598



Step 4. Comparing the overweight landing exceedance of 3,000 kg, with the ZFW exceedance of 1,598 kg, it is obvious that the LW exceedance is greater than the ZFW exceedance. If we now reduce the BRW by the larger of these two exceedances (ie; 3,000 kg), we will take care of the lesser ZFW exceedance.



P/BRW	88,000 kg
Minus largest exceedance	- 3,000 kg
Revised BRW	85,000 kg



Step 5. Find payload using revised BRW.

Item	Kg
Revised BRW	85,000
Minus min FOB at BR	22,900
ZFW	62,100
Minus basic Op	47,100
Payload	15,000

Answer !

In this case the flight was NOT ZFW limited, but LW limited at destination due to a short runway. We could NOT carry the maximum payload for that reason.



Payload example No.3.

Data:

Departure airport “ACCEPTABLE” for the period of possible use, becoming “SUITABLE” , with holding fuel to cover TEMPO weather conditions. Additionally, a 30 traffic holding requirement applies. P/BRW 77, 000 kg (ie: performance limited, not structurally limited).

Destination airport “ACCEPTABLE” for the period of possible use becoming “SUITABLE” with holding fuel to cover INTER weather deteriorations below alternate minima. P/LW 69, 000 kg (ie: performance limited by runway length, NOT structurally limited).

Flight fuel from departure to destination is 14, 000 kg including approach/manoeuvre fuel.

Abnormal ops are NOT limiting.

Aircraft basic operating GW is 47, 250 kg.

Carry minimum fuel required for this operation, as per company fuel policy (page 1-17).

Find: The maximum payload that can be loaded at departure airport ? _____ kg

Working:

Points to note.


- For normal ops, it is the holding fuel requirements at the destination that is of interest to us, NOT that at the departure airport. Normal ops means you will proceed to the destination. You would only return to the departure airport if the aircraft suffered a failure of the cabin pressure (depressurisation), or the loss of thrust from an engine. These two would require you to consider the conditions at the departure airport, and you would carry the holding on whichever airport had the highest applicable holding when considering these. As the flight is said to be limited by the normal operations fuel requirement, the depressurised and 1 engine inop cases are covered by this amount of fuel.



For normal ops, consider only the holding fuel at the destination airport !

Step 1. Working forward from the maximum BRW at departure airport.

Max BRW at Dep	77, 000
Minus flight fuel	14, 000
LW at Dest	63, 000
Max LW at Dest	69, 000
Over /Under by	6, 000 kg

Refer to next page for step 2. 

No LW problem here !



Step 2. Assess min FOB for normal ops at BR.

Normal operations fuel summary at BR.

Item	Kg
Flight Fuel	14, 000
V/R 10%	1, 400
Fixed Reserve (N/ops)	3, 300
Wx Hold (at dest)	2, 000
Traffic Hold (at dest)	NIL
WIP Hold (at dest)	NIL
Final Taxi (at dest)	100
Min FOB @ BR	20, 800 kg



Step 3. Check ZFW at BR at departure.

Item	Kg
Max BRW	77, 000
Minus FOB at BR	20, 800
ZFW at BR	56, 200
MZFW	63, 502
Over/Under by	7, 302

Not ZFW limited !

So we can leave the departure airport at 77, 000 kg, and in doing so not exceed either the maximum LW at destination, or the ZFW. We are limited by the takeoff performance at the departure airport to 77, 000 kg. It is this weight which will limit the amount of payload that can be carried !



Step 5. Find payload using revised BRW.

Item	Kg
Revised BRW	77, 000
Minus min FOB at BR	20, 800
ZFW	56, 200
Minus basic Op	47, 250
Payload	8, 950

Answer !



If the flight is limited by other than ZFW, max payload can NOT be carried !

Next we will look at the scenario whereby an alternate is required. Refer to next page.



Payload calculation - alternate required on destination

General

The workflow is very similar to that previously, except that we must ensure that we do not exceed our LW at both destination, and alternate airports. Refer to example below.

Payload example No.4.

Data:

Departure airport “ACCEPTABLE” for the period of possible use, becoming “SUITABLE” , with holding fuel to cover TEMPO weather conditions. Additionally, a 15 traffic holding requirement applies. P/BRW 89, 357 kg (ie: structurally limited, not performance limited).

