

Annexes and ECQB exams

Version 3, 16/01/2026

Information about the sources from which ECQB annexes are based is provided, for the purpose of supporting students in preparing for their ECQB-based exams. While most of these are available for viewing online from the publisher / copyright holder, a small number may not be familiar (as they have been made available or developed for the ECQB). For this reason, a set of ECQB sample annexes is provided for private study. Any other re-use, for example commercial reproduction, would require the permission of the copyright holder.

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Main sources of annexes

The majority of ECQB annexes are taken from the sources listed in the table below.

Source	Used in:
Bell, S.A. et al. 2016. <i>UK Air Almanac 2017</i> . HM Nautical Almanac Office, UK Hydrographic Office.	050 Meteorology 061 General Navigation
Reg. (EU) No 923/2012 SERA (as amended) Appendix 1, 4. Marshalling Signals.	010 Air Law & ATC
UK Civil Aviation Authority, 2006. <i>CAP 696 CAA JAR-FCL Examinations Mass and Balance Manual (Aeroplanes)</i> . Third Edition, The Stationary Office.	031 Mass & Balance
UK Civil Aviation Authority, 2006. <i>CAP 697 CAA JAR-FCL Examinations Flight Planning Manual</i> . Second Edition, The Stationary Office.	032 Performance (A) 033 Flight Planning
UK CAA UK Civil Aviation Authority, 2006. <i>CAP 698 CAA JAR-FCL Examinations Aeroplane Performance Manual</i> . Third Edition, The Stationary Office.	032 Performance (A). 034 Performance (H): Figure 4.1 Wind Components for Take-Off and Landing
UK CAA UK Civil Aviation Authority, 2009. <i>CAP 758 Helicopter Manual for JAR-FCL Examinations - Mass and Balance – Performance – Flight Planning and Monitoring</i> . The Stationary Office.	031 Mass & Balance: helicopter-specific questions 033 Flight Planning: helicopter-specific questions 034 Performance (H)
Jeppesen 2017. <i>General Student Pilot Route Manual</i> . Jeppesen.	010 Air Law 033 Flight Planning 061 General Navigation 062 Radio Navigation 081 Principles of Flight (A) 090 Communications

Source	Used in:
Finnish Meteorological Institute https://en.ilmatieteenlaitos.fi/aviation – weather charts	050 Meteorology
UK Met Office http://www.metoffice.gov.uk/ – weather charts	050 Meteorology
MeteoSwiss http://www.meteoswiss.admin.ch/ – weather charts	050 Meteorology

ECQB sample annexes

In addition to the sources listed above, additional material is used to provide ECQB annexes. In most cases these have been developed specifically for the ECQB, though in a small number of cases the material is made available for use in the ECQB. The ECQB sample annexes provided are very similar to those that will be faced in the actual exam, with some minor differences to ensure the integrity of the exam system. For each annex, an indication of the syllabus paragraphs¹ where that type of annex is used is given. Note that the samples are made available for the purpose of private study.

- Subject 021 Aircraft General Knowledge: 1 sample
- Subject 031 Mass & Balance: 8 samples (1 old sample removed, 1 added, 3 amended)
- Subject 032 Performance (aeroplane): 7 samples (3 amended)
- Subject 033 Flight Planning: 17 samples (1 old sample removed, 7 amended)
- Subject 034 Performance (helicopter): 3 samples (1 added)
- Subject 061 General Navigation: 1 sample
- Subject 081 Principles of Flight (A): 3 samples (1 added, 1 amended)
- Subject 090 Communications: 1 sample

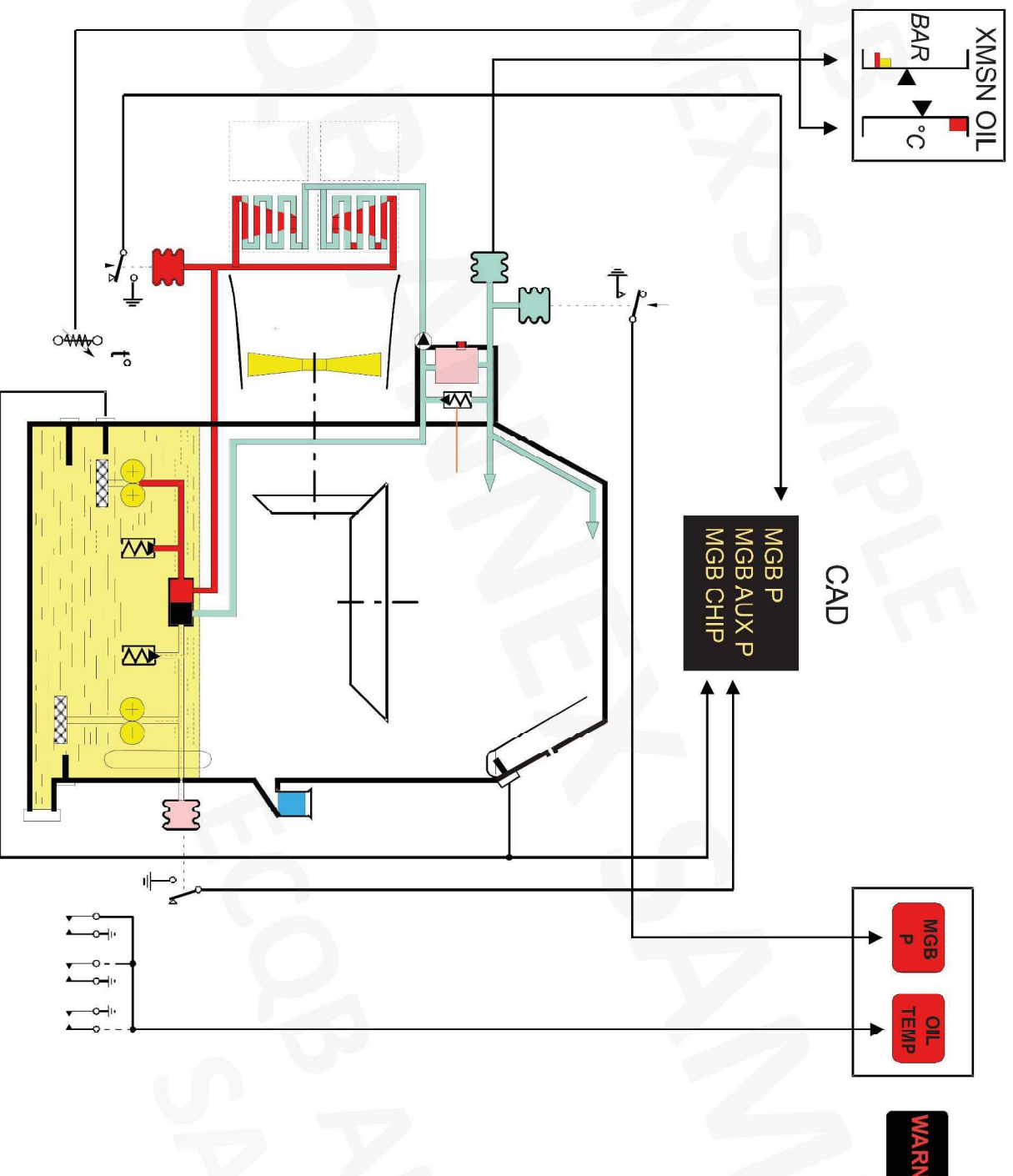
To contact the ECQB Team at EASA: ECQB@easa.europa.eu

Cologne, 16/01/2026

¹ Referring to the syllabus of AMC1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations, as per amendment 10 of AMC/GM to Part-FCL. <https://www.easa.europa.eu/document-library/acceptable-means-of-compliance-and-guidance-materials/group/part-fcl---flight-crew-licensing#group-table>

The diagram illustrates the oil pressure monitoring system for an MGB. Key components and connections include:

- Oil Pump and Pressure Switch:** The oil pump is connected to the pressure switch, which is in turn connected to the MGB P module.
- MGB Modules:** The MGB P module is connected to the MGB AUX P and MGB CHIP modules. The MGB CHIP module is connected to the MGB P module.
- CAD Interface:** The CAD interface is connected to the MGB P module.
- WARN Indicator:** The WARN indicator is connected to the MGB P module.
- Sensors:** The system includes a pressure sensor (BAR) and a temperature sensor (°C) connected to the MGB P module.



Dropdown Trimsheet

From To

Regn Crew Date

Index Calculation

$$\frac{\text{APS Weight (lbs)} \times (\text{Long. Arm} - 133.5)}{10,000}$$
+30

APS Weight & Index Units
(Basic Empty Mass & Units)

Weight	Index
7 0 0 0	34.2

Pilot & Copilot (or Passenger)

3 6 0	1 div = 1 man
-------	---------------

Dry Operating Mass

7 3 6 0

Fuel lb

Tanks

Normal

5 2 0

Small Aux

Large Aux

1 2 0 0

Index

← Negative Units

Fuel Index Scale - See Separate Sheet For Data
Each Division Equals 0.2 Index Units

Positive Units →

Operating Mass
(Wet Operating Mass)

7 8 8 0	fwd
8 5 6 0	aft

Rear
Baggage
Compartment

Forward
Aft
Total Baggage

1 0 0

50 lbs →
50 lbs →

Row	No of Seats	Total	Weight
1			4 0 0
2			
Forward Well			
Aft Well			
Total Pax & Weight			4 0 0

100 lbs ←
100 lbs ←
500 lbs →
100 lbs →

Total Payload

4 0 0
1 0 0

fwd
aft

Operating Mass
(Wet Operating Mass)

7 8 8 0
8 5 6 0

fwd
aft

Takeoff Mass

8 2 8 0
8 6 6 0

fwd
aft

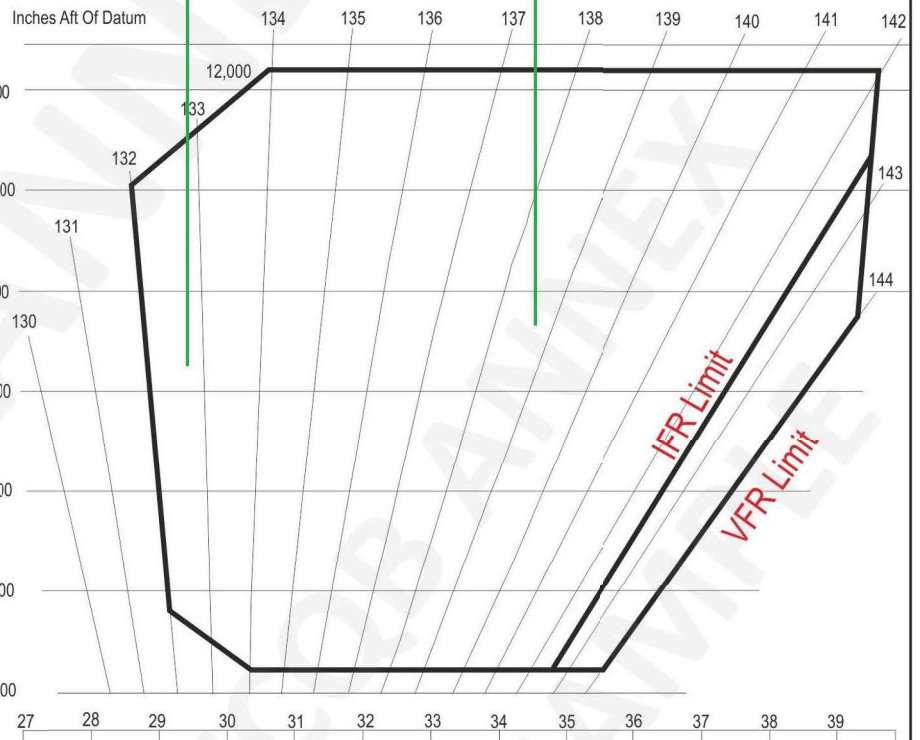
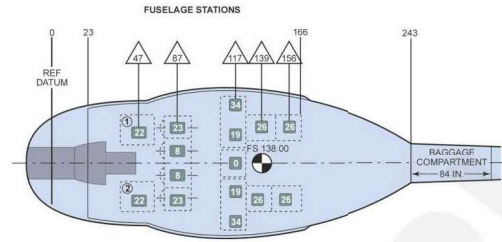
RTOW

