SUPPLEMENT FOR THE

CPL PERFORMANCE CYBER EXAM

This supplement is presented in two parts:

The PPL section.

The CPL section.

Note that the CPL Performance Cyber Exam will field questions on the PPL syllabus as well as the CPL. It is important that you make sure you are very familiar with both sections before you attempt the cyber exam.

The performance data presented in the first section of this supplement is required for some of the questions contained in the CPL Performance Cyber Exam.

Some of the questions on the PPL section of the syllabus are based on the ECHO MK 1
This is a typical single engine general aviation aeroplane. Some of the quesstions are based on the Alpha, Bravo,and Charlie Loading Systems as covered in the PPL syllabus.

The CPL questions are based on the ECHO aeroplane. Echo data is given in the second section of this supplement.

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CHART NO 1

CONDITIONS
Flaps up
Gear up
2700 RPM
Full Throttle
Mixture leaned above 3000 ft
Cowl Flaps Open

ECHO MK 1

MAXIMUM RATE OF CLIMB

WEIGHT LBS	PRESSURE HEIGHT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	+20°C	+40°C
2650	SL	84	925	855	780	710
	2000	83	825	755	685	620
	4000	81	720	655	590	525
	6000	80	620	560	495	435
	8000	78	525	465	405	430
	10000	77	430	370	310	------

CHART NO 2

CONDITIONS
Flaps up
Gear up
2700 RPM
Full Throttle
Mixture leaned above 3000 ft
Cowl Flaps Open

ECHO MK 1

TIME, FUEL AND DISTANCE TO CLIMB

MAXIMUM RATE CLIMB - ISA CONDITIONS

WEIGHT LBS	DENSITY HEIGHT	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED GALS	DISTANCE NM
2650	SL	84	800	0	0.0	0
	1000	83	760	1	0.4	2
	2000	83	715	3	0.8	4
	3000	82	675	4	1.1	6
	4000	81	635	6	1.6	8
	5000	81	590	7	2.0	10
	6000	80	550	9	2.4	13
	7000	79	510	11	2.9	16
	8000	78	465	13	3.3	19
	9000	78	425	15	3.8	22
	10000	77	385	18	4.3	26

CHART NO 3

CONDITIONS
Flaps up
Gear up
2500 RPM
25 Inches of HG or Full Throttle
Mixture leaned above 3000 ft
Cowl Flaps Open

ECHO MK 1

TIME, FUEL AND DISTANCE TO CLIMB

NORMAL CLIMB 90 KIAS - ISA CONDITIONS

WEIGHT LBS	DENSITY HEIGHT	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED GALS	DISTANCE NM
2650	SL	90	530	0	0.0	0
	1000	90	530	2	0.4	3
	2000	90	530	4	0.7	6
	3000	90	530	6	1.1	9
	4000	90	530	8	1.4	12
	5000	90	520	9	1.8	15
	6000	90	475	11	2.2	18
	7000	90	430	14	2.6	22
	8000	90	385	16	3.1	26

CHART NO 4

ECHO MK 1

CRUISE PERFORMANCE PRESSURE ALITITUDE 2000 F

CONDITIONS
2650 pounds
Recommended lean mixture
Cowl flaps closed

NOTE For best fuel economy, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		ISA - 20 [0AT -9°C]			ISA [OAT +11°C]			ISA +20 [OAT +31°C]		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2500	24	77	130	10.3	74	131	9.9	72	132	9.6
	23	72	127	9.7	70	128	9.4	68	128	9.1
	22	68	123	9.1	66	124	8.8	69	124	8.6
	21	63	120	8.6	61	120	8.3	59	120	8.1
2400	25	---	–	–	76	132	10.1	73	133	9.8
	24	74	128	9.9	72	129	9.6	69	130	9.3
	23	70	125	9.3	67	126	9.0	65	126	8.8
	22	65	121	8.8	63	122	8.5	61	122	8.3
2300	25	76	129	10.1	73	130	9.7	71	131	9.4
	24	71	126	9.5	69	127	9.2	67	127	8.9
	23	67	123	9.0	65	123	8.7	63	123	8.5
	22	63	119	8.5	61	119	8.2	59	119	8.0
2200	24	69	124	8.3	66	124	8.9	64	125	8.6
	23	64	121	7.9	62	121	8.4	60	120	8.2
	22	60	117	7.4	58	116	7.9	56	116	7.7
	21	66	112	6.9	54	112	7.5	52	111	7.3

CHART NO 5

ECHO MK 1

CRUISE PERFORMANCE PRESSURE ALTITUDE 4000 FEET

CONDITIONS
2650 pounds
Recommended lean mixture
Cowl flaps closed

NOTE For best fuel economy, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed

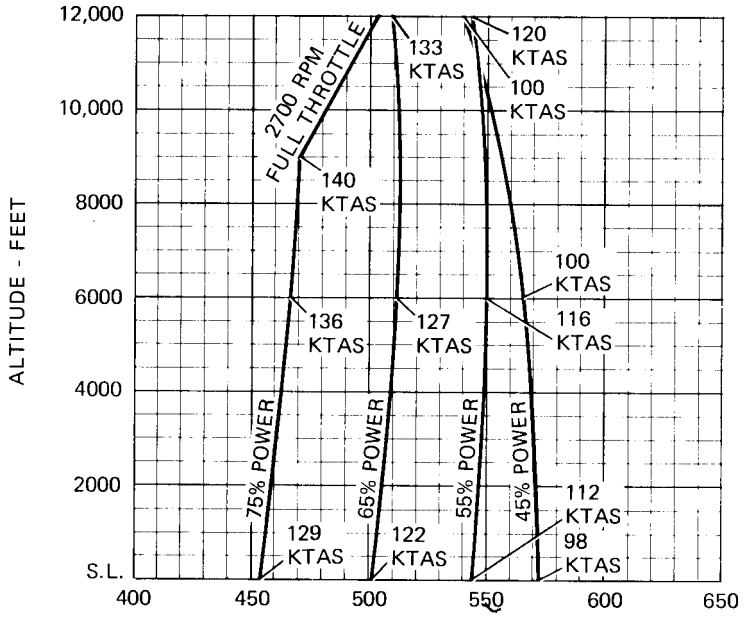
		ISA - 20 [0AT -13°C]			ISA [OAT +7°C]			ISA +20 [OAT +27°C]		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2500	24	–	----	---	77	135	10.2	74	136	9.9
	23	75	131	10.0	72	132	9.7	70	132	9.4
	22	70	127	9.4	68	128	9.1	66	128	8.8
	21	66	124	8.8	63	124	8.6	61	124	8.3
2400	24	77	132	10.2	74	133	9.9	72	134	9.6
	23	72	129	9.7	70	130	9.3	67	130	9.0
	22	68	126	9.1	65	126	8.8	63	126	8.5
	21	63	122	8.6	61	121	8.3	59	121	8.1
2300	25	–	---	---	76	134	10.1	73	135	9.7
	24	74	130	9.9	71	131	9.5	69	131	9.2
	23	70	127	9.3	67	127	9.0	65	127	8.7
	22	65	123	8.8	63	123	8.5	61	123	8.3
2200	24	71	128	9.5	69	129	9.2	66	129	8.9
	23	67	125	9.0	65	125	8.7	62	125	8.4
	22	63	121	8.5	60	121	8.2	58	120	8.0
	21	58	116	8.0	56	116	7.7	54	115	7.5

CHART NO 6

ECHO MK 1
RANGE PROFILE
45 minutes Fixed Reserve
44 gallons useable fuel

CONDITIONS
2650 pounds
Recommended lean mixture
ISA conditions
No wind

NOTE This chart allows for the fuel used during engine start, taxi take-off and climb, and the distance covered in climb.