Destination airport “ACCEPTABLE” for the period of possible use. (needs an alternate). P/LW 72, 574 kg (ie: performance limited by 30 flap structural landing limit, NOT runway length,).

Alternate airport “ACCEPTABLE” for the period of possible use, becoming “SUITABLE”, with weather holding to cover INTER deteriorations below alternate minima. Additionally, a 15 minutes traffic holding requirement applies. P/LW 65, 000 kg

Flight fuel from departure to destination is 10, 000 kg.

Flight fuel from destination to alternate is 6, 000 kg, including approach/manoeuvre fuel..

Abnormal ops are NOT limiting.

Aircraft basic operating GW is 46, 850 kg.

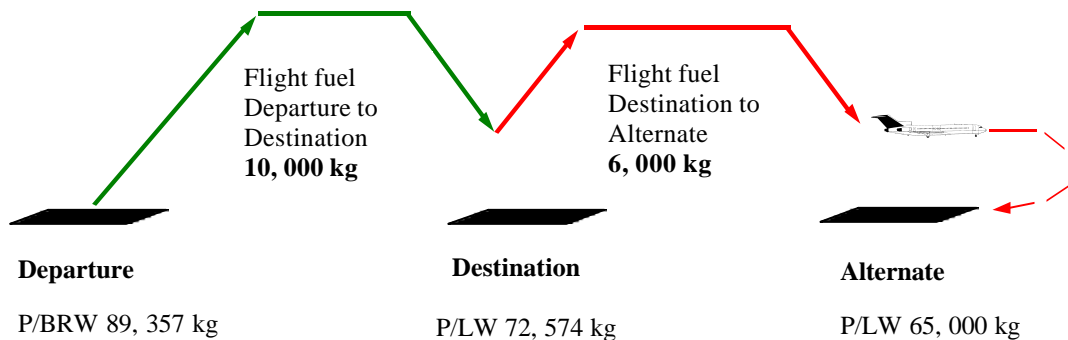
Carry minimum fuel required for this operation, as per company fuel policy (page 1-17).

Find: The maximum payload that can be loaded at departure airport ? _____ kg

Refer to flight profile below for guidance !



Fixed reserve when an alternate is required is 2, 250 kg, NOT 3, 300 kg.



Flight profile.

Payload example 4 continued ...

Step 1. Working forward from the maximum BRW at departure airport to destination.



Step 2. Working forward from the maximum BRW at departure airport to Destination, and destination to alternate.

Max BRW at Dep	89, 357
Minus flight fuel Dep to Dest	10, 000
LW at Dest	79, 357
Max LW at Dest	72, 574
Over/Under by	6, 783 kg

Max BRW at Dep	89, 357
Minus flight fuel Dep to Dest, to Alt	16, 000
LW at Alternate	73, 357
Max LW at Alt	65, 000
Over/Under by	8, 357 kg



Step 4. Check ZFW at BR at departure.



Step 3. Normal operations fuel summary at BR.

Item	Kg
Max BRW	89, 357
Minus FOB at BR	22, 950
ZFW at BR	66, 407
MZFW	63, 502
Over/Under by	2, 905

Item	Kg
Flight Fuel	16, 000
V/R 10%	1, 600
Fixed Reserve (N/ops)	2, 250
Wx Hold (at alt)	2, 000
Traffic Hold (at alt)	1, 000
WIP Hold	NIL
Final Taxi (at dest)	100
Min FOB @ BR	22, 950 kg



Step 5. Reduce the BRW of 89, 357 kg at departure by the largest exceedance. In this case the 8, 357 kg exceedance of LW at the alternate airport.

P/BRW	89, 357 kg
Minus largest exceedance	- 8, 357 kg
Revised BRW	81, 000 kg



Step 6. Find payload using revised BRW.

Item	Kg
Revised BRW	81, 000
Minus min FOB at BR	22, 950
ZFW	58, 050
Minus basic Op	46, 850
Payload	11, 200

Answer !

Payload example No.5.

Data:

Departure airport “ACCEPTABLE” for the period of possible use, becoming “SUITABLE” , with holding fuel to cover INTER weather conditions.