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NOTES

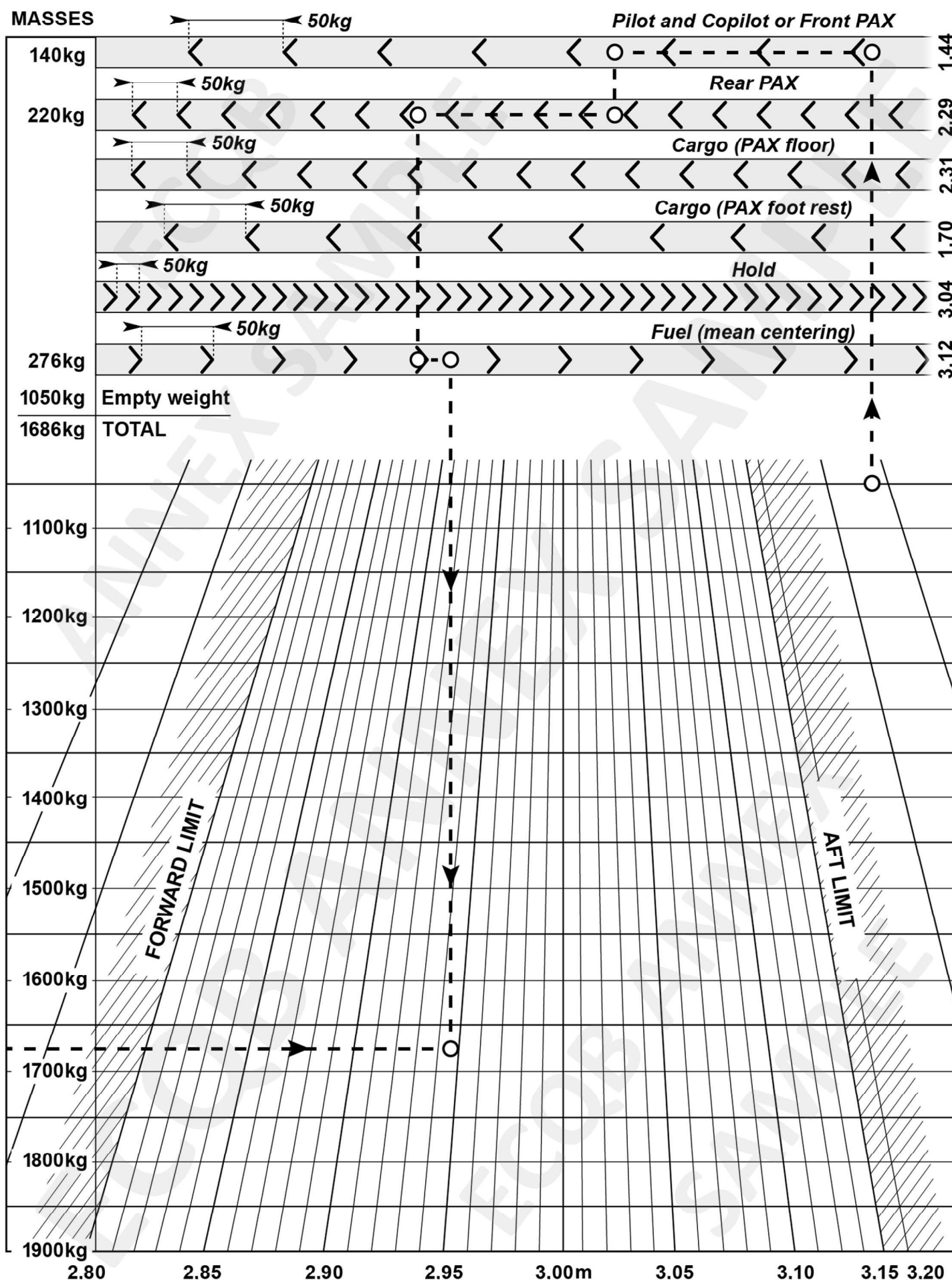
When Calculating RTOW Use Actual Weights
If trim sheet shows final CG to be close to a limit, carry out a mathematical check

Loading Officer's Signature



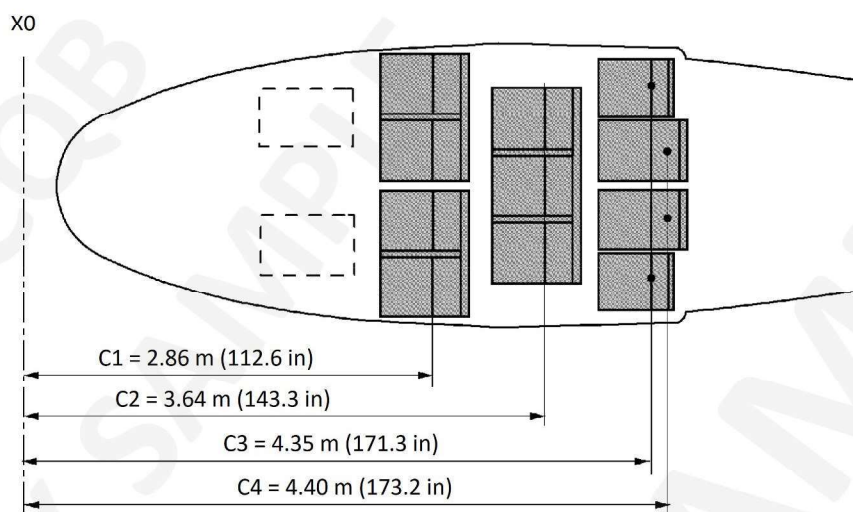
Example:

BEM: 7000 lb, Index at BEM: 34.2 in, 2 pilots: 360 lb,
Take-off Fuel - normal tank: 520 lb, index: -0.27
Take-off Fuel - large aux. tank: 1200 lb, index: +1.33
Baggage in the aft area of the rear baggage compartment: 100 lb, 2 passengers in row 1: 400 lb
Total mass: 9580 lb
Most forward CG position: 132.7 in, most aft CG position: 138.7 in

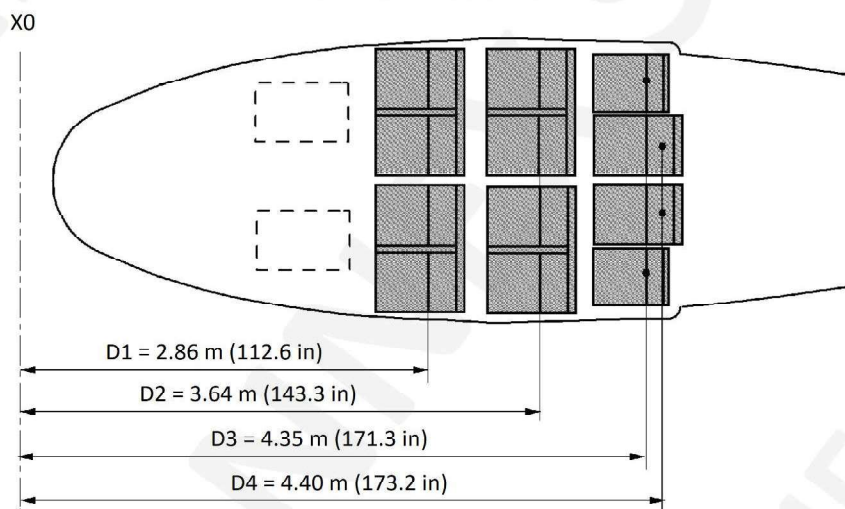


Example: Basic empty weight: 1050 kg, Wet operating mass: 1686 kg,
 Mass of Pilot, Co-pilot / front passenger: 140 kg, Mass of rear passengers: 220 kg
 No cargo loaded, Fuel mass: 276 kg
 CG position: 2.945 m

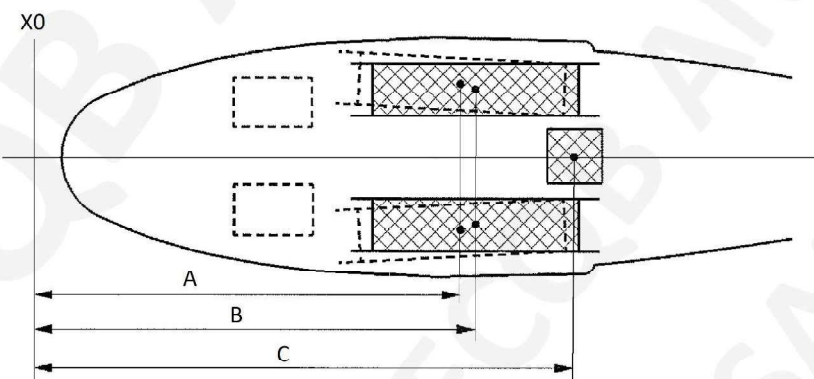
11-SEAT LAYOUT



12-SEAT LAYOUT



AMBULANCE LAYOUT



A = 3.50 m (137.8 in) - LOWER STRETCHER(S).
 B = 3.60 m (141.7 in) - UPPER STRETCHER(S).
 C = 4.38 m (172.4 in) - MEDICAL ATTENDANT'S SEAT.

Used e.g. in 031 05 02 02 03 Load sheet/balance schedule and CG envelope for light aeroplanes and for helicopters -
Check CG position at ZFM and TOM to be within the CG envelope including last-minute changes, if applicable

Item	Mass (lb)	Longitudinal Arm (in)	Longitudinal Moment (lb.in)
Basic Empty Mass		100.1	
Pilot - Left-hand		83.2	
Passenger - Right-hand		83.2	
Passenger - Centre		80.0	
Zero Fuel Mass			
Fuel Mass		108.5	
Take-Off Mass			