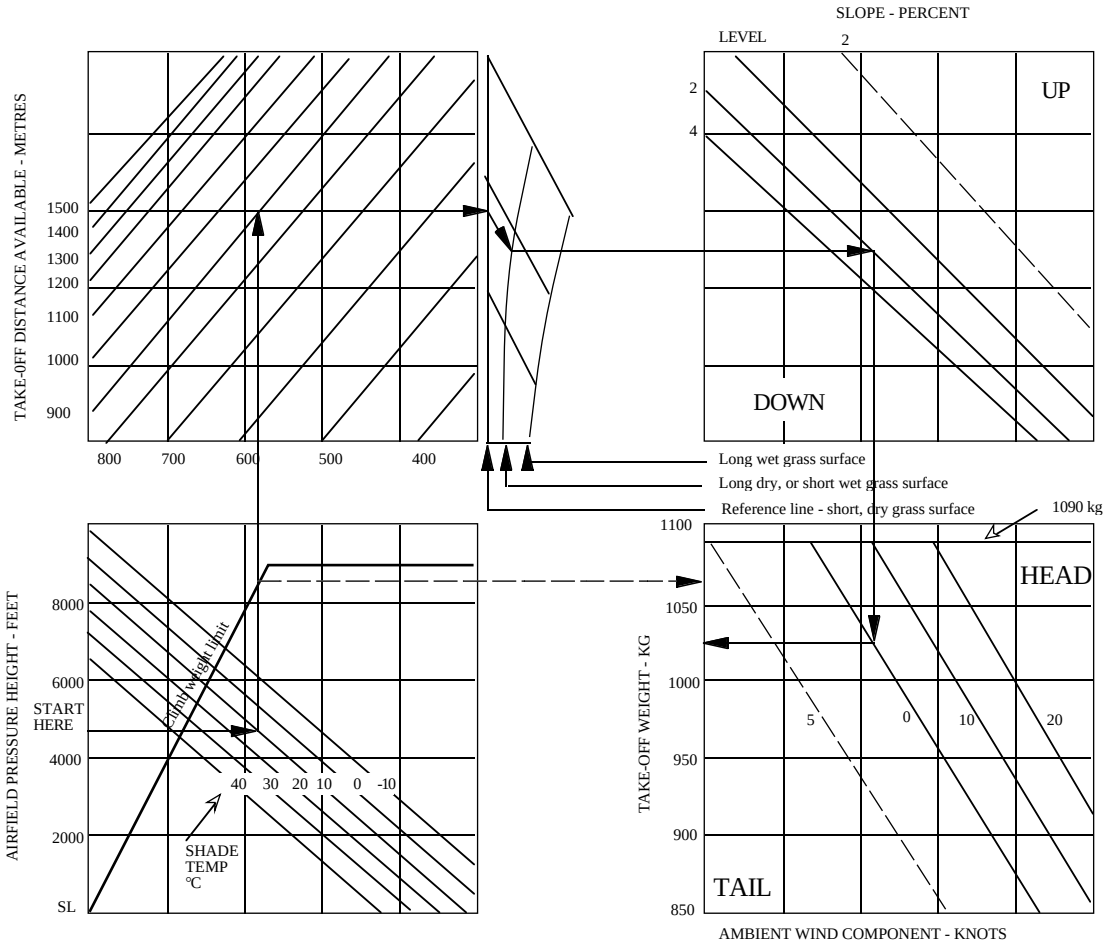


TAKE-OFF CHART TYPE 1

EXAMPLE

Find the maximum take-off weight permitted under the conditions described below.

Airfield pressure height	=	4700 ft
Shade temperature	=	+10°C
TODA	=	900 m
Short wet grass surface		
2% down slope		



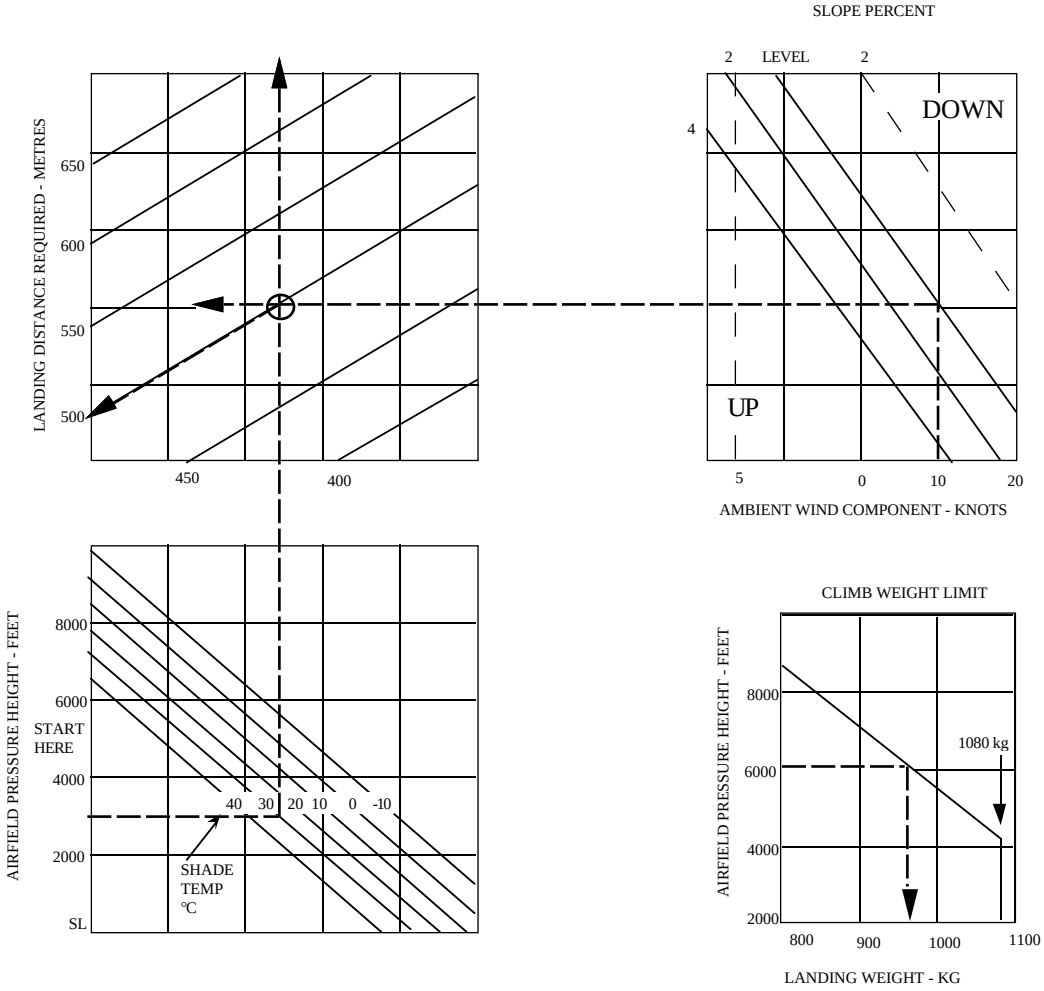
Answer 1020 kg

LANDING CHART TYPE ONE

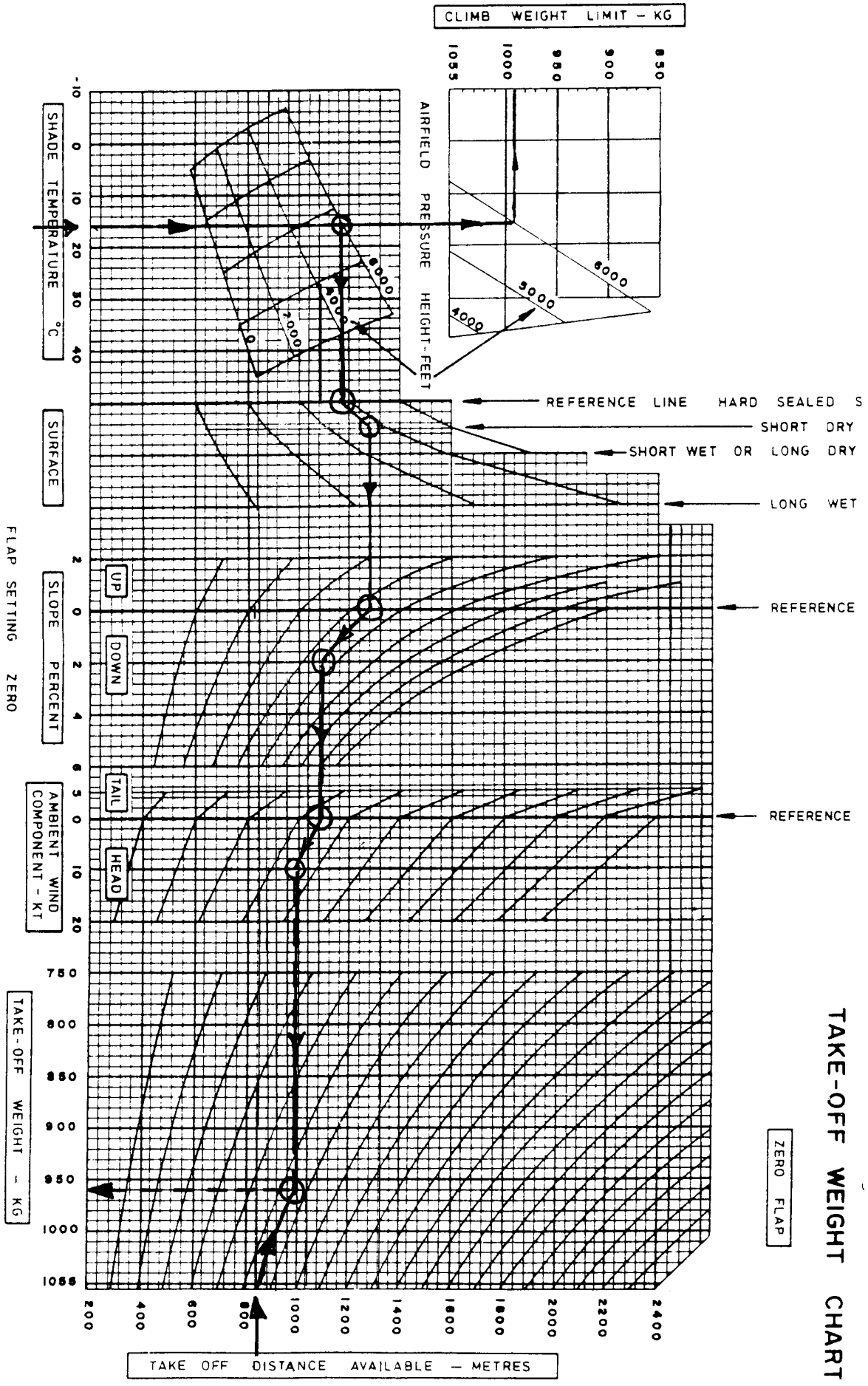
Example Find the landing distance required under the following conditions.