P/BRW 86, 500 kg (ie: performance limited, NOT structurally limited).

Destination airport “ACCEPTABLE” for the period of possible use. (needs an alternate). Additionally, a 15 minute traffic holding requirement applies.

P/LW 68, 000 kg (ie: limited by landing performance, NOT by 30 flap structural landing limit).

Alternate airport “SUITABLE” for the period of possible use. P/LW 64, 636 kg (limited by 40 flap structural landing limit refer manual page 1-1).

Flight fuel from departure to destination is 8, 500 kg.

Flight fuel from destination to alternate is 4, 000 kg, including approach/manoeuvre fuel..

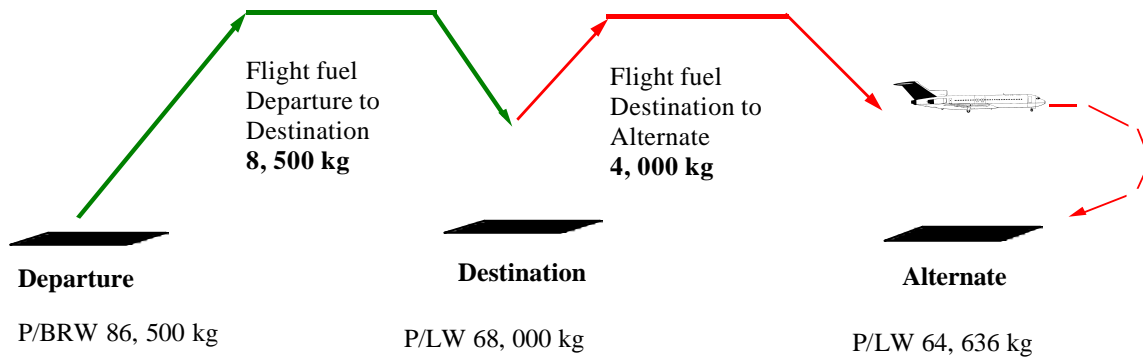
Abnormal ops are NOT limiting.

Aircraft basic operating GW is 47, 450 kg.

Carry minimum fuel required for this operation, as per company fuel policy (page 1-17).

Find: The maximum payload that can be loaded at departure airport ? _____ kg

Refer to flight profile below for guidance !



Flight profile



Step 1. Working forward from the maximum BRW at departure airport to destination.

Max BRW at Dep	86, 500
Minus flight fuel Dep to Dest	8, 500
LW at Dest	78, 000
Max LW at Dest	68, 000
Over/Under by	10, 000 kg

Step 2. Working forward from the maximum BRW at departure airport to Destination, and destination to alternate.

Max BRW at Dep	86, 500
Minus flight fuel Dep to Dest, to Alt	12, 500
LW at Alternate	74, 000
Max LW at Alt	64, 636
Over/Under by	9, 364 kg

Step 3. Normal operations fuel summary at BR.

Item	Kg
Flight Fuel	12, 500
V/R 10%	1, 250
Fixed Reserve (N/ops)	2, 250
Wx Hold (at alt)	NIL
Traffic Hold (at dest)	1, 000
WIP Hold	NIL
Final Taxi (at alt or dest)	100
Min FOB @ BR	17, 100 kg

Step 4. Check ZFW at BR at departure.

Item	Kg
Max BRW	86, 500
Minus FOB at BR	17, 100
ZFW at BR	69, 400
MZFW	63, 502
Over/Under by	5, 898

Step 5. Reduce the BRW of 86, 500 kg at departure by the largest exceedance. In this case the 10, 000 kg exceedance of LW at the destination airport.

P/BRW	86, 500 kg
Minus largest exceedance	- 10, 000 kg
Revised BRW	76, 500 kg

Step 6. Find payload using revised BRW.

Item	Kg
Revised BRW	76, 500
Minus min FOB at BR	17, 100
ZFW	59, 400
Minus basic Op	47, 450
Payload	11, 950

Answer !

Loading Max Fuel at Departure

From page 5 of the B727 Flight Planning Operating Manual - addenda, note that the total amount of fuel which can be loaded on an ISA day using under-wing (pressure refuelling) 29, 094 kg. This addenda will be supplied as part of the work booklet in the CASA examination.