Remarks

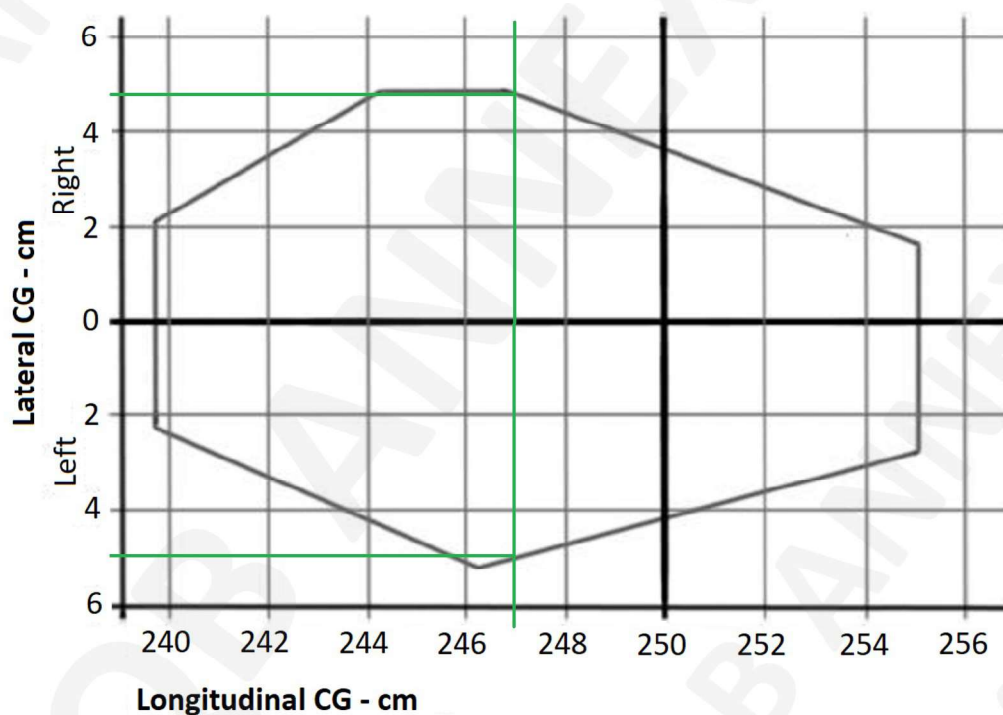
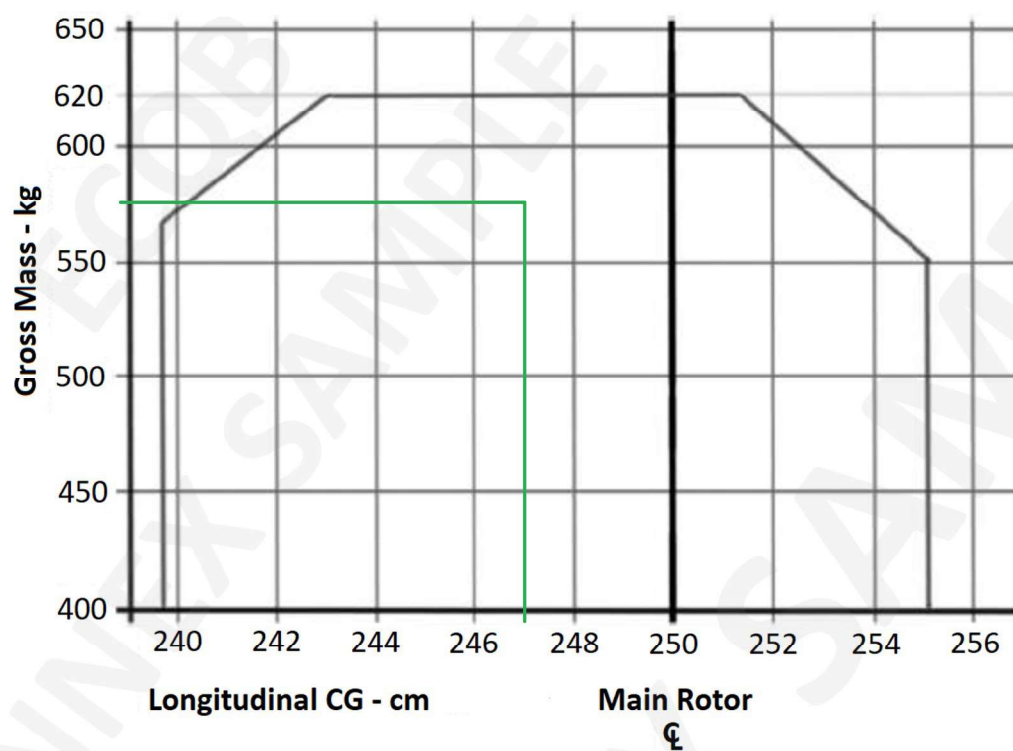
Engine oil, main gearbox, and hydraulic fluid: 18 lb

Maximum Take-Off Mass: 1680 lb

MASS AND BALANCE COMPUTATION FORM

MEP

REGISTRATION NUMBER _____		FLIGHT NUMBER _____		DATE _____	
ITEM	Mass (kg)	Arm (m)	Moment (kg.m)		
Basic Empty Mass	2890	2.53			
Pilot and Co-Pilot		2.04			
Passengers seats 1 & 2		3.20			
Passengers seats 3 & 4		3.65			
Passengers seats 5 & 6		4.00			
Forward Baggage Zone		1.20			
Aft Baggage Zone		4.60			
Zero Fuel Mass (4030 kg Max)					
Fuel loading (980 kg Max)		2.45			
Engine oil loading (25 kg Max)		0.20			
Ramp Mass (4398 kg Max)					
Fuel for start, taxi and run-up		2.45			
Engine oil for start, taxi and run-up	negligible	0.20	negligible		
Take-off Mass (4380 kg Max)					
Estimated fuel burn-off		2.45			
Estimated engine oil consumption		0.20			
Landing Mass (4160 kg Max)					



Example:

Helicopter total (gross) mass: 575 kg, total moment: 142 025 kg.cm, longitudinal CG: 247 cm
Lateral CG limits: Left: - 4.9 cm, Right: +4.7 cm

DRY OPERATING MASS CONDITIONS			
MASS (1000 KG)		CG (% MAC)	
I = [(CG - 20) x M x 0.025] + 100			
DRY OPERATING INDEX			
BASIC INDEX CORRECTION			
DRY OPERATING MASS DEVIATION	ZONES		
	E	F	G
	+ 100 KG	-0.89	-0.52	+0.91
- 100 KG	+0.89	+0.52	-0.91
INDEX CORRECTION			

Used e.g. in 032 05 02 01 Drift-down and stabilising altitude (performance data)

ONE ENGINE INOPERATIVE MAXIMUM CRUISE ALTITUDE							Cell legend
							<i>Cruise altitude Anti-Ice OFF</i>
Air Cond: ON One engine: MCT							Cruise altitude Anti-Ice ON
L/G UP							
Mass (lb)	IAS	ISA - 5	ISA	ISA + 5	ISA + 10	ISA + 15	ISA + 20
44 000	185	21 000 19 000	20 300 17 700	19 200 16 000	18 300 13 500	16 500 12 000	15 200 -
42 000	181	22 300 20 000	21 500 19 000	20 500 17 500	19 500 15 500	17 800 13 500	16 500 -
40 000	177	23 500 21 500	22 800 20 500	22 000 19 500	21 000 17 700	19 300 15 300	17 500 14 000
38 000	172	24 700 23 000	24 200 22 300	23 500 21 300	22 500 20 000	21 000 17 200	19 000 15 700
36 000	168	26 000 24 500	25 500 24 000	25 000 23 000	24 300 22 000	22 700 19 300	20 500 17 500
34 000	163	27 300 26 000	27 000 25 300	26 800 24 700	26 000 24 000	24 800 21 700	23 300 19 300
32 000	158	28 800 27 000	28 500 26 700	28 200 26 300	28 000 25 700	26 500 24 500	25 500 22 000
30 000	153	30 200 28 000	30 200 28 000	30 000 28 000	30 000 27 800	28 000 26 500	27 000 25 000
28 000	148	31 500 30 000	31 500 30 000	31 500 30 000	31 500 29 700	29 800 28 000	28 800 26 500
26 000	143	33 500 31 500	33 500 31 500	33 500 31 500	33 500 31 500	31 500 29 700	30 500 28 000
24 000	137	35 200 33 500	35 200 33 500	35 200 33 500	35 200 33 500	33 500 31 500	32 500 29 500

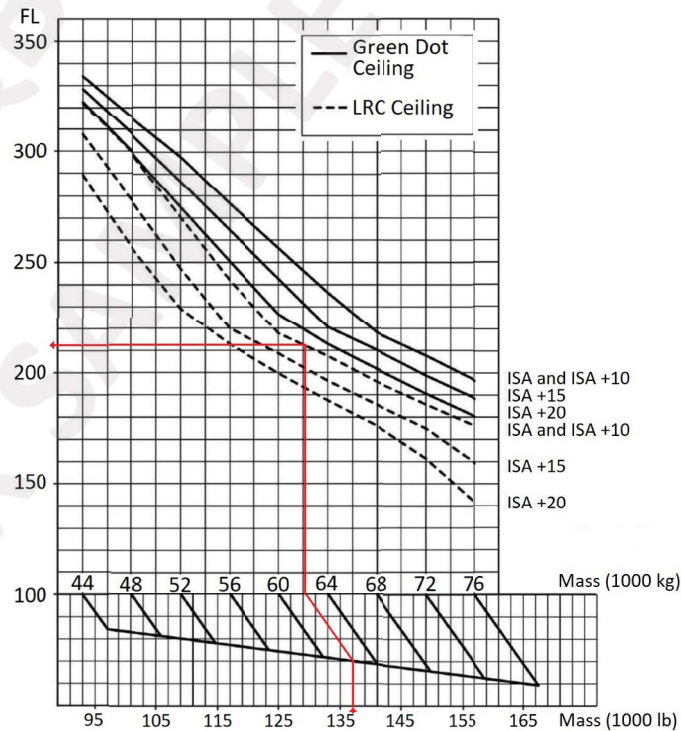
Interpolation may be used

Example:

Expected Gross Mass: 37 000 lb, Temperature: ISA + 10, Anti-ice: ON
One-engine-out maximum cruise altitude: 21 000 ft

ONE ENGINE OUT

NET CEILING at LONG RANGE and GREEN DOT SPEEDS Pack Flow Hi - Anti-ice OFF



Example:

Expected gross mass: 137 000 lb, long range cruise speed (LRC), temperature: ISA + 10, and the maximum one-engine-inoperative net level-off ceiling is 21200 ft.

Further corrections of the ceiling should be calculated based on the anti-ice status, using the table below.

CORRECTIONS		ISA	ISA + 10	ISA + 15	ISA + 20
LONG RANGE	ENGINE ANTI-ICE ON	-1300 ft	-1300 ft	-1200 ft	-1200 ft
	TOTAL ANTI-ICE ON	-2900 ft	-2800 ft	-2700 ft	-4300 ft
GREEN DOT	ENGINE ANTI-ICE ON	-800 ft	-800 ft	-900 ft	-900 ft
	TOTAL ANTI-ICE ON	-1900 ft	-1900 ft	-2200 ft	-2400 ft

Used e.g. in 032 05 02 01 Drift-down and stabilising altitude (performance data)

Altitude at engine failure (ft)		Mass at engine failure (x 1000 lb)												
		44	42	40	38	36	34	32	30	28	26	24	22	20
47000	Time (min)						38	36	34	33	31	29	27	27
	Distance (NM)						179	169	159	150	140	130	119	116
	Fuel used (lb)						820	740	670	600	530	470	400	380
	Final ALT (ft)						27380	28980	30600	322240	33960	35720	37440	39180
45000	Time (min)				41	39	37	35	33	31	29	27	25	24
	Distance (NM)				193	182	171	161	150	142	131	120	107	103
	Fuel used (lb)				990	890	810	720	650	580	510	450	380	350
	Final ALT (ft)				24300	25800	27360	28960	30580	32240	33940	35700	37420	39140
43000	Time (min)		44	42	40	37	35	33	31	29	27	25	22	20
	Distance (NM)		206	196	185	174	163	152	142	132	121	108	94	86
	Fuel used (lb)		1160	1060	970	880	790	700	630	560	490	420	340	300
	Final ALT (ft)		21360	22800	24280	25800	27340	28940	30560	32200	33920	35680	37400	39100
41000	Time (min)	43	42	40	38	36	34	32	29	27	25	22	18	15
	Distance (NM)	204	198	187	177	166	154	143	132	121	109	94	76	61
	Fuel used (lb)	1220	1140	1040	950	850	760	680	600	530	450	380	290	220
	Final ALT (ft)	20000	21340	22780	24260	25780	27320	28920	30540	32180	33900	35640	37360	39000
39000	Time (min)	42	41	39	37	34	32	30	27	25	22	18	12	3
	Distance (NM)	196	190	179	168	156	145	133	120	109	94	77	50	11
	Fuel used (lb)	1190	1120	1020	920	830	740	650	560	490	410	320	200	40
	Final ALT (ft)	19980	21340	22760	24240	25760	27300	28900	30520	32140	33840	35580	37280	38800
37000	Time (min)	41	40	37	35	33	30	27	24	22	18	12	10	22
	Distance (NM)	188	181	170	159	146	134	121	107	93	75	50	41	89
	Fuel used (lb)	1170	1090	990	890	790	700	610	520	430	340	210	170	360
	Final ALT (ft)	19960	21300	22740	24220	25720	27280	28860	30480	32100	33780	35480	37120	38760
35000	Time (min)	39	38	35	33	30	28	24	21	17	11	14	25	27
	Distance (NM)	178	172	160	148	135	122	107	91	72	45	58	102	107
	Fuel used (lb)	1130	1060	960	850	750	650	560	450	350	210	260	450	450
	Final ALT (ft)	19940	21280	22720	24180	25700	27240	28820	30420	32020	33680	35300	37120	38760
33000	Time (min)	37	36	33	31	28	24	21	16	9	17	27	30	30
	Distance (NM)	169	162	149	136	122	107	90	68	40	71	108	120	117
	Fuel used (lb)	1100	1020	910	810	700	590	480	350	200	350	510	540	510
	Final ALT (ft)	19920	21260	22680	24160	25660	27180	28760	30340	31900	33480	35300	37120	38760
31000	Time (min)	35	34	31	28	24	20	15	8	19	28	31	33	32
	Distance (NM)	158	150	137	123	107	88	66	32	79	113	125	130	124
	Fuel used (lb)	1050	970	860	750	630	500	360	180	420	580	620	610	560
	Final ALT (ft)	19900	21220	22640	24100	25600	27120	28660	30180	31720	33480	35300	37120	38760

Interpolation may be used

Example:

Altitude at engine failure: 41 000 ft, Mass at engine failure: 41 000 lb.