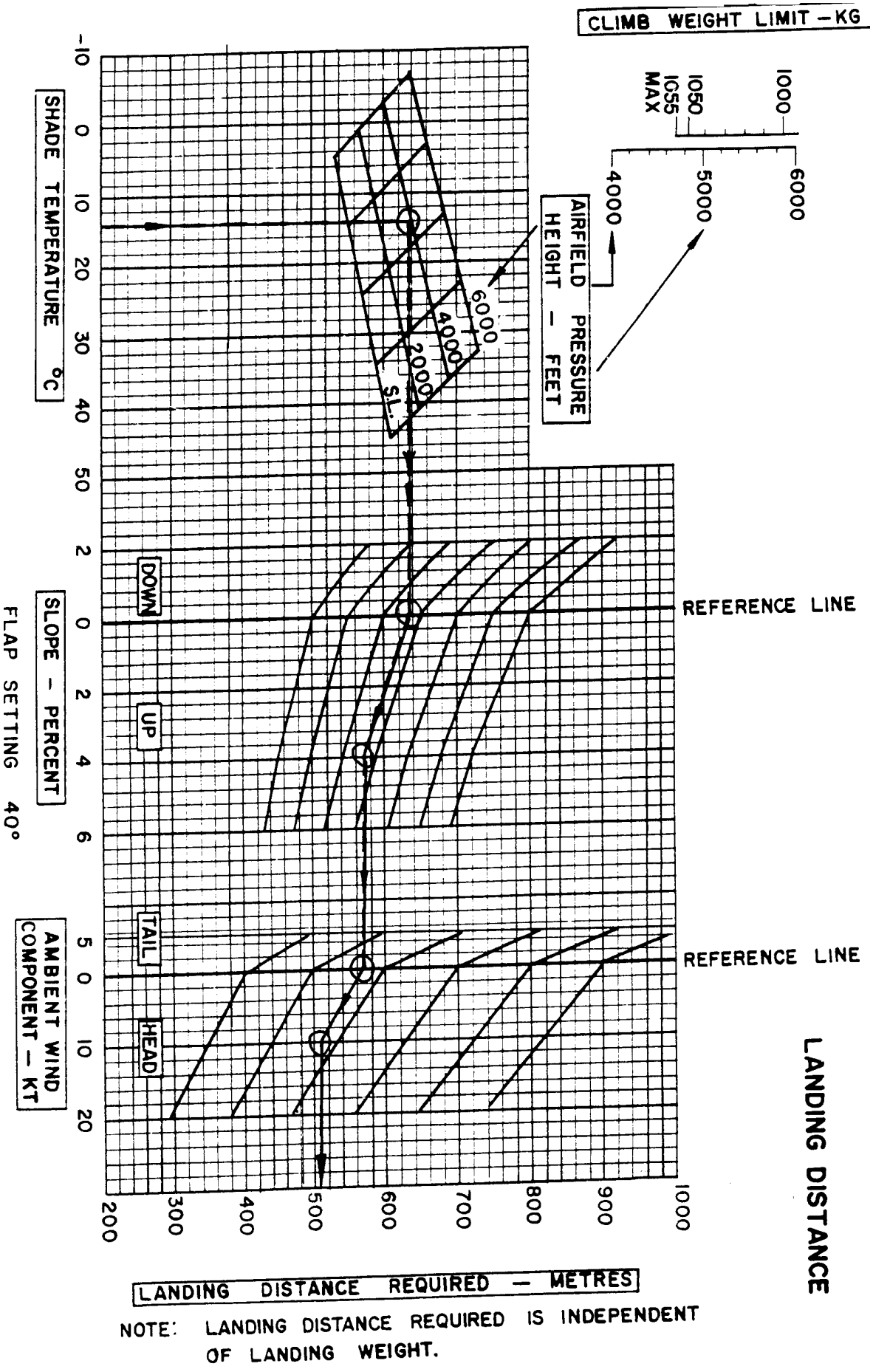
Pressure height	3000 ft
Temperature	+30°C
Level strip	

LANDING CHART



Answer 500 m


TAKE-OFF WEIGHT CHART
ZERO FLAP
CLIMB WEIGHT LIMIT – KG
1055
1000
950
900
850
AIRFIELD PRESSURE HEIGHT - FEET
8000
6000
4000
2000
0
SHADE TEMPERATURE °C
-10
0
10
20
30
40
SURFACE
REFERENCE LINE HARD SEALED S
SHORT DRY
SHORT WET OR LONG DRY
LONG WET
SLOPE PERCENT
UP
DOWN
2
0
2
4
REFERENCE
AMBIENT WIND COMPONENT - KT
TAIL
HEAD
6
5
0
10
20
REFERENCE
FLAP SETTING ZERO
TAKE-OFF WEIGHT – KG
750
800
850
900
950
1000
1055
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
TAKE OFF DISTANCE AVAILABLE – METRES



NOTE: LANDING DISTANCE REQUIRED IS INDEPENDENT OF LANDING WEIGHT.

LOADING SYSTEM ALPHA Configuration 6/7 seats.

1. Obtain the Basic Empty weight and Index Units from current section 6.2 of the Flight Manual. [Note the basic empty weight includes unusable fuel and engine oil].

2. Mark Basic Empty Weight Index units on the top scale. Enter Basic Empty Weight at the top of the right hand column.

3. Enter the weights of load items required for flight in the appropriate squares of the right hand column. Maximum weights for load items are indicated in the index unit scales.

4. Total the weights in the right hand column to obtain the Zero Fuel Weight and Take-off weight.**

5. Draw horizontal lines on the centre of gravity envelope corresponding to the Zero Fuel Weight and the Take-off Weight.

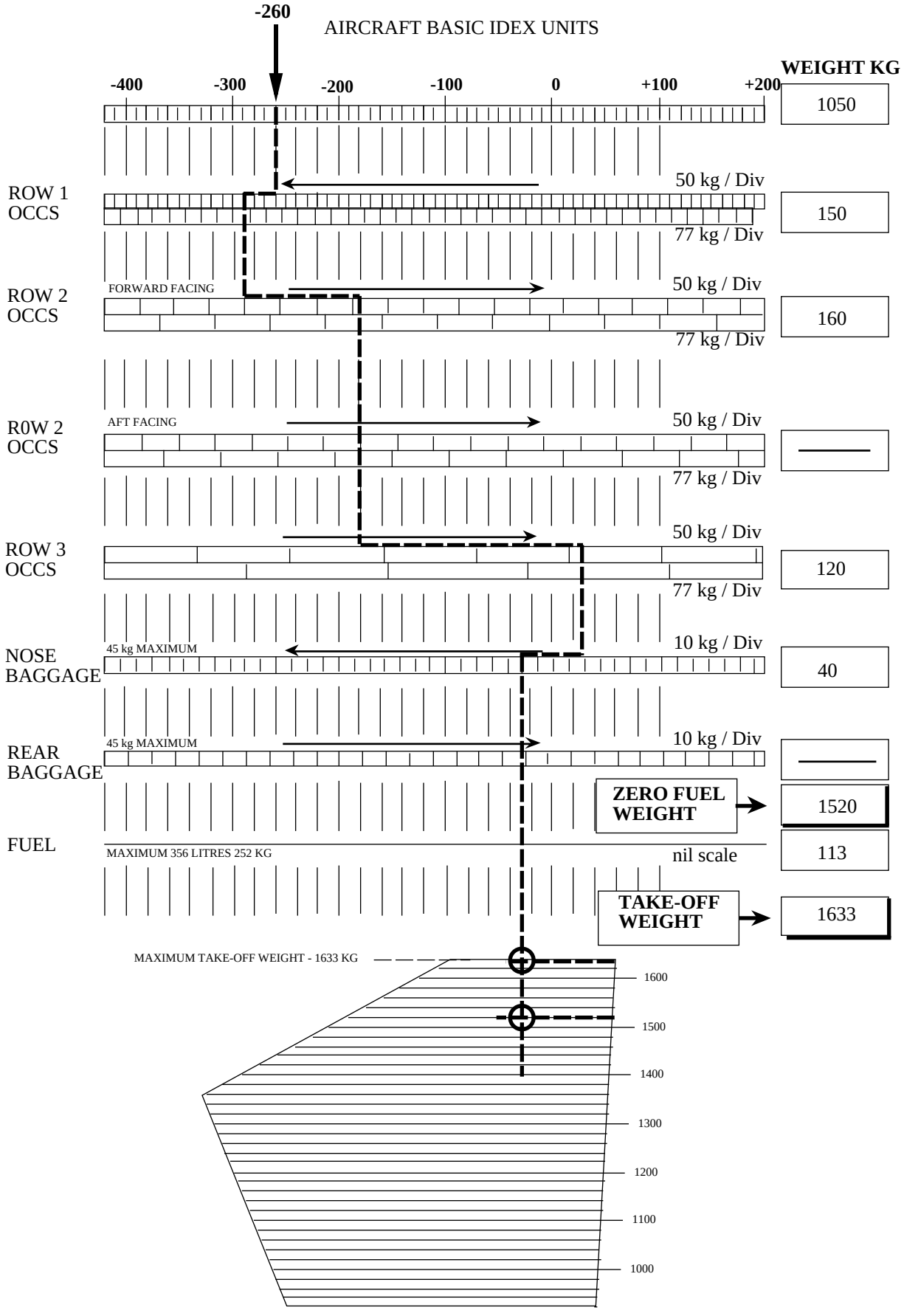
6. Draw a line vertically down from the point marked on the Basic Empty Weight Index Units scale to the first load item.
   Move to the left or right on this load item scale as indicated by the arrow direction and mark a point as appropriate to the load indicated in the right hand column.
   [eg 154 kg load @ 77 kg divisions = 2 divisions].

