Annexes and ECQB exams

Version 2, 05/01/2024

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. *UK Air Almanac 2017*. 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. *CAP 696 CAA JAR-FCL Examinations Mass and Balance Manual (Aeroplanes).* Third Edition, The Stationary Office.	031 Mass & Balance
UK Civil Aviation Authority, 2006. *CAP 697 CAA JAR-FCL Examinations Flight Planning Manual.* Second Edition, The Stationary Office.	032 Performance (A) 033 Flight Planning
UK CAA UK Civil Aviation Authority, 2006. *CAP 698 CAA JAR-FCL Examinations Aeroplane Performance Manual.* 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. *CAP 758 Helicopter Manual for JAR-FCL Examinations - Mass and Balance – Performance – Flight Planning and Monitoring*. The Stationary Office.	031 Mass & Balance: helicopter-specific questions 033 Flight Planning: helicopter-specific questions 034 Performance (H)
Jeppesen 2017. *General Student Pilot Route Manual*. 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 paragraphs[1] where that type of annex is used is given. Note that the samples are made available for the purpose of private study.

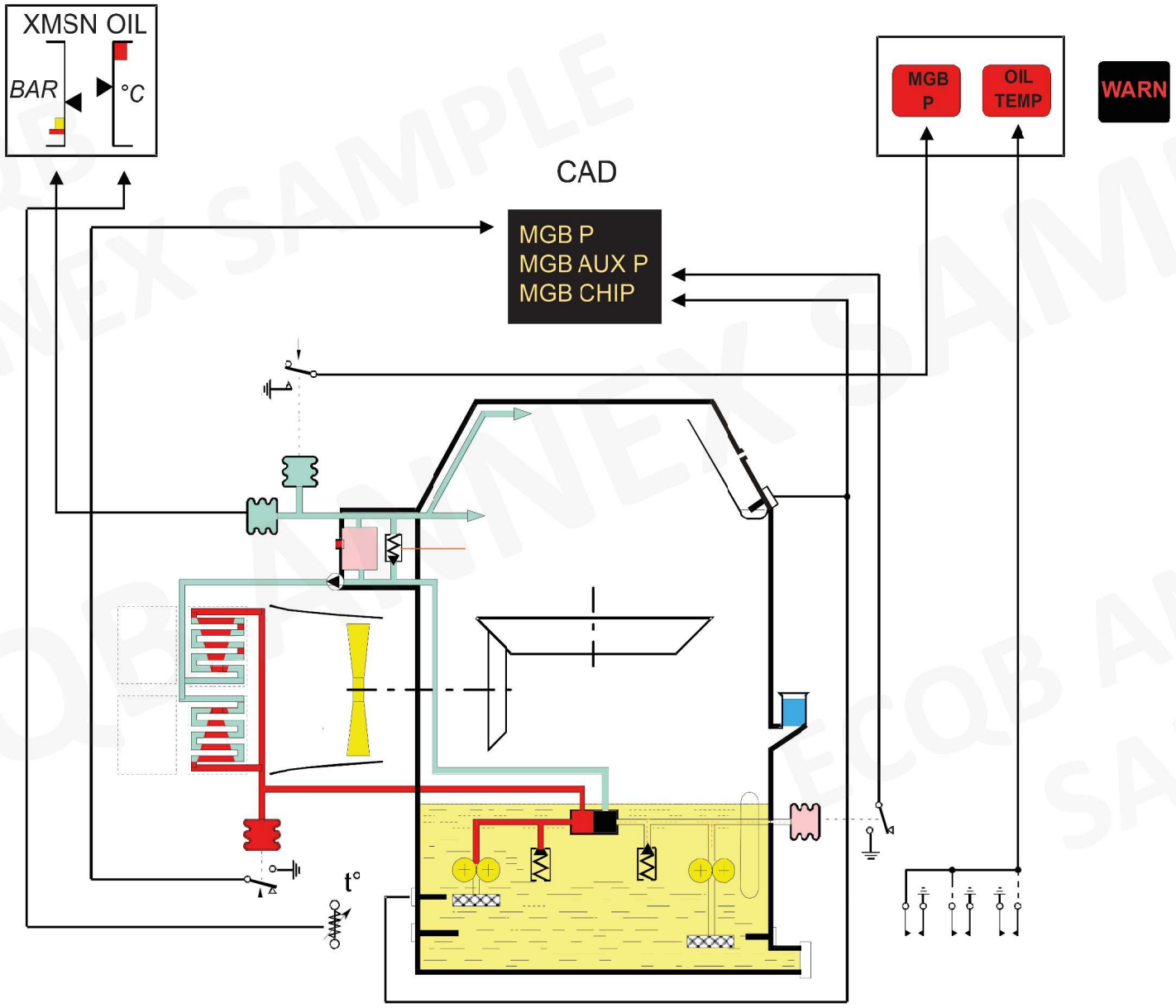
- Subject 021 Aircraft General Knowledge: 1 sample
- Subject 031 Mass & Balance: 9 samples
- Subject 032 Performance (aeroplane): 7 samples (+1 added 2024)
- Subject 033 Flight Planning: 18 samples
- Subject 034 Performance (helicopter): 2 samples (+1 added 2024)
- Subject 061 General Navigation: 1 sample
- Subject 081 Principles of Flight (A): 2 samples (added 2024)
- Subject 090 Communications: 1 sample (added 2024)