After engine failure, the aircraft drifts down.

From the point of engine failure, time travelled: 41 minutes, distance travelled: 192.5 NM, fuel used: 1090 lb, final altitude: 22060 ft.

BRAKE COOLING TIME TABLE

Determination of the brake cooling time:

EXAMPLE:

55	152	153	154	155	155	====> TIME (min) WITHOUT BRAKE COOLING FAN
	46	46	46	46	47	====> TIME (min) WITH BRAKE COOLING FAN

If the Energy and the OAT are not given in the table, use the values given in the next column right/row below.

For Example, with Energy = **55 MJ**, and OAT = 15 °C, entering the next adjacent column/row (Energy = **55 MJ**, OAT = 20 °C) gives the following results:

- Without brake cooling fan: 158 min
- With brake cooling fan: 47 min

Enter the following table with the energy and the OAT to determine the ground brake cooling time.

GROUND BRAKE COOLING TIME (min)												
ENERGY (MJ)	OAT (°C)											
	-50	-40	-30	-20	-10	0	10	20	30	40	50	55
0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	4	9	14	19	23	27	31	35	37
	0	0	0	1	3	4	6	7	8	9	10	11
15	31	35	38	42	45	48	51	54	57	60	62	64
	9	10	11	12	13	14	15	16	17	18	19	19
20	59	62	65	67	70	72	74	77	79	81	83	84
	18	19	19	20	21	22	22	23	24	24	25	25
25	81	83	85	87	89	91	92	94	96	98	99	100
	24	25	25	26	27	27	28	28	29	29	30	30
30	98	99	101	103	104	106	107	109	110	112	113	114
	29	30	30	31	31	32	32	33	33	34	34	34
35	112	113	115	116	117	119	120	121	123	124	125	126
	34	34	34	35	35	36	36	36	37	37	38	38
40	124	125	126	127	129	130	131	132	133	134	135	136
	37	37	38	38	39	39	39	40	40	40	41	41
45	134	135	136	137	139	140	141	142	143	144	145	145
	40	41	41	41	42	42	42	42	43	43	43	44
50	144	145	146	146	147	148	149	150	151	152	153	153
	43	43	44	44	44	45	45	45	45	46	46	46
55	152	153	154	155	155	156	157	158	159	160	160	161
	46	46	46	46	47	47	47	47	48	48	48	48
60	160	160	161	162	163	164	164	165	166	167	167	168
	48	48	48	49	49	49	49	50	50	50	50	50
65	167	167	168	169	170	170	171	172	172	173	174	174
	50	50	50	51	51	51	51	52	52	52	52	52

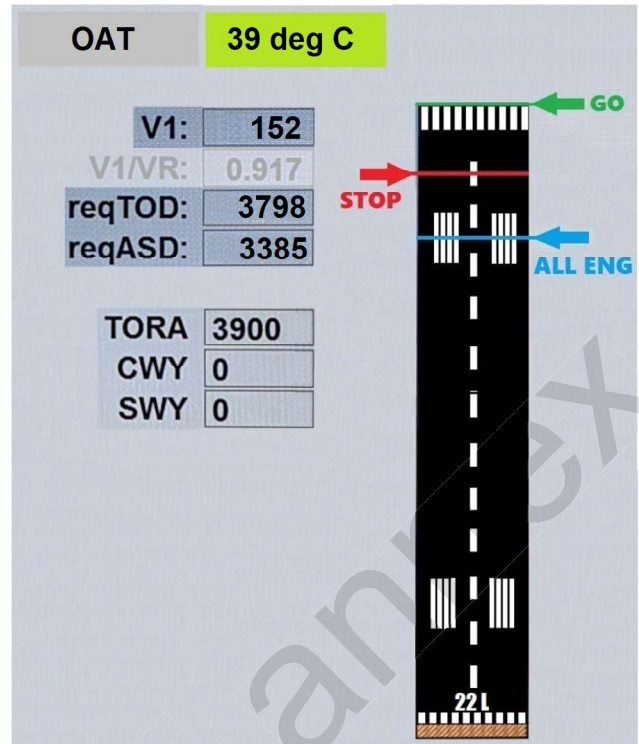
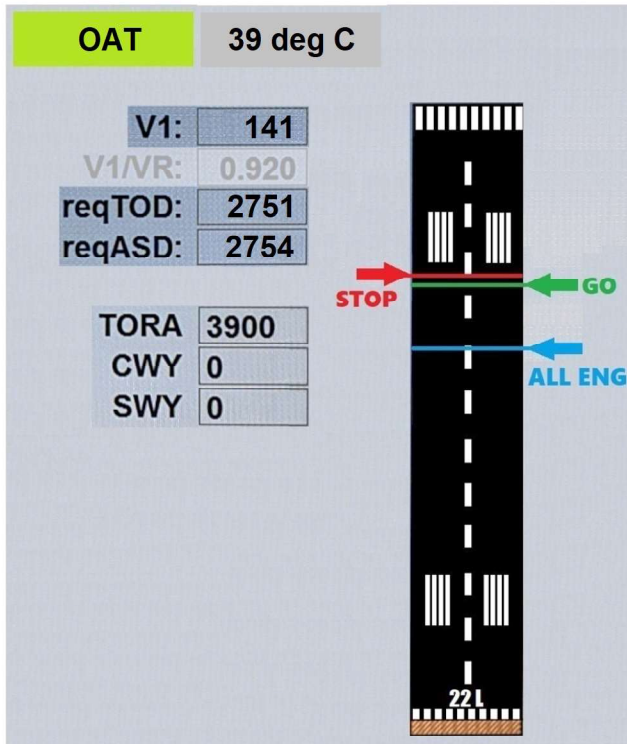
Used e.g. in 032 04 01 13 Take-off performance using different take-off flap settings

Flap/Slat position setting	1	2	3
Field limit TOM (kg)	58700	60250	60050
Climb limit TOM (kg)	62000	61300	60250
Obstacle limit TOM (kg)	62500	62150	61800

Flap/Slat position setting	1	2
Field limit TOM (kg)	17750	18300
Climb limit TOM (kg)	16500	16200
Obstacle limit TOM (kg)	17750	17400
Structural limit TOM (kg)	18300	18300

Used e.g. in 032 05 03 01 CS-25/OPS PERFORMANCE CLASS A - Landing (performance data)

	Flap 25	Flap 40
Approach climb limit mass (kg)	17200	17200
Landing climb limit mass (kg)	19350	19350
Field length limit mass (kg)	16400	17500
Structural limit landing mass (kg)	18400	18400



OAT: TOGA thrust

39 deg. C: assumed / FLEX temperature thrust

ALL ENG: TOD all engines

GO: TOD engine out

STOP: ASD

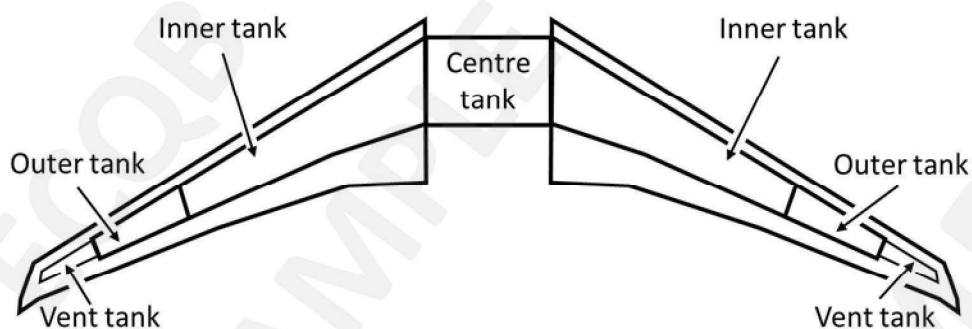
Long range cruise

Max. cruise thrust limits Normal air conditioning Anti-icing OFF			ISA + 20° CG = 33.0 %		N1 (%) kg / hr / ENG NM / 1000 kg		Mach IAS (kt) TAS (kt)	
Mass	FL290	FL310	FL330	FL350	FL370			
64000 kg	84.3 .703	85.6 .735	86.7 .753	87.4 .764	88.9 .780			
	1295 269	1304 270	1286 266	1264 258	1268 252			
	167.6 433	172.4 449	177.8 457	182.0 460	184.4 467			
66000 kg	84.9 .713	86.3 .743	87.2 .758	88.0 .769	89.5 .782			
	1339 274	1344 274	1320 267	1303 260	1304 253			
	164.4 440	169.2 454	174.2 460	177.7 463	179.7 468			
68000 kg	85.5 .723	86.8 .749	87.6 .760	88.5 .775	89.7 .768			
	1383 278	1379 276	1351 268	1343 262	1303 248			
	161.4 446	166.2 458	170.8 461	173.6 466	176.8 460			
70000 kg	86.2 .733	87.2 .753	88.0 .764	89.0 .780				
	1427 282	1410 278	1387 270	1384 264				
	158.6 452	163.4 460	167.2 463	169.6 469				
72000 kg	86.7 .742	87.7 .757	88.5 .769	89.6 .781				
	1469 285	1444 279	1425 272	1420 264				
	155.8 457	160.4 463	163.7 466	165.7 479				
74000 kg	87.3 .748	88.1 .760	88.9 .773	90.0 .780				
	1505 288	1476 280	1464 273	1445 264				
	153.3 461	157.6 465	160.3 469	162.6 469				
76000 kg	87.7 .752	88.4 .762	89.4 .779					
	1538 290	1509 281	1507 276					
	150.8 463	154.7 466	156.8 472					
78000 kg	88.1 .755	88.9 .766	89.9 .780					
	1570 291	1547 283	1540 276					
	148.4 466	151.6 469	153.8 473					
80000 kg	88.5 .759	89.3 .770	89.9 .764					
	1604 293	1585 285	1526 270					
	145.9 468	148.7 471	151.9 463					
82000 kg	88.8 .761	89.6 .773						
	1636 294	1619 286						
	143.5 469	146.0 472						
84000 kg	89.2 .764	89.7 .761						
	1671 295	1613 281						
	141.0 471	144.6 466						
86000 kg	89.6 .768	89.8 .735						
	1710 296	1599 270						
	138.5 473	140.7 449						
88000 kg	89.7 .762							
	1716 294							
	137.0 470							
90000 kg	89.7 .750							
	1711 289							
	135.2 462							
92000 kg	89.8 .724							
	1702 278							
	131.2 446							
Econ Air Conditioning Δ Fuel = - 0.5 %		Engine anti-ice ON Δ Fuel = + 3 %		Total anti-ice ON Δ Fuel = + 4.5 %				