7. Draw a line vertically down from the point marked on the first load item scale to the second load item scale and continue as per the italic note above. Continue down the scales to 'Rear Baggage' scale. Draw a line vertically from the 'Rear Baggage' point down to intersect the Zero Fuel Weight line and the take-off weight line previously marked on the envelope.

8. The two points defined in 7 above must not fall beyond the boundaries of the envelope. If they do, rearrange the load and repeat steps 3 to 7.
   **DO NOT EXCEED THE MAXIMUM TAKE-OFF WEIGHT AS SHOWN ON THE ENVELOPE DIAGRAM OF THIS LOADING SYSTEM.

EXAMPLE.		
	Basic Empty Weight	1050 kg
	Empty Index Units	-260
	Row 1	150 kg
	Row 2 [forward facing]	160 kg
	Row 3	120 kg
	Nose Baggage	40 kg
	Rear Baggage	nil
	ZERO FUEL WEIGHT	**1520 kg**
	Fuel	113 kg
	TAKE-OFF WEIGHT	**1633 kg**

LOADING SYSTEM ALPHA



LOADING SYSTEM BRAVO

To check the loading of the aircraft before take-off, calculate the total weight and total moments as shown in the example below.

Plot the total weight and moment on the 'Centre of Gravity Envelope' chart given on the opposite page. If the point of intersection is within the boundaries of the envelope, the loading is acceptable.

AIRCRAFT LIMITATIONS

Maximum take-off weight		
Normal category	1000 kg	[2200 lbs]
Utility category	841 kg	[1850 lbs]
Maximum baggage compartment load	53 kg	[120 lbs]

Notes:

This aircraft is fitted with standard tanks. [37 US Gallons @ 6 lbs per gal].

Empty weight includes unusable fuel and undrainable oil.

Obtain the moment index from the loading graph opposite or multiply the weight at each station by the arm of that station [see example below], and divide by 1000.

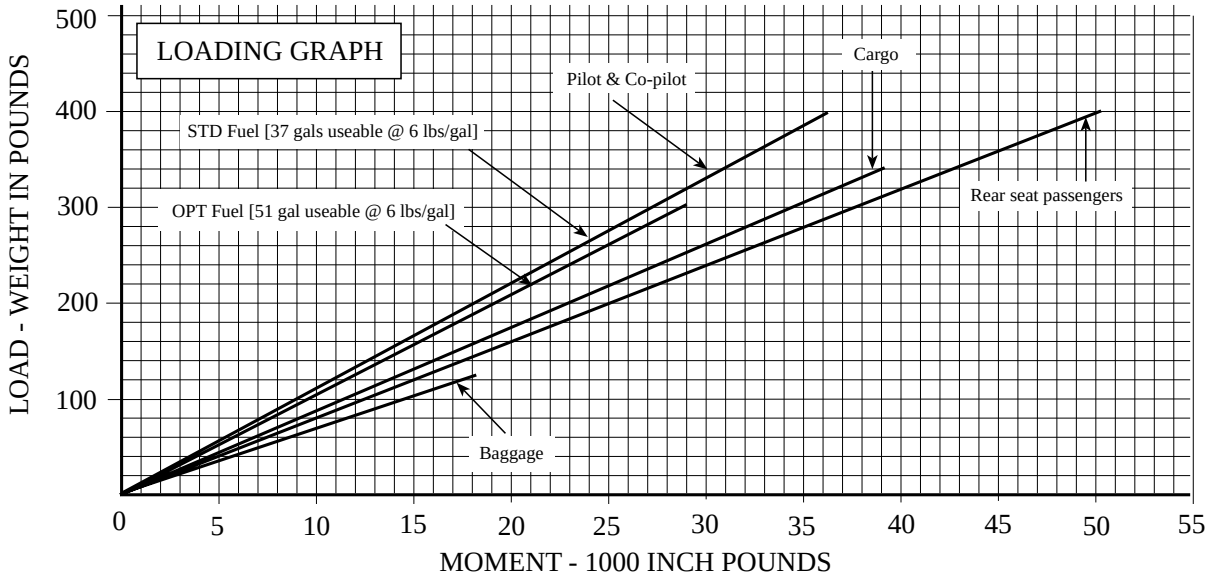
EXAMPLE:

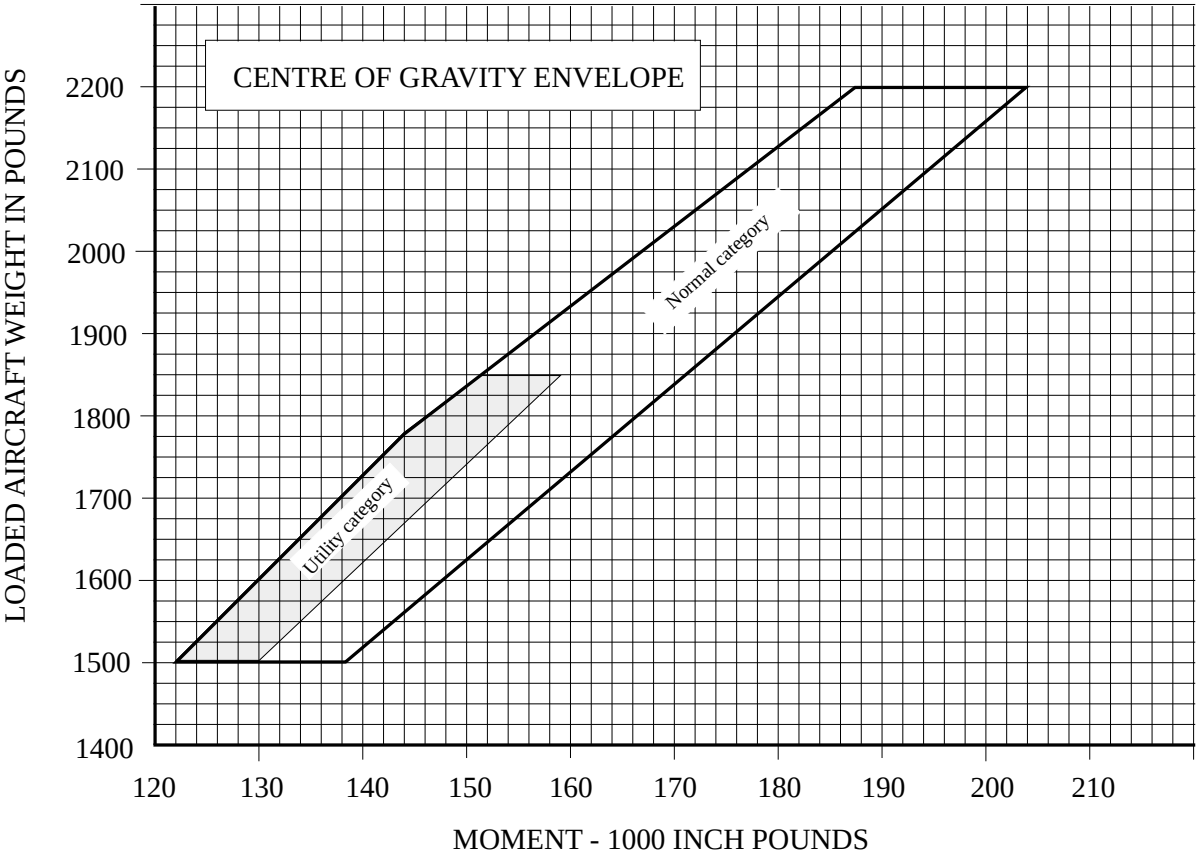
	WEIGHT [lbs]	ARM [ins]	MOMENT [1000 inch pounds].
Empty weight	1260	80	100.80
Oil	15	32	0.48
Fuel [141 litres max].	222	91	20.20
Row 1	320	91	29.12
Row 2	350	126	44.10
Baggage	25	151	3.78
TAKE-OFF WEIGHT	**2192**		**198.48**

Check the intersection of 2192 lbs and 198.48 index units on the chart opposite.

LOADING SYSTEM BRAVO

The loading graph below converts weights in each location to a corresponding moment index. However in practice [or in the examination] it is actually both faster and much more accurate to multiply the weight by the location arm in the load sheet example at left and divide the result by 1000. The load sheet example will be provided in the examination.