There may be occasions in the CASA exam, and in real life, where you wish to uplift as much fuel at the departure airport as possible, perhaps because the price of fuel at the destination is much higher. These types of questions will be worth 3 or 4 marks in the CASA exam, so you can ill afford to get them wrong.

You will be given:

- A performance limited BRW (PBRW). An exam question may provide a PBRW that is over maximum structural takeoff weight. You must reduce this to 89, 357 kg (Refer B727 addenda) in this event.
- The payload (total weight of passengers and freight).
- Basic operating GW (fleet average is 47, 000 kg - B727 manual page 1-1).
- The flight fuel.
- The minimum ramp fuel for the flight (ie: flight fuel plus reserves required).



Always assume that the reserves will remain unused upon landing at destination, unless specifically advised otherwise in the question !

Example 6.

Given: Route Adelaide to Jakarta. Flight Fuel 18, 650 kg. Total minimum ramp fuel required 24, 065 kg. P/BRW Adelaide is 91, 000 kg. Payload is 12, 000 kg. Basic operating GW is the fleet average. Uplift maximum fuel ex Adelaide due to high fuel cost in Jarkarta ! Underwing (pressure) refuelling is available in Adelaide, where the temperature is ISA.

Which answer is closest to the planned landing weight at Jakarta, assuming reserves are unused ?

- a. 66, 200 kg b. 69, 300 kg c. 69, 450 kg d. 70, 550 kg

Working:

Step 1.

Reduce BRW to 89, 357 kg to conform to published Max structural BRW.
Ramp max GW is 89, 357 kg + 150 kg = 89, 507 kg.

Step 2.

Find max fuel that can be loaded.

Item	Kg
Revised Ramp	89, 507
Minus Basic Op	47, 000
Minus Payload	12, 000
Max Ramp fuel	30, 507

Reduce this to max underwing capacity of 29, 094 kg

Step 3. Summary

Item	Kg
Basic Op GW	47, 000
Plus Max fuel uplift	29, 094
Plus Payload	12, 000
Ramp Wt Adelaide	88, 094
Less Taxi Adelaide	150
Less flight fuel	18, 650
LW Jakarta	69, 294

Answer "B" closest !!

Example 6.

Given: Route Melbourne to Singapore. Flight Fuel 20, 000 kg.
 Total minimum ramp fuel required 25, 550 kg. Payload 11, 000 kg.
 P/BRW Melbourne is 92, 000 kg. Basic operating GW is 47, 200 kg.
 Uplift maximum fuel ex Melbourne due to high fuel cost in Singapore !
 Underwing (pressure) refuelling is available in Melbourne. Assume ISA conditions in Melbourne.

Which answer is closest to the planned landing weight at Singapore, assuming reserves are unused?

- a. 67, 300 kg b. 67, 050 kg c. 60, 250 kg d. 67, 150kg

Working:

Step 1.

Reduce BRW to 89, 357 kg to conform to published Max structural BRW. Max ramp GW is 89, 357 kg + 150 taxi out fuel = 89, 507 kg.

Step 2.

Find max fuel that can be loaded.

Item	Kg
Revised Ramp GW	89, 507
Minus Basic Op	47, 200
Minus Payload	11, 000
Max Ramp fuel	31, 307

Reduce this to max underwing capacity of 29, 094 kg

Step 3. Summary

Item	Kg
Basic Op GW	47, 200
Plus Max fuel uplift	29, 094
Plus Payload	11, 000
Ramp Wt Melbourne	87, 294
Less Taxi Melbourne	150
Less flight fuel	20, 000
LW Singapore	67, 144

Answer "D" closest !

Example 7.

Given: Route Perth to Bali. Flight Fuel 15, 000 kg. P/BRW Perth is 88, 000 kg.
 Basic operating GW is 47, 350 kg. Payload as per summary. Uplift maximum fuel ex Perth due to high fuel cost in Bali !

Underwing (pressure) refuelling is available in Perth. Assume Perth conditions are ISA. Which answer best describes the planned landing weight in Bali assuming reserves are unused?