Interpolation may be used

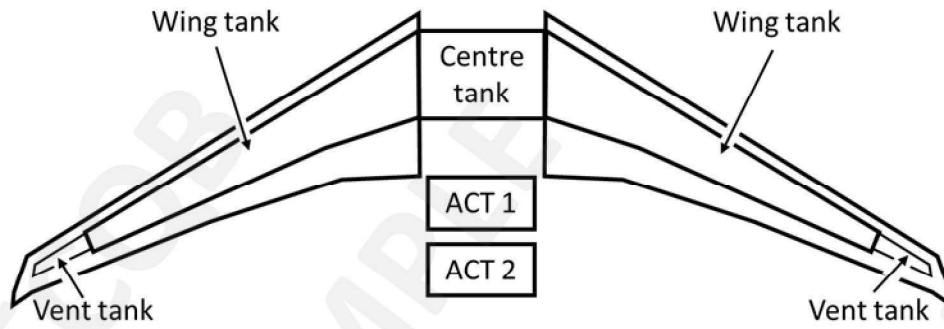
Example:

Aeroplane mass is 69000 kg, at FL330, ISA + 20°C.
Long range cruise TAS is 462 kt



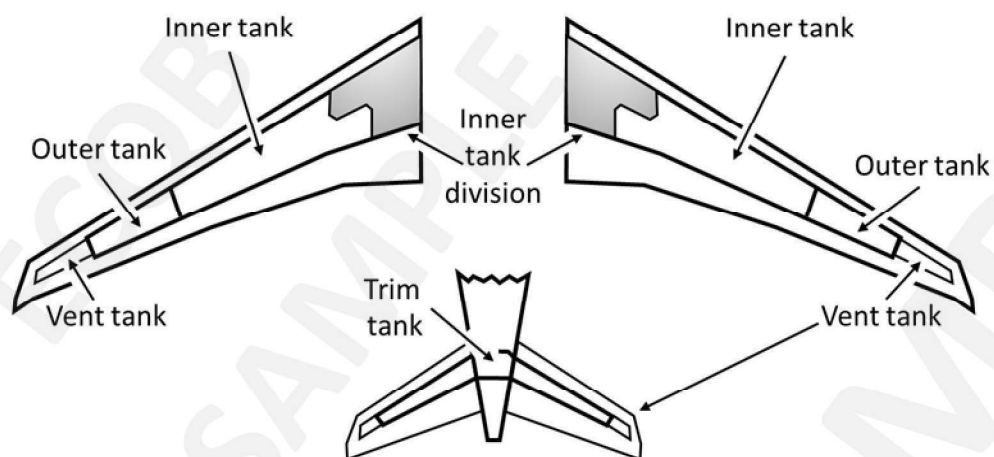
Usable fuel					
		Outer tanks	Inner tanks	Centre tank	Total
Volume	(litres)	870 x 2	6916 x 2	8233	23805
	(US gallons)	230 x 2	1827 x 2	2175	6289
Weight*	(kg)	683 x 2	5429 x 2	6463	18687
	(lb)	1507 x 2	11969 x 2	14248	41200

*Fuel density: 0.785 kg/l or 6.551 lb/US gallon



Usable fuel							
		Wing tanks	Centre tank	ACT	Total with:		
					No ACT	1 ACT	2 ACTs
Volume	(litres)	2 x 7910	8160	2981	23980	26961	29942
	(US gallons)	2 x 2090	2156	787	6336	7123	7910
Weight*	(kg)	2 x 6209	6406	2340	18824	21164	23504
	(lb)	2 x 13692	14124	5156	41508	46664	51820

*Fuel density: 0.785 kg/l or 6.551 lb/US gallon



Usable fuel					
		Outer tanks	Inner tanks	Trim tank	Total
Volume	(litres)	3660 x 2	42050 x 2	6220	97640
	(US gallons)	967 x 2	11108 x 2	1643	25793
Weight*	(kg)	2873 x 2	33009 x 2	4883	76647
	(lb)	6335 x 2	72769 x 2	10763	168 971

*Fuel density: 0.785 kg/l or 6.551 lb/US gallon

Legends: TM: Time to waypoint
ETO: Estimated time overhead (HHMM)
ATO: Actual time overhead (MM)
MF REQD: Minimum fuel required (KG)
AREM: Actual fuel remaining (KG)

TO	TM	ETO/ATO	TEMP LVL	MTK	DST	W/V	MSA	MF REQD	AREM	FL
TOC	000	0624 / 20	-60 360	265	005	33015	027	6269	6380:	:
ROBEG	003	0627 / 24	-60 360	265	018	34014	027	6169	6345:	:
BADMU	001	0628 / ...	-60 360	265	011	34014	027	6107	:	:
MOBSA	003	0631 / ...	-60 360	265	019	34013	027	5999	:	:
OSN 114.3	001	0632 / ...	-60 360	264	006	34012	021	5966	:	:
AMSAN FIR BDRY	006	0638 / ...	-60 360	264	043	32011	027	5722	:	:
ETEBO FIR BDRY	001	0639 / ...	-60 360	264	009	32011	021	5673	:	:
RKN 116.8	001	0640 / 36	-60 360	264	004	32011	020	5650	5735:	:
TENLI	002	0642 / ...	-60 360	288	020	31012	020	5536	:	:
FLEVO	004	0646 / ...	-60 360	288	025	29013	017	5393	:	:

IN-FLIGHT PERFORMANCE

Fuel penalty factors: these are conservative values, for the flight crew to use as guidance in their decision-making.

Note: The fuel predictions provided by the FMS would no longer be reliable. The flight crew must still monitor and calculate the actual fuel consumption.

Methodology

- Establish which system is faulty and select the appropriate line in the table below.
- In case of multiple failures, add up all the relevant fuel penalty factors to find the total fuel penalty factor.
- Apply the fuel penalty factor either to the calculated trip fuel as indicated in the FMS, or to correct the fuel flow.

System	Fault	Fuel penalty factor
Flaps & slats	Flaps extended	85 %
	Slats extended	65 %
	Flaps & slats extended	100 %
Landing gear	Landing gear not retracted ⁽¹⁾	180 %
	Landing gear doors extended ⁽²⁾	20 %
Flight controls	1 spoiler per wing ⁽³⁾	10 %
	2 spoilers per wing ⁽³⁾	15 %
	3 spoilers per wing ⁽³⁾	55 %

⁽¹⁾ The value of the fuel penalty factor is the most conservative, with a fully extended landing gear. It includes the effect of the landing gear doors extended.

⁽²⁾ The landing gear is confirmed to be retracted on the systems display but indications show that the gear is in transit, with the landing gear doors in an unconfirmed position.

⁽³⁾ Dependent on the reason, the spoilers may be floating and gradually extend during the flight. The fuel penalty may not be fully representative with the spoilers fully extended.

Used e.g. in 033 01 01 05 Completion of navigation plan

Aircraft	Aircraft type	Route: from		to	Date	Take-off time UTC	Landing time UTC
		A		F	15/9	08:23	

From	To	Safety Altitude	FL/Alt	TAS	Track (T)	Wind	Hdg (T)	Var	Hdg (M)	GS kt	Distance NM	Time minutes	ETA	ATA
A	B	14800	Climb	85	018°	320°/15	009°	2°E	007°	76	9			
B	TOC	14800	Climb	90	325°	340°/20	328°	2°E	326°	71	5.5			
TOC	C	11400	8500	125	325°	350°/20	329°	2°E	327°	107	15			
C	D	10100	8500	125	267°	350°/20	276°	1°E	275°	121	54			
D	E	9800	8500	125	262°	330°/25	273°	1°E	272°	113	25			
E	F	9800	Descent	120	280°	330°/25	289°	1°E	288°	102	46.5			

Used e.g. in 033 01 01 05 Completion of navigation plan

From: DEP Elevation: Sea Level		To: DEST Elevation: Sea Level		Alternate Aerodrome: ALTN Elevation: 185 ft			Call sign:				
FROM	TO	ALTITUDE	Course (True)	TAS	Wind Direction and Speed	HDG (True)	VAR	HDG (Magn.)	Estim. GS Actual GS	Sector Distance	Sector Time Accumulated Time
1 DEP	WPT A		247°	120 kt	310° 26 kt	258°	1°W	259°	106 kt	20 NM	0:11
2 WPT A	WPT B	2500	247°	120 kt	310° 26 kt	258°	1°W	259°	106 kt	30 NM	0:11
3 WPT B	WPT C	2500	333°	120 kt	355° 18 kt	336°	1°W	337°	103 kt	45 NM	0:17
4 WPT C	DEST		196°	125 kt	335° 28 kt	204°	1°W	205°	145 kt	20 NM	0:28
5 DEST	ALTN	-	354°	100 kt	335° 22 kt	350°	1°W	351°	79 kt	40 NM	0:26

AB1193P	A/C TYPE	EHAM/AMS	ENBR/BGO	CRZ	SYS	CI	30
ABC1193	PHBXC	1910/1927	2047/2051	GND	DIST	523	
11APR19		CTOT:....	STA 2050	AIR	DIST	517	
				AVG	W/C	T006	
MAXIMUM	ZFW	61688	LAW 66360	TOW	73708	AVG	ISA M01
ESTIMATED	ZFW	55100	LAW 57848	TOW	61194	F-F	FACTOR +4.5
ACTUAL	ZFW	55100	LAW	TOW	62271		

TRIP	3346	0120	.....	
CONT 5MINS	190	0005	.....	
ALTN	1358	0031	ENZV	.....
FINAL	1200	0030	.....	
PLN TOF	6094	0226		
ALTN DIFF	....	....		
PLN TOF	....	....	(CORRECTED)	CONT SUMMARY
EXTRA	....	1077		CONT90 -2
TOF	6094	7171		ENRT ALTN
TAXI	370	....		CONT CORR
BLOCK	6464	7541		MEAN

CONT99	3

38	/MIN
-6	

WAYPNT	RTE-	TRK	M	ETO /ATO	TP	TMP	WIND	EFOB
AWY	MORA	DIS	GS	ETE /TTE	FL			AFOB
EHAM36L		035		 /	CLB		096/002	6.1
SPY2V	21		0038	0008/0008				6.7
ANDIK		052		 /	CLB	-27	131/013	5.2
UN873	20		0004	0001/0009				
KEKIX		052		 /	CLB	-28	138/014	5.1
UN873	20		0032	0004/0013				
GRONY		052		 /	CLB	-47	166/010	4.8
UN873	20		0024	0003/0016				
BEDUM		345		 /	CLB	-57	186/007	4.6
UP603	20		0026	0004/0020				
T-O-C				 /	390	37	-58 229/007	4.4
UP603	20		0044	0005/0025				5.0
MOKUM		345	787	 /		37	-57 237/009	4.2
UP603	20		0004	0001/0026				
LIMBI		345	787	 /		37	-57 238/009	4.2
UP603	20		0028	0004/0030				
GREFI		342	787	 /		37	-57 243/011	4.0
P603	20		0049	0006/0036				
GARKA		354	786	 /		37	-58 240/013	3.8
P603	20		0010	0002/0038				
BUSOM		003	786	 /		37	-58 239/013	3.7
P603	20		0026	0003/0041				4.6
NAMIK		004	786	 /		37	-58 238/013	3.6
P603	20		0037	0005/0046				
KARLI		002	786	 /		38	-58 234/015	3.4
UP603	20		0038	0005/0051				
RIRUT		002	786	 /		38	-59 231/017	3.2
UP603	34		0030	0004/0055				
T-O-D			786	 /	DSC	38	-59 231/019	3.1
UP603	34		0045	0006/0101				4.2
ZOL		352		 /	DSC	-50	248/026	3.1
ZOL2P	46	0087		0019/0120				
ENBR35				 /			221/006	2.7