LOADING SYSTEM CHARLIE.

To check the loading of the aircraft before take-off, carry out a summation of weight and index units as shown in the example below. Calculate the centre of gravity of the aircraft at Zero Fuel Weight and at Take-off Weight by use of the following formula:

$$\text{Centre of gravity position [mm aft of the datum]} = \frac{\text{index units x 100}}{\text{gross weight}}$$

Plot the position of the centre of gravity so calculated against the gross weight on the centre of gravity envelope opposite. The points plotted must fall within the boundaries of the envelope.

Aircraft limitations:

Maximum take-off weight	
Normal category	1115 kg
Utility category	925 kg
Maximum baggage compartment load	122 kg

Notes:

Aircraft empty weight includes unusable fuel and undrainable oil.
All arms are in mm aft of the datum and are given in the example below.
One index unit = 100 kg/mm
The actual aircraft empty weight and moment index will be given in the question.

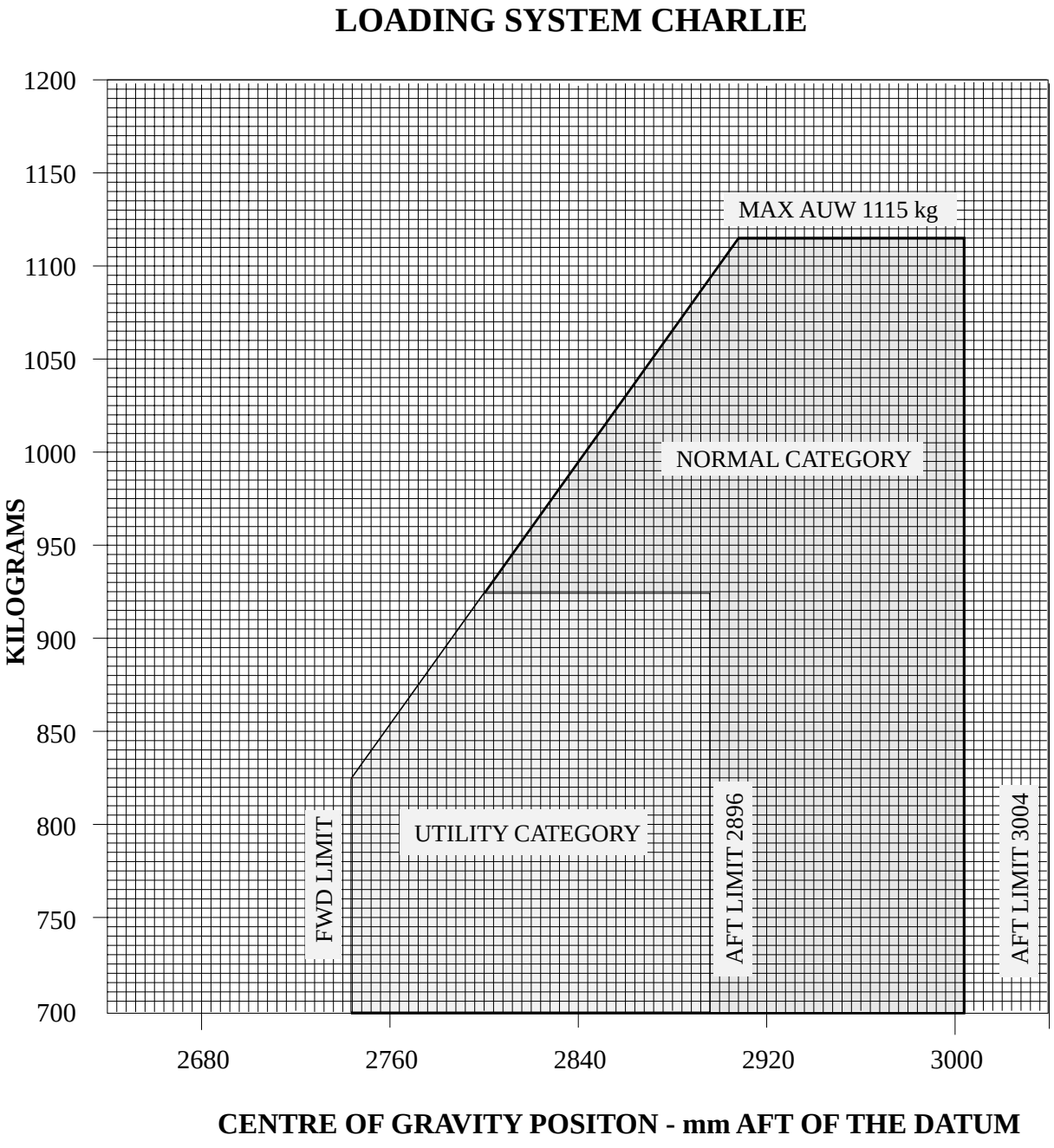
EXAMPLE:

	WEIGHT [kg	ARM [mm]	MOMENT INDEX
Aircraft empty weight	687	.....	19,522
Full oil	7	1230	86
Row 1	140	2750	3,850
Row 2	160	3600	5,760
Baggage	20	4210	842
ZFW	**1014**		**30,060**
Fuel	99	2950	2,920
TAKE-OFF	**1113**		**32,980**

At ZFW centre of gravity = 30,060 x 100 ÷ 1014 = 2965 [Check against weight opposite].
At TAKE-OFF centre of gravity = 32,980 x 100 ÷ 1113 = 2963 [Check against weight opposite].

LOADING SYSTEM CHARLIE

CENTRE OF GRAVITY ENVELOPE



PERFORMANCE DATA
FOR THE
ECHO

COMMERCIAL PILOT
EXERCISES

COMPANY POLICY

EXTRACT FROM COMPANY OPERATIONS MANUAL

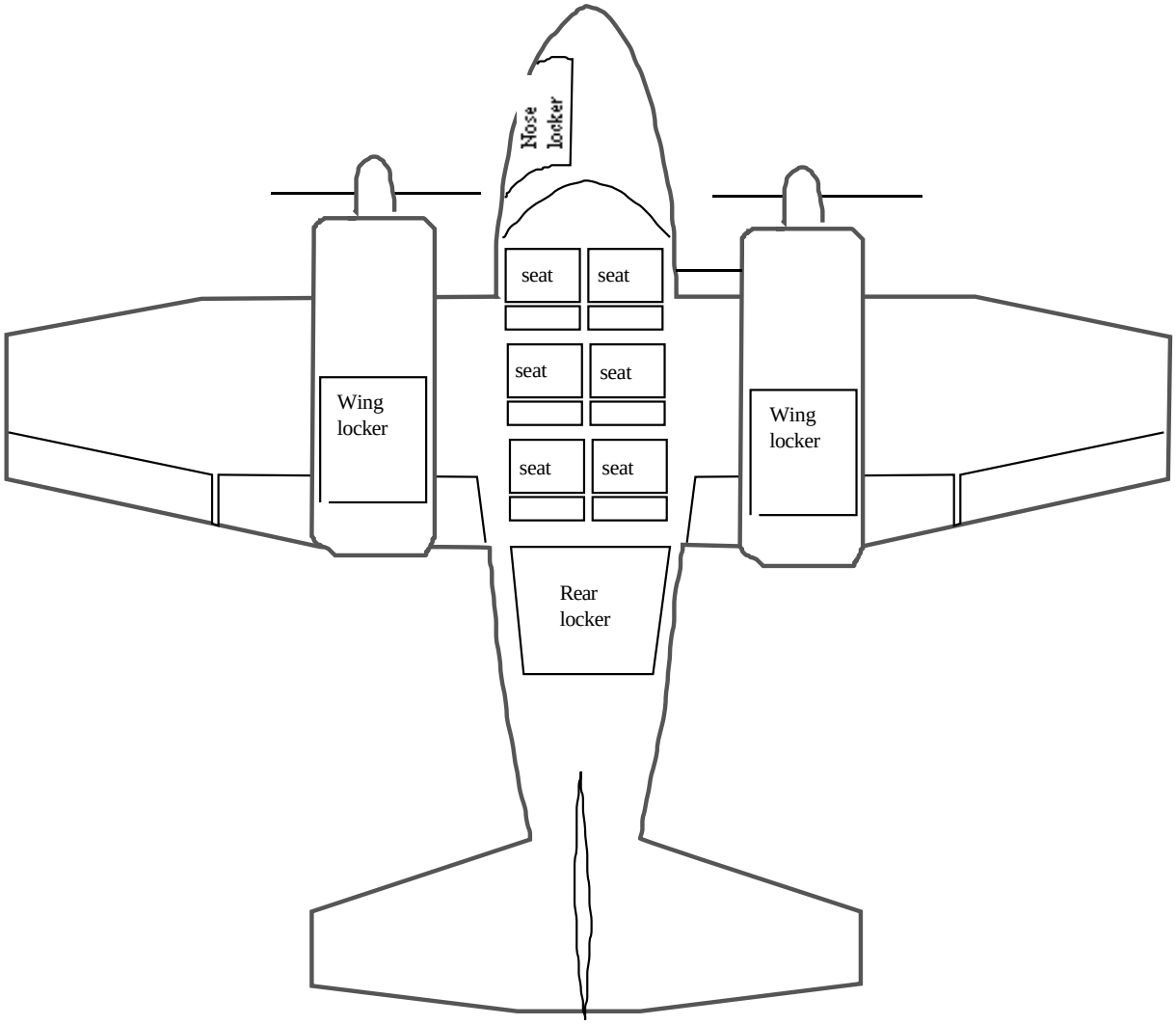
Fuel Reserves

Fuel reserves [for all flights] shall be carried in accordance with Civil Aviation Advisory Publication [CAAP] No: 23-1 [0] dated March 1991.