- a. 71, 800 kg b. 71, 200 kg c. 72, 850 kg d. 71, 000

Payload summary

Item	Kg
Zone 1	20 adults
Zone 2	15 adults/2 adolescents
Zone 3	18 adults/2 adolescents/2 children
Zone 4	22 adults/2 infants/2 children
Zone 5	16 adults/2 adolescents/2 infants
Fwd Cargo 1	500 kg
Fwd Cargo 2	1, 000 kg
Aft Cargo 4	400 kg
Aft Cargo 5	500 kg
Extra Crew	1

Working:

Step 1.

Add up payload using B727 operating addenda for standard Pax weight info. You should get 10, 484 kg.

Step 2.

Find max fuel that can be loaded.

Item	Kg
Max ramp GW Perth	88, 150
Minus Basic Op	47, 350
Minus Payload	10, 484
Max Ramp Fuel	30, 316

Reduce this to max underwing capacity of 29, 094 kg

Step 3. Summary

Item	Kg
Basic Op GW	47, 350
Plus Max fuel uplift	29, 094
Plus Payload	10, 484
Ramp Wt Perth	86, 928
Less Taxi Perth	150
Less flight fuel	15, 000
LW Bali	71, 778

Answer "A" closest !!

Example 8.

Given: Route Sydney to Melbourne. Flight Fuel 5, 500 kg. P/BRW Sydney is 92, 500 kg. Basic operating GW is 47, 150 kg. Maximum payload. Uplift maximum fuel ex Sydney due to a refueller strike in Melbourne. Underwing (pressure) refuelling is available in Sydney. Assume Sydney conditions are ISA. Sydney Airport - Suitable, +30 traffic holding. Melbourne Suitable with INTER, + 20 traffic holding.

Which answer best describes the maximum fuel which can be on board at Sydney Ramp ?

- a. 14, 700 kg b. 29, 000 kg c. 13, 500 kg

Working:

Step 1. The flight will be a zero fuel weight limited one due to short distance. Therefore we can carry maximum payload - this is the difference between MZFW 63, 502 kg (for all B727's), and the basic operating GW of 47, 150 kg. Max payload is therefore 16, 352 kg. You can carry maximum payload up to about 1, 000 nm. Melbourne is less than 400 nm from Sydney.

Step 2. An important consideration here is that you could load 29, 094 kg of fuel above the MZFW of 63, 502 kg, to get a Ramp GW of 92, 596 kg. This would yield a BRW well above the maximum BRW of 89, 357 kg. So we are limited to a max structural BRW of 89, 357 kg or less out of Sydney.

Step 3. If you released the brakes at 89, 357 kg, and burnt only 5, 500 kg as flight fuel to Melbourne, you would land at 83, 857 kg, which is over the 30 flap maximum structural landing weight of 72, 574 kg by a staggering 11, 283 kg. Clearly we can NOT carry the maximum possible fuel load of 29, 094 kg at Sydney, without smashing the aircraft on landing at Melbourne. Melbourne LW is the most limiting case.

Step 4. Working backwards from the maximum LW at Melbourne of 72, 574 kg, and adding the flight fuel of 5, 500 kg, we get a maximum BRW at Sydney of 78, 074 kg, and a max ramp weight 150 kg heavier at 78, 224 kg. The difference between this maximum ramp weight and the MZFW of 63, 502 kg, is the maximum weight of fuel we can have in the tanks to avoid landing overweight in Melbourne. In this case it 14, 722 kg. Check this by working logically forward as shown in the summary below.

Step 5. Summary check - forward thinking.

Item	Kg
Max ramp weight Sydney	78, 224
Less initial taxi fuel	150
Max BRW Sydney	78, 074
Less flight fuel	5, 500
LW Melbourne	72, 574
Less unburnt fuel at landing (14, 722 - 150 - 5, 500)	9, 072
ZFW	63, 502

Answer "A" closest !!

Note: The minimum fuel required for the flight is 12, 933 kg. We will be carrying 14, 722 kg, so margin fuel is the difference between them of 1, 789 kg. We will probably have to return to Sydney via say Canberra to pick up more fuel, then proceed on the Sydney from there. The information on holding at Sydney and Melbourne would be needed only if they asked you how much margin fuel you could carry out of Sydney.

Now attempt the payload assignments !