AFOB: Actual Fuel on Board
 BLOCK: Block Fuel
 EFOB: Estimated Fuel On Board
 EXTRA: Extra Fuel & Discretionary Fuel
 LAW: Landing Weight

TAXI: Taxi Fuel
 TOF: Take-Off Fuel
 TOW: Take-Off Weight
 ZFW: Zero Fuel Weight

Short Trip Fuel and Time

Ground to Air Miles Conversion

Air Distance (NM)					Ground Distance (NM)	Air Distance (NM)				
Headwind Component (kt)						Tailwind Component (kt)				
100	80	60	40	20		20	40	60	80	100
92	79	69	61	55	50	46	42	39	37	34
158	142	128	117	108	100	93	87	82	77	73
224	204	187	173	161	150	141	133	125	119	113
288	265	245	228	213	200	188	178	169	161	153
351	325	302	283	265	250	236	224	213	203	194
415	385	360	337	318	300	284	270	257	246	235
478	445	417	392	370	350	332	316	302	288	276
541	506	474	447	422	400	380	362	346	331	317
606	567	532	502	474	450	428	408	390	373	358
672	629	591	557	527	500	476	453	433	415	398

Trip Fuel and Time Required

Air Distance (NM)		Landing Mass (1000 kg)					Time (HH:MM)
		30	40	50	60	70	
50	Fuel (1000 kg) ALT (ft)	0.5 13000	0.5 11000	0.6 11000	0.6 9000	0.7 9000	00:14
100	Fuel (1000 kg) ALT (ft)	0.7 21000	0.8 19000	0.9 19000	1.0 17000	1.1 17000	00:22
150	Fuel (1000 kg) ALT (ft)	0.9 29000	1.1 25000	1.2 25000	1.3 23000	1.4 23000	00:30
200	Fuel (1000 kg) ALT (ft)	1.1 41000	1.3 35000	1.5 29000	1.6 27000	1.8 25000	00:37
250	Fuel (1000 kg) ALT (ft)	1.3 41000	1.5 41000	1.7 37000	1.9 31000	2.1 29000	00:44
300	Fuel (1000 kg) ALT (ft)	1.4 41000	1.7 41000	1.9 39000	2.1 35000	2.4 31000	00:50
350	Fuel (1000 kg) ALT (ft)	1.6 41000	1.9 41000	2.1 39000	2.4 35000	2.7 33000	00:57
400	Fuel (1000 kg) ALT (ft)	1.8 41000	2.1 41000	2.4 39000	2.7 35000	3.0 33000	01:04
450	Fuel (1000 kg) ALT (ft)	1.9 41000	2.2 41000	2.6 39000	2.9 35000	3.3 33000	01:11
500	Fuel (1000 kg) ALT (ft)	2.1 41000	2.4 41000	2.8 39000	3.2 35000	3.6 33000	01:19

Interpolation may be used

Based on 280/0.78 climb, long range cruise, and 0.78/280/250 descent

Example:

Intended landing mass: 60 000 kg. Fuel required to an alternate aerodrome 100 NM away, with headwind component: 30 kt. Interpolate from the upper table, NAM: 112.5 NM.

Interpolate from the lower table, fuel for 112.5 NAM: 1075 kg.

Flight Planning Data

Aircraft Fuel Capacities Useable

	US gal	Litres	lb	kg
Basic Aircraft	276	1052	1850	840

Standard TAS and Fuel Flows

	Speed (TAS)	Fuel Flow
Cruise All Masses - 2 engines operating	140 kt	600 lb/h
Holding All Masses - 2 engines operating	100 kt	480 lb/h
Cruise & Holding All Masses - OEI ISA	100 kt	420 lb/h
	ISA+20	440 lb/h

Standard Fuel Allowances

	lb
Instrument Approach Fuel	50
Start/Wheel-Taxi Fuel	40
Rotors Running Turnaround	80

Mid-Zone Fuel Masses

Unless otherwise advised by a responsible company officer, the Mid-Zone Weight vs Fuel Flow table (Figure 2.1.1) must be used to derive fuel flows for all sectors flown with 2 engines operating.

To determine the Mid-Zone Mass, calculate fuel burn to the mid-zone (half-way) position of the entire flight at the standard rate and subtract this mass from the aircraft's Take-Off Mass. The Mid-Zone Mass derived will be used for all sectors. Enter the table at the appropriate Density Altitude for each sector and read the fuel flow for the sector from the corresponding mass column.

Mid-Zone Masses are not required for OEI operations. Use standard fuel flows when calculating fuel requirements for sectors flown in the OEI configuration.

These figures are for planning purposes only. The Pilot-in-Command must carefully monitor actual fuel flows to ensure that all statutory requirements are met.

Used e.g. in 033 04 02 02 06 Update of navigation plan using the latest meteorological information

Legends: APT: Airport
 TRK: Track
 DST: Distance
 FL: Flight Level
 WC: Wind Component
Units: TIME: HHMM
 FUEL: kg

APT	TRK	DST	VIA	FL	WC	TIME	FUEL
ESNU/14	195	144	VERAG T31 KETEL	160	P003	0026	1404
EFOU/12	106	109	DCT SLU T320 OTVEM	150	P005	0021	1108
EFRO/21	42	126	BESLA M607 NEMGU DCT	150	P002	0029	1534

Legends: Fuel quantities: KG
 Weight change increment: 1000 KG
 Flight level increment: 1000 FT
 Change nominator M: Negative
 Change nominator P: Positive

PLANNED FUEL

FUEL	ARPT	FUEL	TIME	FUEL	TIME
TRIP	HEGN	15863	0531	.....	.....
CONT 3 %	HECA	476	0010	.....	.....
ALTN	HELX	1605	0033	.....	.....
FINRES		1300	0030	.....	.....
MIN T/O FUEL		19244	0644	.....	.....
TAXI	EGBB	189	0014	.....	.....
MIN BLOCK FUEL	EGBB	19433			
ADDFU		0	0000	.....	.....
BLOCK FUEL		19433	0658	.....	.....
EXTRA		.....	.....	POSS EXTRA 3226C	.....
DISCRETIONARY		.....	.....	.....	.....
TOTAL FUEL	EGBB	.....	.....	.....	.....
TANKERING RECOMMENDED:	GAIN 23 USD/T				

OPERATIONAL IMPACTS

WEIGHT CHANGE	DN 1.0	TRIP	M 0116 KGS	TIME P 0000
WEIGHT CHANGE	UP 1.0	TRIP	P 0123 KGS	TIME M 0000
FL CHANGE	DN FL1	TRIP	P 0204 KGS	TIME M 0002
FL CHANGE	UP FL1		NOT AVAILABLE	
SPD CHANGE	M.80	TRIP	P 0606 KGS	TIME M 0005

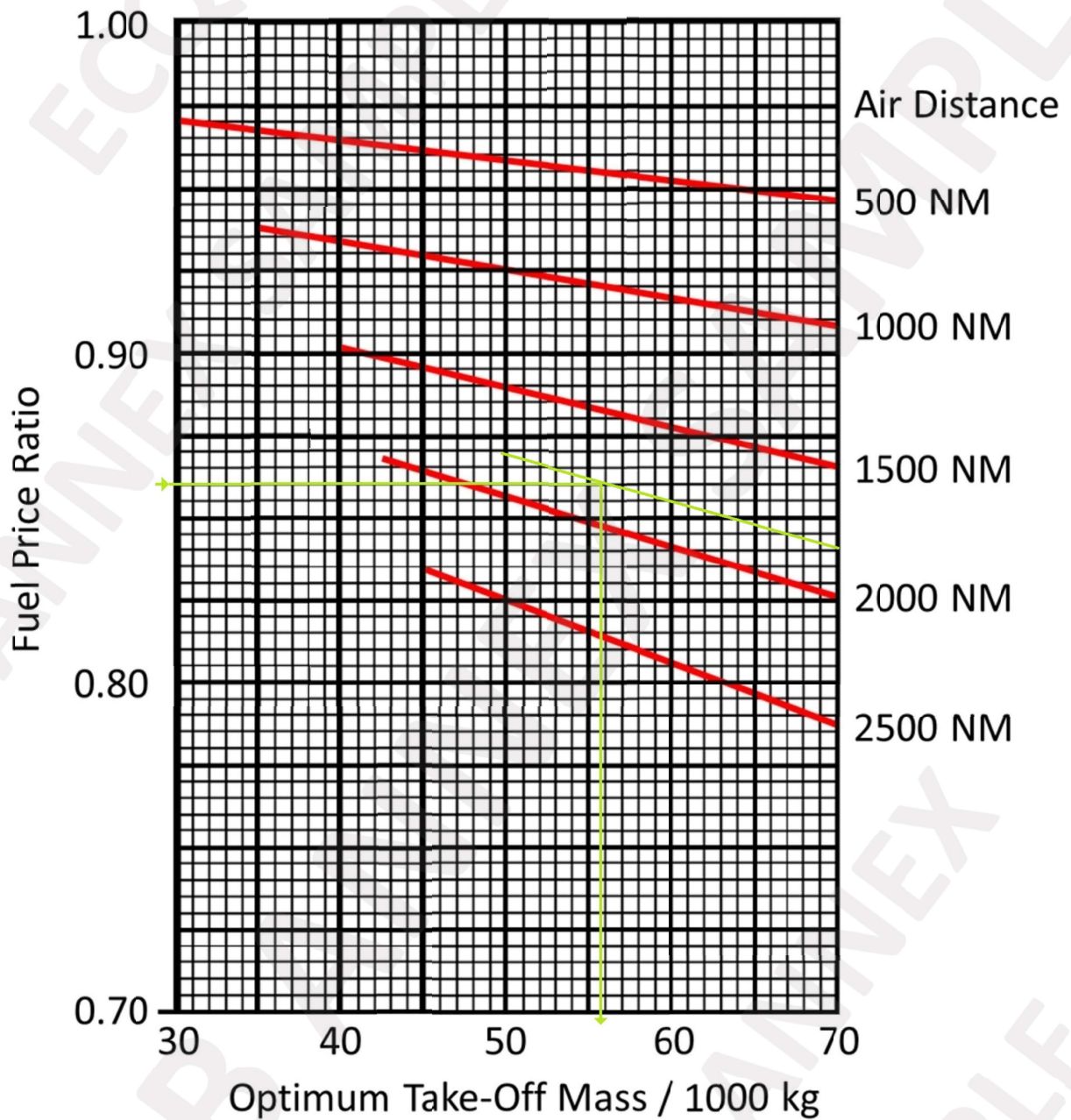
FLIGHT PLAN	TIME	FUEL		
TAXI	00.13	150 KG	MZFW 63300	PZFW 52209
TRIP	02.14	5293 KG	MTOW 72500	PTOW 57947
CONT MIN	00.05	195 KG	MLWT 65900	PLWT 54234
EGAA/25	00.24	950 KG	FL170 TTK001 GD 117 MSA 3.4 W/C P004	
FINAL RESV	00.30	1181 KG		
FPL FUEL	03.26	7769 KG		
EXTRA	00.17	598 KG		
ADD HOLD	00.00	0 KG		
DISCRETIONARY	00.00	0 KG		
TARGET	03.43	8367 KG		
BLOCK FUEL	.....	8965 KG		
2000 FT ABOVE	TRIP MS 16 /	TIME 02.21		
2000 FT BELOW	TRIP PS 100 /	TIME 02.21		
WEIGHT CHANGE PER 1000 KG		94 KG TO TOTAL FUEL		
FUEL CARRIAGE COST:	49 US DOLLARS PER 1000 KG			