CONVERSION FACTORS

1 inch	=	25.4 mm
1 foot	=	0.305 m
1 lb	=	0.454 kg
1 US gal	=	3.8 litres
1 US gal	=	2.72 kg

1.1 The Echo is a twin engined, six place unpressurised aircraft. It is fitted with fuel injected, turbo charged engines with fully feathering constant speed propellers. The aircraft is equipped with oxygen to allow flight at any level up to and including 20,000 feet. It has four separate cargo compartments the details of which are given on page CLP 8.



Removal of seats for freight operations.

The cabin seats are easily removeable and may be stowed in the rear compartment or left at the departure aerodrome to increase the volumetric capacity of the cabin.

AIRCRAFT FUEL CAPACITY

2.1 Two main and two auxiliary fuel tanks are fitted.

	Usable Fuel US Gallons	Unusable Fuel US Gallons	Total Fuel US Gallons
MAIN TANKS:			
Left	50	2	52
Right	50	2	52
AUXILIARIES			
Left	40	3	43
Right	40	3	43
TOTAL	**180**	**10**	**190**

2.2 The specific gravity of the fuel is 0.71, and the weight of all unusable fuel and all engine oil is included in the aircraft's Basic Empty Weight.

FUEL POLICY

2.3 Allowance for start-up and taxi is..... 3 US Gallons
Reserves [for all flights]
Variable reserve.....15% of the flight fuel*
Fixed Reserve [45 minutes @ 45% MCP].....15 US Gallons
Holding Fuel when required .....at 45% MCP

* Flight fuel is the fuel calculated to be consumed from take-off to arriving over the top of the destination aerodrome [or alternate if required]. For the purpose of examination questions, make no allowance for climbs or descents.

2.4 When refuelling ,the main tanks should be filled to capacity first. The auxiliary tanks should be used only if the required fuel cannot be accommodated in the mains.

2.5 Use MAIN TANKS for start-up, taxi, take-off, climb and descent. Once in cruise, the AUXILIARY TANKS should be selected and all auxiliary fuel should be used before the main tanks are used.

Operating Limitations:

3.1 Never Exceed Speed [Vne].....230 kt IAS
Normal Operating Speed [Vno or Maximum Structural Cruising].....199 kt IAS
Maximum Flaps Extended [Vfe].....156 kt IAS
Landing Gear Extended [Vle].....139 kt IAS
Single engine Minimum Control Speed [Vmc].....75 kt IAS
Manoeuvring Speed [Va or Maximum Control Deflection].....160 kt IAS

3.2 Engine Limitations.

	Take-off Power [limit of 3 minutes]	Maximum Continuous Power
Maximum RPM	3200	3200
Manifold Pressure	37.4 "Hg	34.5"Hg
Mixture	Rich	Rich
Brake Horse Power	375 per engine	340 per engine

3.3 Maximum Crosswind Component for take-off or landing.....20 kt.

3.4 Maximum Tailwind Component for take-off or landing.....5 kt

Performance Data.

4.1 Take off and Landing performance is given in the form of 'P' charts within this manual. The Echo is not to be operated into or out of any landing area that does not meet the performance limitations obtained by the use of these charts. For any sealed or gravel surface, the 'short dry grass' reference line on the take-off chart should be used.

4.2 Maximum Climb Performance [Maximum Rate of Climb].
The maximum climb performance expected at various combinations of Pressure Height and Gross Weight is given in the table below. Note that the performance given assumes ISA conditions. If temperature deviates from ISA, density height should be used instead of pressure height.

Pressure Height ISA feet.	Gross Weight - TWO ENGINES					
	2950		2500		2000 kg	
	TAS	ROC	TAS	ROC	TAS	ROC
Sea level	101	1600	92	2250	82	2950
5000	109	1500	99	2100	88	2800
10000	118	1400	107	1950	95	2650
15000	128	1300	116	1800	104	2500
20000	139	800	126	1250	112	1800

Pressure Height ISA feet.	Gross Weight - ONE ENGINE					
	2950 kg		2500 kg		2000 kg	
	TAS	ROC	TAS	ROC	TAS	ROC
Sea level	105	280	97	525	92	780
5000	112	200	103	450	98	700
10000	120	100	111	360	106	625
15000	129	20	119	270	115	530

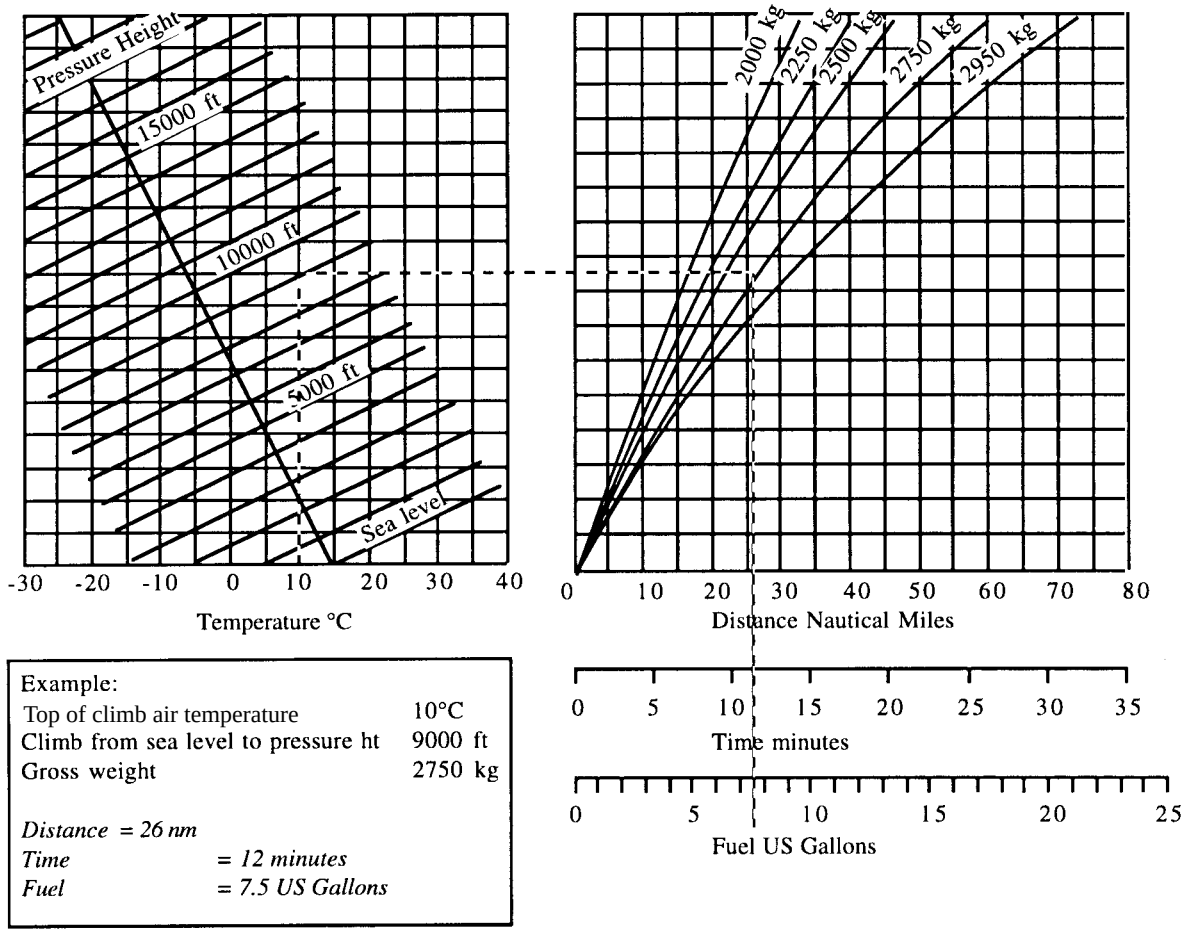
4.3 The Cruise Climb chart.

The cruise climb chart shown below gives the distance, time and fuel required to climb in no wind from sea-level to various pressure heights under various temperature and gross weight conditions. The temperatures given at the bottom of the left-hand box are the temperatures *at* the pressure height to which the climb is being made.

An allowance for wind can be made by calculating the distance represented by the wind speed applied to the duration of the climb. [eg a wind speed of 30 kt for a six minute climb would represent a distance of 3 nm]. This distance should be added to the distance obtained from the graph for a tailwind, and subtracted for a headwind. The time and fuel required for any given climb will not be affected by wind.

The most accurate method for obtaining the figures for a climb from an aerodrome at other than sea level [eg from 5000 ft to 15000 ft], is to calculate the set of figures from sea-level to 15000 ft, then calculate the set of figures from sea-level to 5000 ft and subtract the 5000 ft figures from the 15000 ft figures.

Note that in the examination any questions on climb performance will stand alone. Climbs and descents are ignored when calculating the fuel required for any given flight stage.



Example:

Top of climb air temperature	10°C
Climb from sea level to pressure ht	9000 ft
Gross weight	2750 kg

Distance = 26 nm
Time = 12 minutes
Fuel = 7.5 US Gallons

Power used for cruise climb is 75% MCP with the mixture rich.
Climbing indicated airspeed for a cruise climb is 120 kt .

4.4 The TAS that may by planned for cruise at various pressure heights, temperatures, gross weight and power are shown in the table below.

TAS knots GROSS WEIGHT																
Pressure Ht	Temp	2950 kg					2500 kg					2000 kg				
		75%	65%	55%	45%	35%	75%	65%	55%	45%	35%	75%	65%	55%	45%	35%
SL	ISA -20	177	165	156	142	116	180	168	159	145	118	184	171	161	149	120
5000		185	172	160	145	116	188	172	163	147	119	192	178	166	151	121
10,000		193	179	165	147	117	196	182	168	150	119	201	185	171	153	122
15,000		201	185	169	149	116	204	189	173	152	117	209	193	177	155	120
20,000		209	193	174	150	----	213	197	178	154	---	217	201	182	157	-----
SL	ISA	181	168	158	144	116	184	171	161	146	118	188	174	164	149	121
5000		189	175	162	146	117	192	178	165	148	119	198	181	169	152	122
10,000		197	182	166	148	117	200	185	170	151	119	205	189	174	154	122
15,000		205	189	171	150	114	208	192	176	154	116	213	196	184	156	118
20,000		213	198	177	151	----	217	201	180	154	---	221	208	189	157	----
SL	ISA +20	185	171	160	145	116	187	174	163	147	119	191	177	166	151	121
5000		192	178	166	145	116	195	181	166	150	119	200	185	171	153	122
10,000		200	185	170	149	116	204	188	173	152	118	208	192	176	155	121
15,000		209	193	173	151	----	212	196	178	154	----	217	200	182	157	----
20,000		216	201	179	149	----	221	205	183	152	-----	225	209	186	155	----

4.5 The fuel flow that can be planned for various power settings is shown in the table below. Fuel flow depends only on engine power output and is unaffected by aircraft gross weight or cruising level.
The mixture should be leaned to best economy at all cruise power settings. Rich mixture should be used only for 100% power, during a cruise climb or as a means of controlling engine overheating.

FUEL FLOWS PER ENGINE IN US GALLONS PER HOUR.		
Engine Power % MCP	Mixture leaned to best economy	Mixture fully rich
100%	not available	31.7*
75%	16.3	19.7
65%	14.0	16.9
55%	11.8	14.1
45%	10.2	11.8
35%	8.6	9.3
*100% power is not available above 15,000 feet.		

Aircraft Weight and Balance Data:

5.1 The aeroplane basic empty weight includes all seats, unusable fuel and full engine oil. The actual aircraft basic empty weight and moment index will be given in the examination question.

5.2 Structural Weight Limitations.

Maximum take-off weight.....2950 kg
Maximum landing weight.....2725 kg
Maximum zero fuel weight*.....2630 kg

*All weight above zero fuel weight must be made up of fuel only.

5.3 Balance data. Aircraft centre of gravity limits.

The forward limit for the centre of gravity:
2400 mm aft of the datum for gross weights of 2360 kg or less.
2560 mm at a gross weight of 2950 kg.
Linear variation applies for weights between 2360 kg and 2950 kg.
The aft limit for the centre of gravity is 2680 mm aft of the datum for all weights.
Mean Aerodynamic Chord [MAC] data.
Location of leading edge of MAC = 2190 mm aft of the datum
Length of MAC = 1900 mm

*The aircraft must be loaded so that the centre of gravity falls between the specified limits at zero fuel weight **and** at take-off.*

5.4 Loading data:

The arms [in millimetres aft of the datum], and limiting weights for cargo compartments are given in the table below.

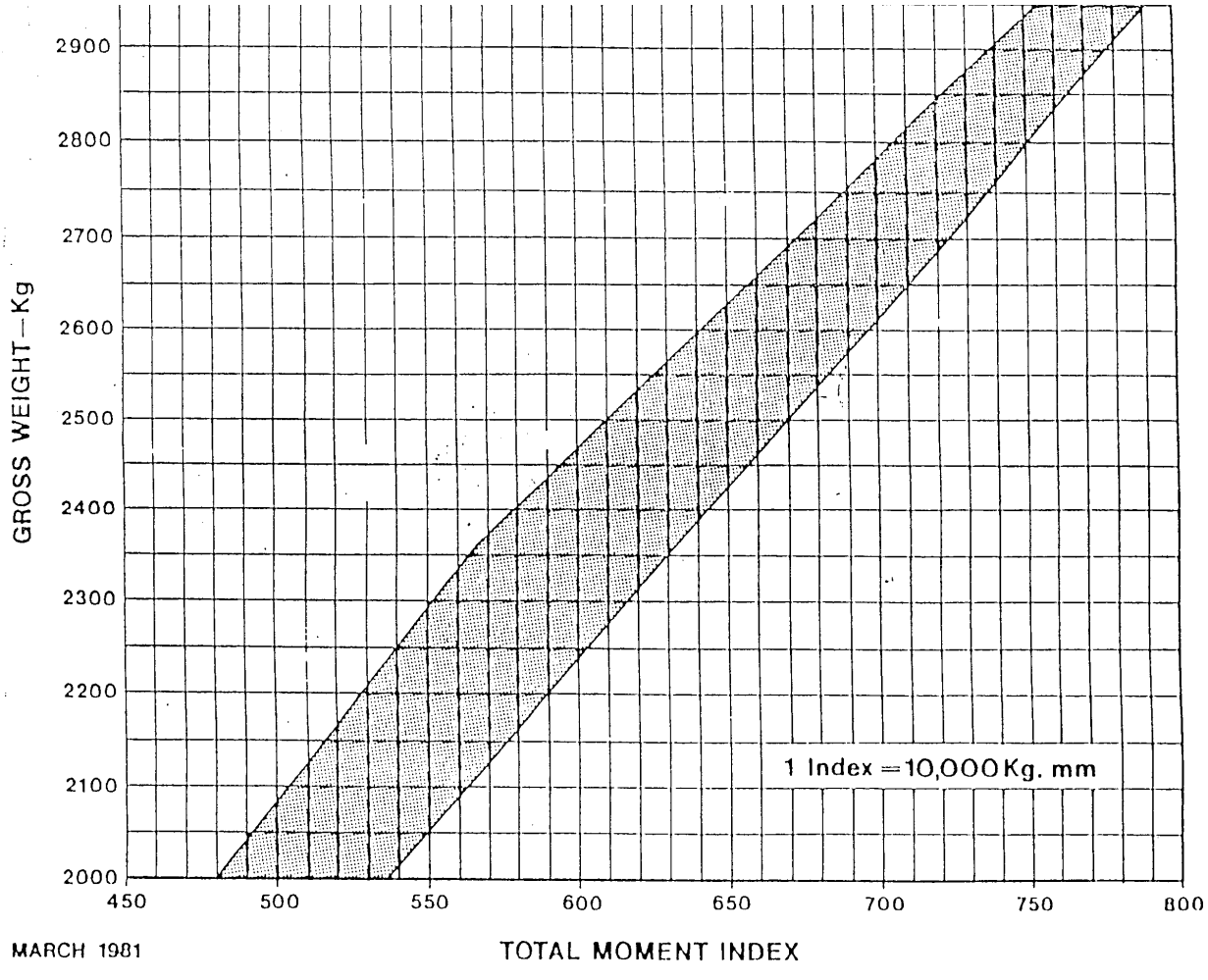
LOCATION	MAX LOAD	ARM [mm]
Row 1 [seats 1 & 2]	Pilot and one passenger	2290
Row 2 [seats 3 & 4]	two passengers	3300
Row 3 [seats 5 & 6]	two passengers	4300
Cargo nose	55 kg	500
Cargo left wing	55 kg	3550
Cargo right wing	55 kg	3550
Cargo rear	155 kg	5000
Floor loading intensity	450 kg/square metre	
Main fuel tanks		
Left [useable]	50 US gallons	1780
Right [useable]	50 US gallons	1780
Auxiliary fuel tanks		
Left [useable]	40 US gallons	2800
Right [useable]	40 US gallons	2800

Passenger seats may be removed to increase the volumetric capacity of the cabin. Each passenger seat weighs 5 kg and the maximum weight of cargo that can be placed on the area otherwise occupied by a seat is 82 kg.

Sample load sheet.
Moment Index is obtained by multiplying the arm in mm aft of the datum by the weight in kg and dividing the result by 10,000. In the example below, moment index is expressed to one decimal place, however in practice the nearest whole unit would be acceptable.