Used e.g. in 033 06 01 02 Flight monitoring - In-flight fuel management

Legends: TM: Time to waypoint
ETO: Estimated time overhead (HHMM or MM)
ATO: Actual time overhead (MM or HHMM)
DST: Distance to waypoint (NM)
MF REQD: Minimum fuel required (KG)
AREM: Actual fuel remaining (KG)

TO	TM	ETO/ATO	TEMP LVL	MTK	DST	W/V	MSA	MF REQD	AREM
TAXI RWY06	Airborne 1243							8111	
PR631	003	1246 /...	-02 080	058	011	23019	033	7747	
PR632	003	49 /...	-14 154	323	016	27032	034	7453	
PR621	001	50 /...	-18 179	241	006	28037	034	7357	
ESINU	004	54 /...	-30 237	241	019	28042	034	7102	
BALTU	002	56 /...	-39 272	235	016	28047	039	6921	
DOPOV	002	58 /...	-44 286	263	008	28048	056	6840	
DONAD	001	59 /...	-47 294	266	005	28049	056	6792	
SOGPA	002	1301 /...	-51 313	294	012	28048	056	6676	
VARIK FIR BDRY	002	03 /...	-57 338	294	015	27049	045	6548	
PEROX	001	04 /...	-61 350	291	008	27052	045	6484	
TOC	001	1305/1302	-63 360	293	008	27056	045	6421	
SODRO	003	08 /...	-65 360	293	008	26056	045	6370	
ROBEL	008	16 /...	-65 360	293	059	25055	044	6005	
KEMAD FIR BDRY	004	20 /...	-64 360	293	032	24054	044	5813	
RAVLO FIR BDRY	039	59 /...	-63 360	294	264	22073	041	4254	
BODSO	006	1405 /...	-61 360	282	039	21071	010	4025	

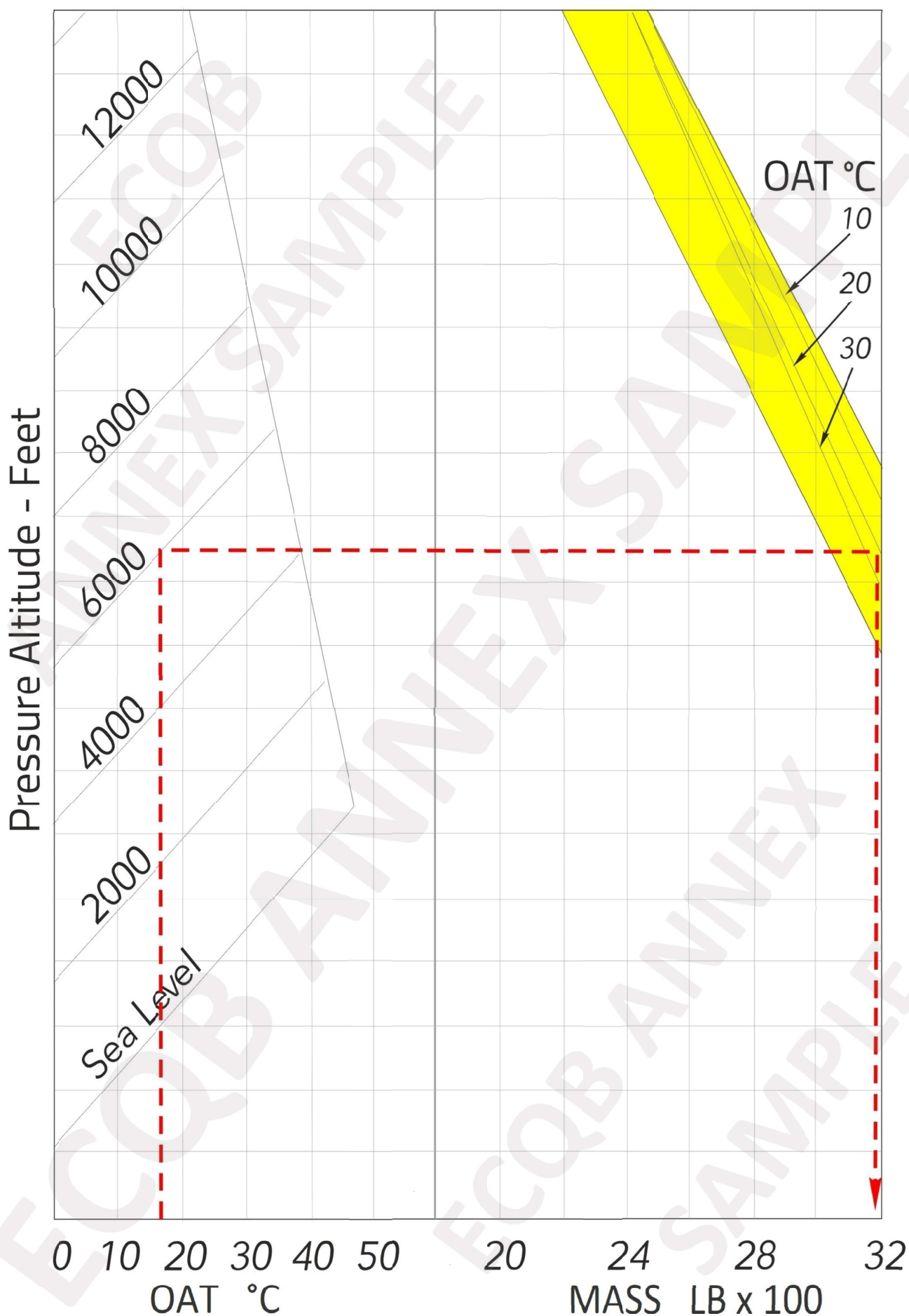
FL330 M0.74 Cruise



Example:

Fuel price ratio: 0.86, air distance: 1800 NM, and the optimum take-off mass is 55800 kg.

Used e.g. in 034 02 04 01 02 SINGLE-ENGINE HELICOPTERS - Use of helicopter performance data
Take-off (including hover) - Find the maximum allowed take-off mass for certain conditions

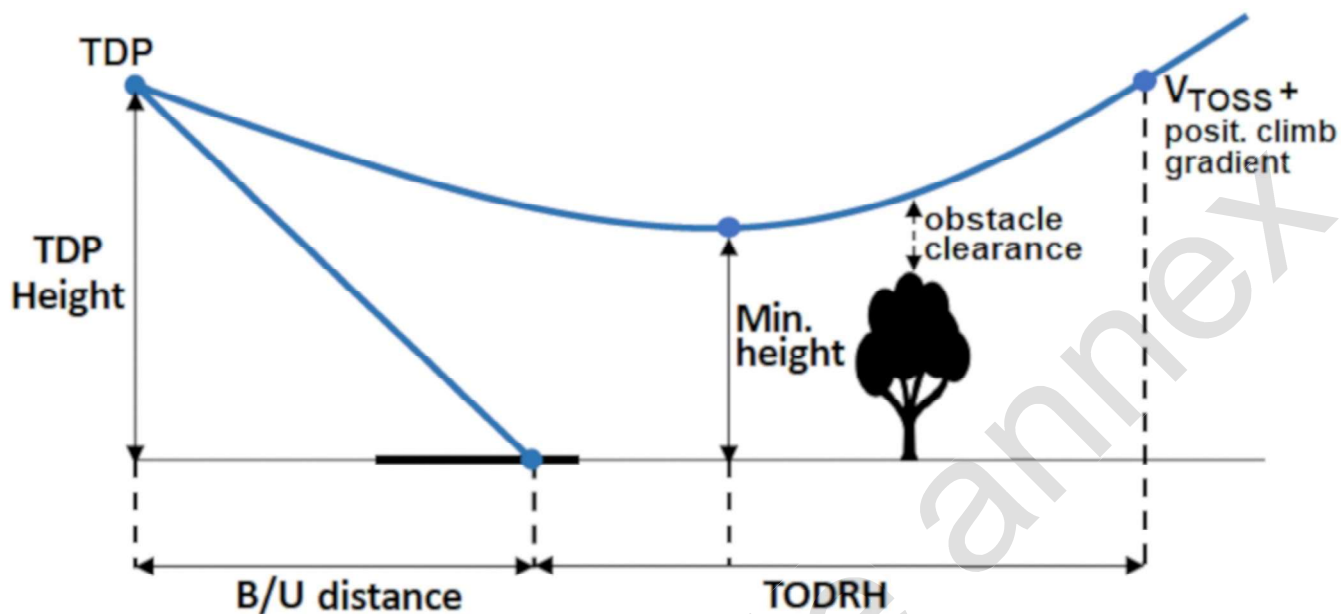


Example:

Pressure altitude: 6000 ft, OAT at sea level: +16° C, and the maximum TOM is 3200 lb.

PC1 take-off procedure

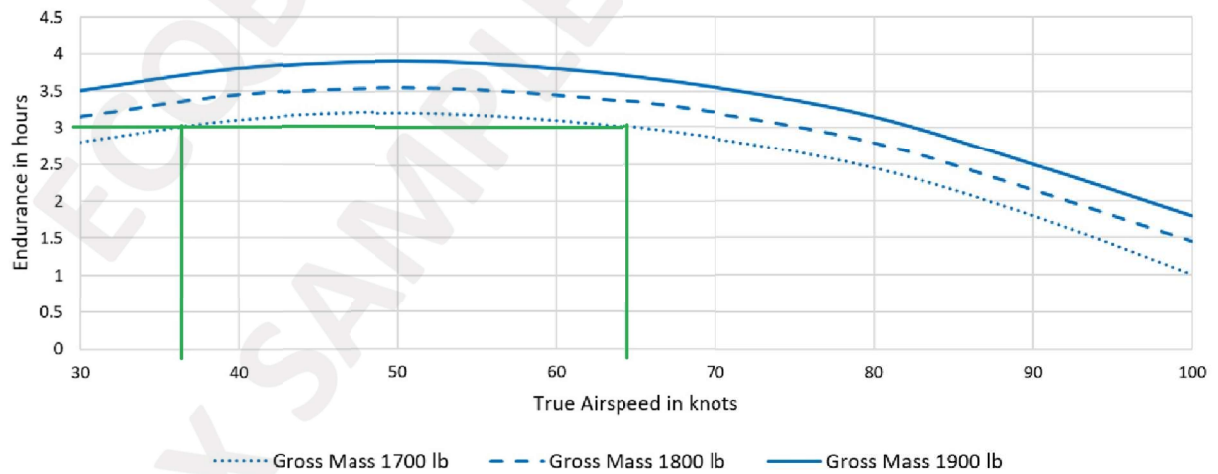
(helipad + elevated helipad)



	B/U distance	Minimum height	Height at V_{TOSS}	TODRH
120 ft	45 m	25 ft	50 ft	165 m
130 ft	49 m	35 ft	60 ft	160 m
140 ft	54 m	45 ft	70 ft	155 m
150 ft	58 m	55 ft	80 ft	150 m
160 ft	64 m	65 ft	90 ft	145 m
170 ft	69 m	75 ft	100 ft	140 m
180 ft	74 m	85 ft	110 ft	135 m
190 ft	79 m	95 ft	120 ft	130 m