ITEM	WEIGHT	ARM	MOMENT INDEX.
Basic Empty Wt	1992		480.0
Row one	154	2290	35.3
Row two	160	3300	52.8
Row three	77	4300	33.1
Cargo nose	30	500	1.5
Cargo wings	60	3550	21.3
Cargo rear	100	5000	50.0
Zero Fuel Weight	**2573**		**674.0 ***
Mains fuel	250	1780	44.5
Take-off	**2823**		**718.5 ***

***** Plot these points on the centre of gravity envelope below.



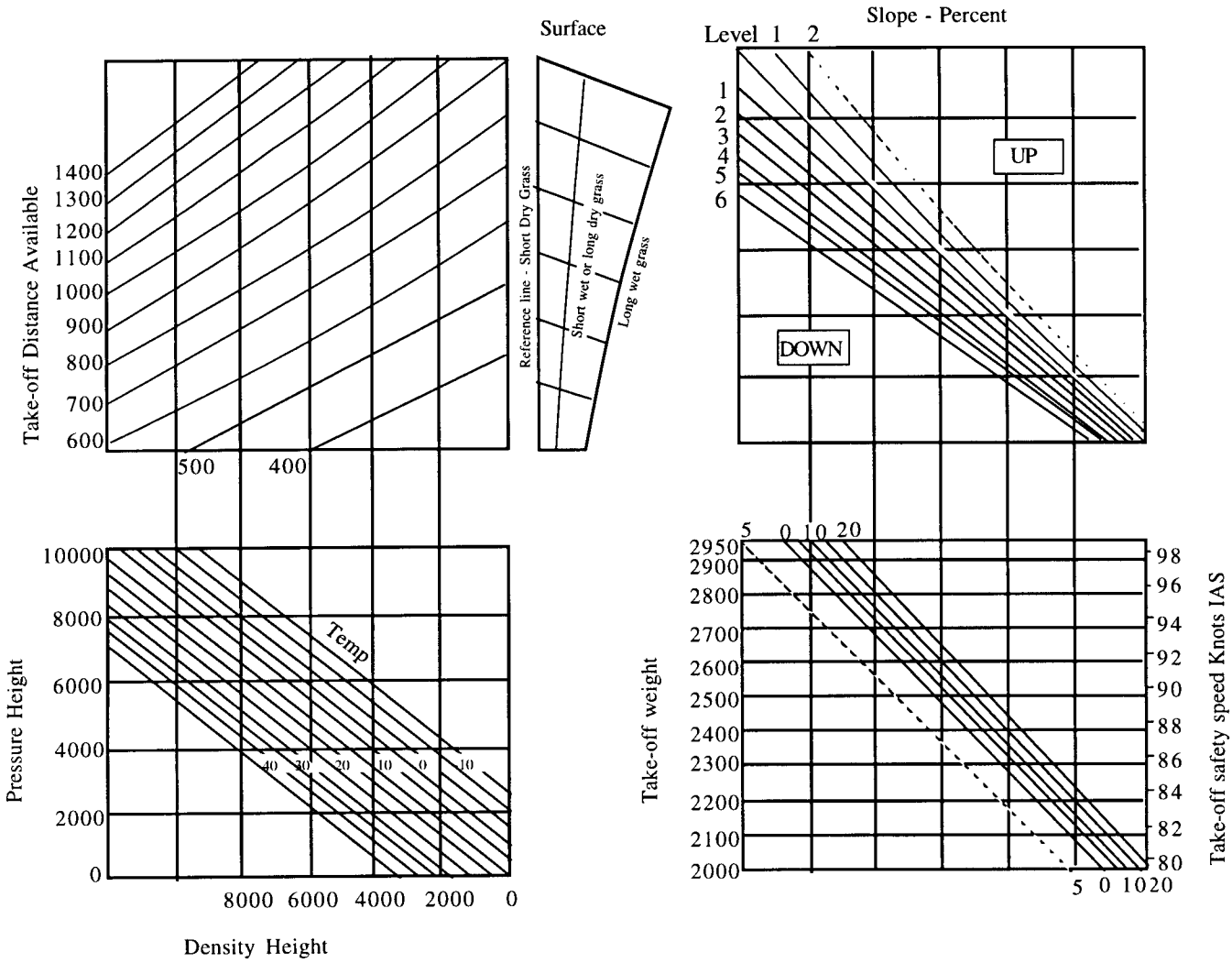
The left hand vertical scale represents aircraft weight in kg. The bottom scale represents the total moment index. The centre of gravity of the loaded aeroplane must fall within the shaded area at zero fuel weight and at take-off.

TAKE-OFF CHART

Enter the chart at the pressure height of the aerodrome and move horizontally to the ambient temperature, then vertically up to the take-off distance box.
If density height is used, enter the chart at the density height scale and move vertically up to the take-off distance box, ignoring temperature.

For sealed or gravel surfaces use the short dry grass reference line.

Interpolation is permitted but extrapolation is not permitted. [If the wind is above 20 kt, use the 20 kt wind reference line].



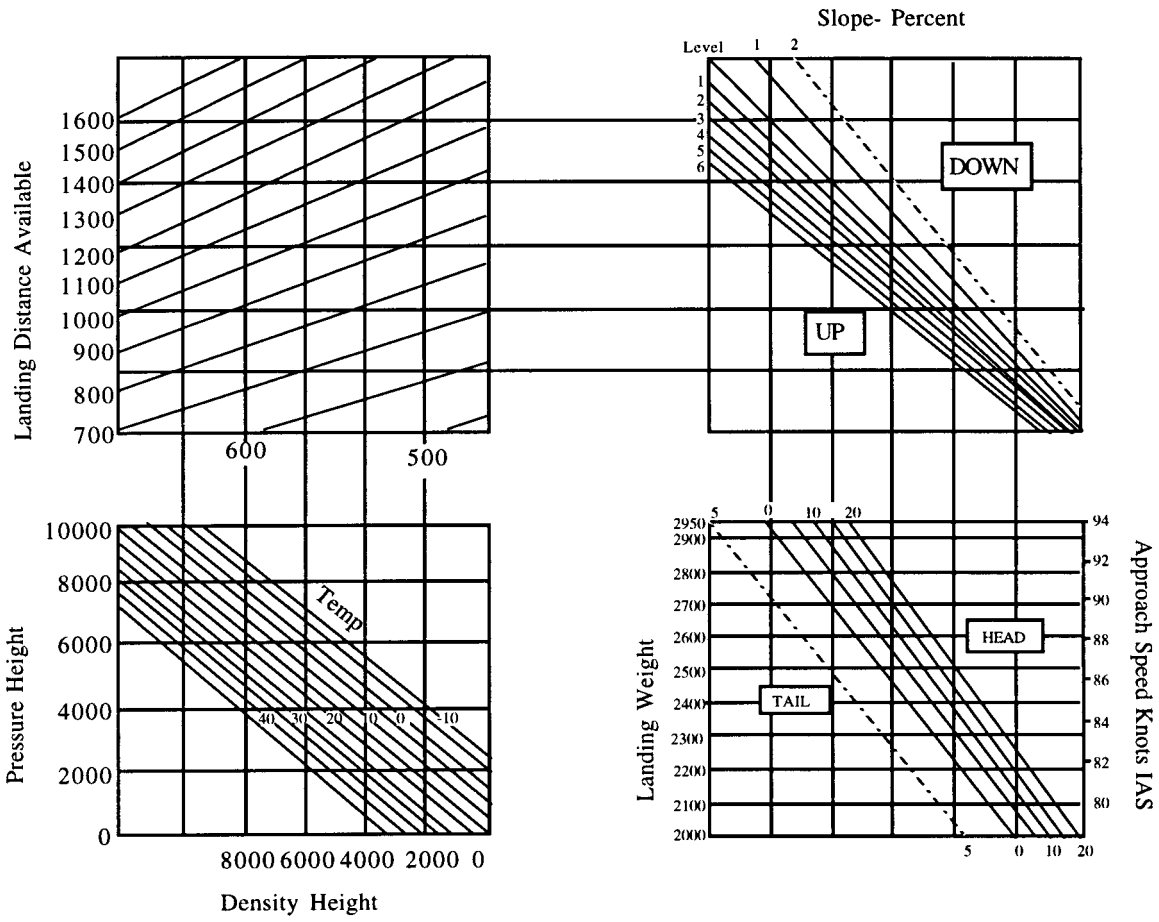
TAKE-OFF WEIGHT CHART ECHO		
Power to be used	RPM	3200
	Man Press	37.4
Flap Setting		0°
Take-off Safety Speed		See scale
Take-off distance factor		1.22

LANDING CHART

Enter the chart at the pressure height of the aerodrome and move horizontally to the ambient temperature, then vertically up to the landing distance box.
If density height is used, enter the chart at the density height scale and move vertically up to the landing distance box, ignoring temperature.

Interpolation is permitted but extrapolation is not permitted. [If the wind is above 20 kt, use the 20 kt wind reference line].

The conditions used for landing will normally be forecast conditions. If a landing weight is being calculated to establish a take-off weight limit [ie landing weight plus the fuel burn-off], you should use the forecast QNH and temperature but zero wind.



LANDING WEIGHT CHART ECHO	
Flap Setting	45°
Approach Speed	See scale
Landing distance factor1.26	