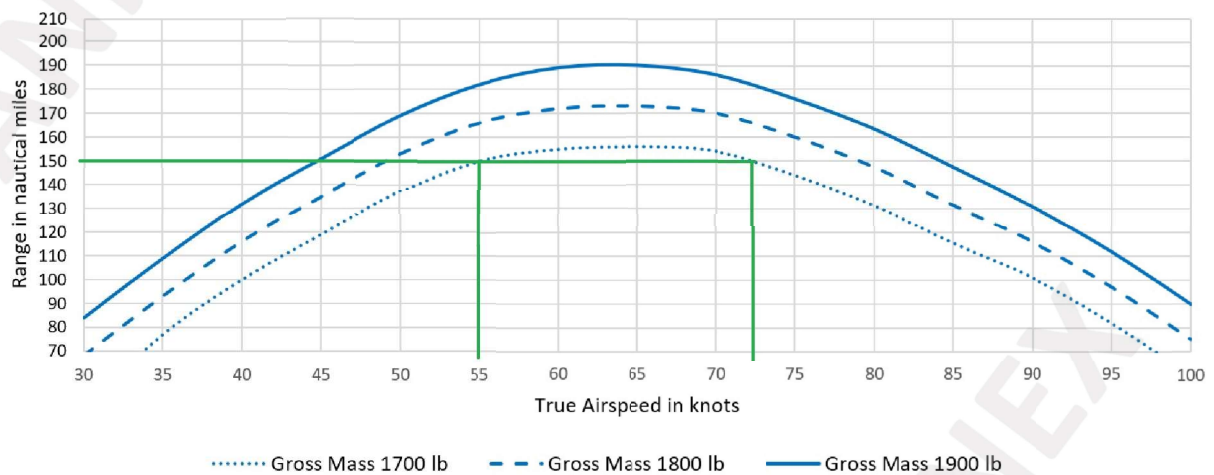
Note: if barometric altimeter is used for TDP identification add 50 ft to the TDP height of this table

Endurance and Range: sea-level, ISA conditions, 3500 RPM



Example:

Take-off gross mass is 1700 lb, target endurance for the cruise is 3 hours, fastest TAS is 64 kt.



Example:

Take-off gross mass is 1700 lb, target maximum range for the cruise is 150 NM, fastest TAS to achieve that range is 72 kt.

Used e.g. in 061 01 05 05 01 Flight log - Enter revised navigational en-route data, for the legs concerned, into the flight plan

Flight number	Aircraft type	Registration	From	To	Date	Off block	07:40
			A	G	17/10	Take-off	07:51
FPL PLAN : A ... WP1 ... B G							Landing
							On block

From	To	FL/Alt	TAS [kt]	Track (M)	Hdg (M)	GS [kt]	Distance [NM]	Time [minutes]	ETO	ATO	Plan Fuel	Min Fuel	Fuel check	Notes
A	TOC	Climb	145	47	58	121	48	24	08:15	08:12	460	422	474	
TOC	B	FL90	190	47	55	167	65	23	08:38	08:34	414	376	472	
B	C	FL90	190	47	55	167	43	15	08:53	08:48	383	345	437	
C	D	FL90	190	47	55	167	26	9	09:02		365	327		
D	E	FL90	190	47	55	167	19	7	09:09		351	313		
E	F	FL90	190	48	56	166	16	6	09:15		340	302		
F	G	FL90	190	48	56	166	13	5	09:20		330	292		

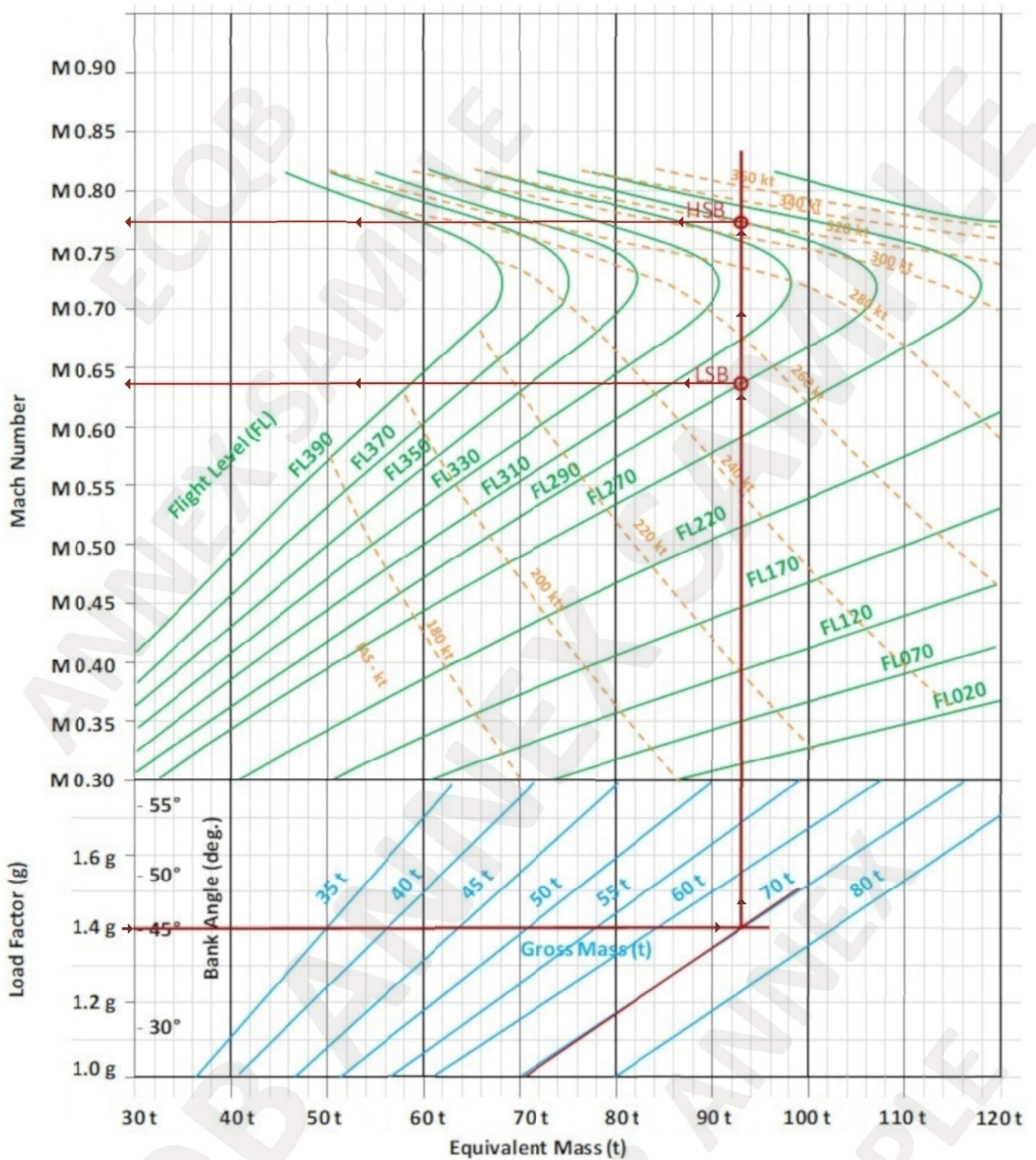
Situation 1



Situation 2



Used e.g. in 081 03 02 02 Shock stall - Buffet onset (example graph)

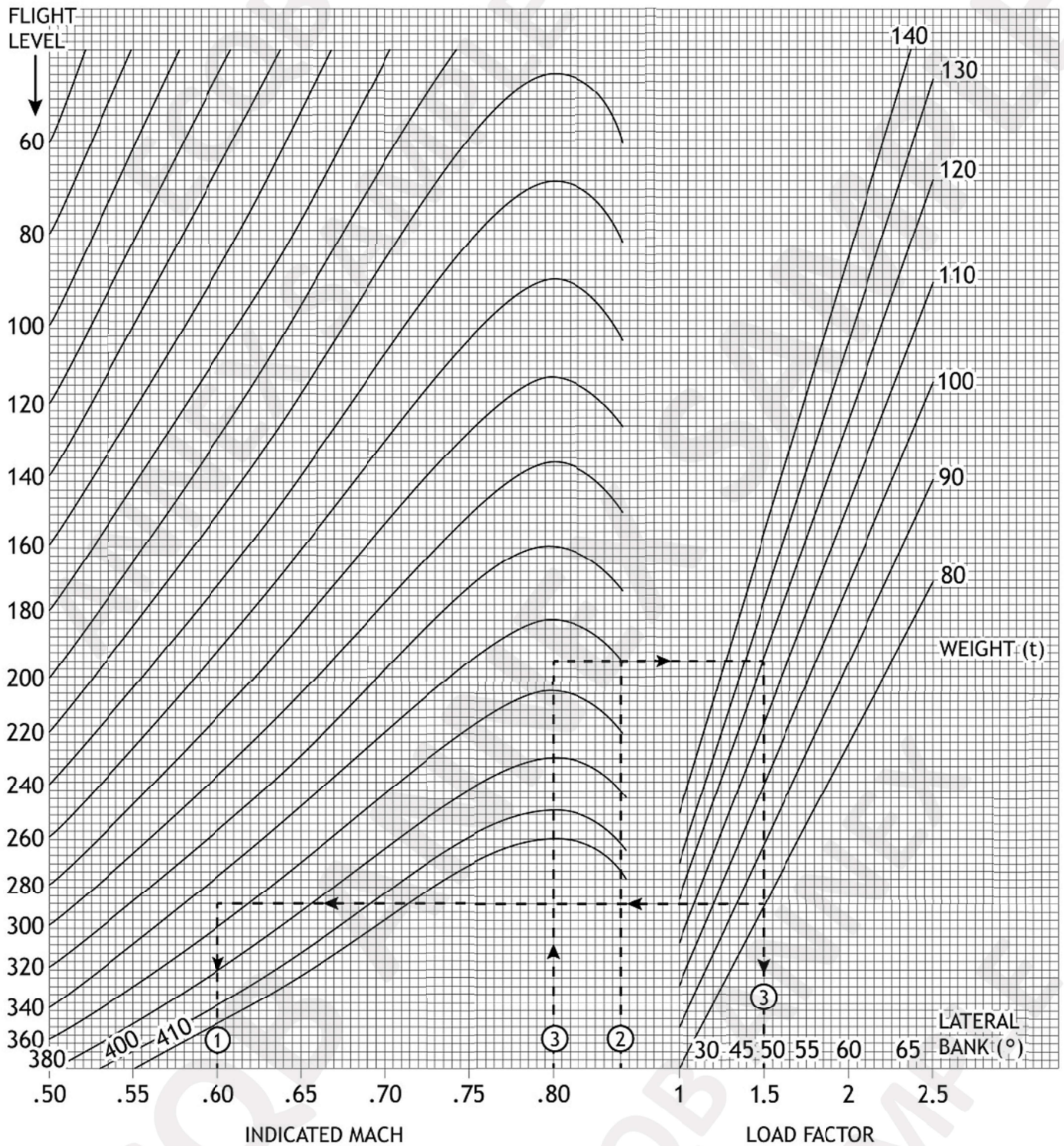


Example:

Gross mass = 70 t
Load Factor = 1.4 g
Flight level = FL290

Results:

High speed buffet (HSB) = M 0.775
Low speed buffet (LSB) = M 0.64



EXAMPLE		
DATA		RESULTS
Weight	120t	① Low speed buffeting at $M = 0.60$
Load factor	1g	② High speed buffeting at $M > 0.84$
Level	350	③ At Mach 0.80 buffeting takes place at 48° bank or 1.5g
Mach nr	0.80	
Level	350	
Weight	120t	

Used e.g. in 090 03 01 02 Aerodrome weather - Weather broadcast

ATC	FLIGHT INFORMATION	COMPANY
REVIEW	MANAGER	NEW MESSAGES

1925Z

ATIS

EDDK ENR ATIS N
1920Z
EXPECT ILS APCH RWY 32R 32 L
TRL 70
23005KT
CAVOK

PRINT

CANCEL