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

Cologne, 05/01/2024

[1] Referring to the syllabus of AMC1 FCL.310; FCL.515(b); FCL.615(b) 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

Used e.g. in 021 11 03 08 Helicopter specifics on design, operation, and components for additional systems such as lubrication system



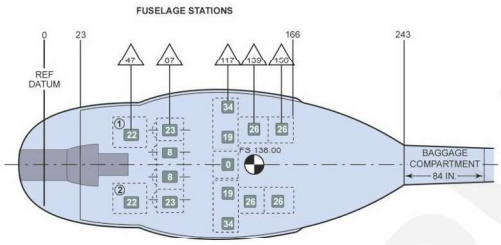
 Used e.g. in 031 05 01 Determination of CG position - methods, 031 05 02 Load & trim sheet/balance schedule and CG envelope

Dropdown Trimsheet

From	To	
Regn	Crew	Date

Index Calculation

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



	Weight	Index
APS Weight & Index Units		
Pilot & Copilot (or Passenger)		
Dry Operating Mass		

28 29 30 31 32 33 34 35 36 37 38 39

1 div = 1 man

Fuel lbs	Tanks		Index
	Normal		
	Small Aux		
	Large Aux		

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

← Negative Units Positive Units →

Operating Weight	

Rear Baggage Compartment			
	Forward		50 lbs →
	Aft		50 lbs →
	Total Baggage		

Row	No of Seats	Total	Weight	
1				100 lbs ←
2				100 lbs ←
Forward Well				500 lbs →
Aft Well				100 lbs →
Total Pax & Weight				

Total Payload

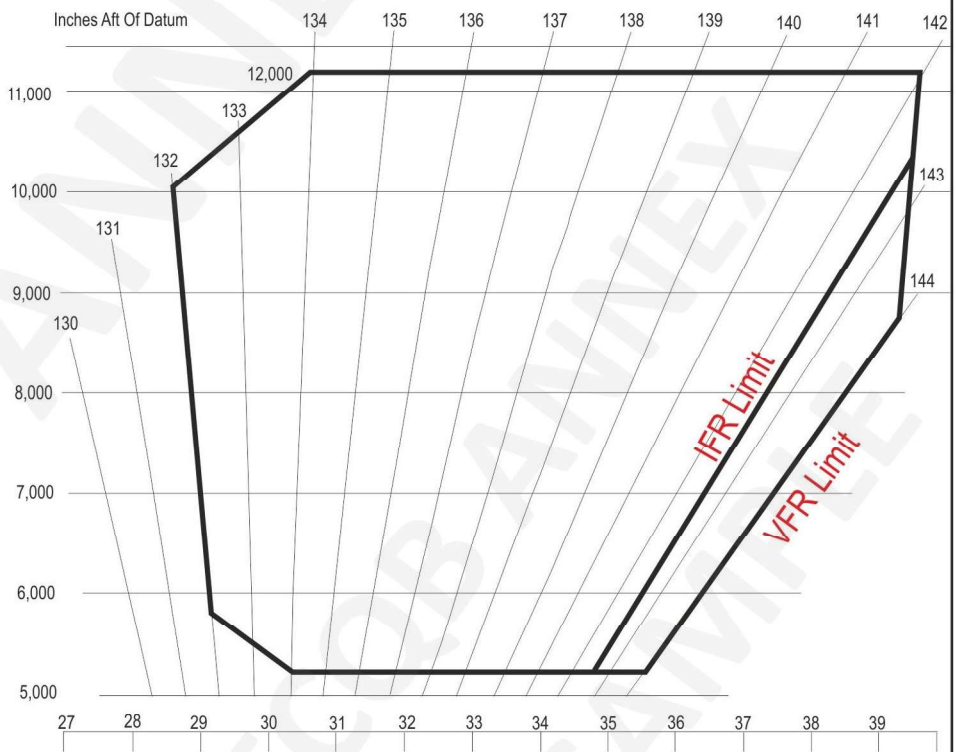
\+

Operating Weight

=

Takeoff Weight

RTOW



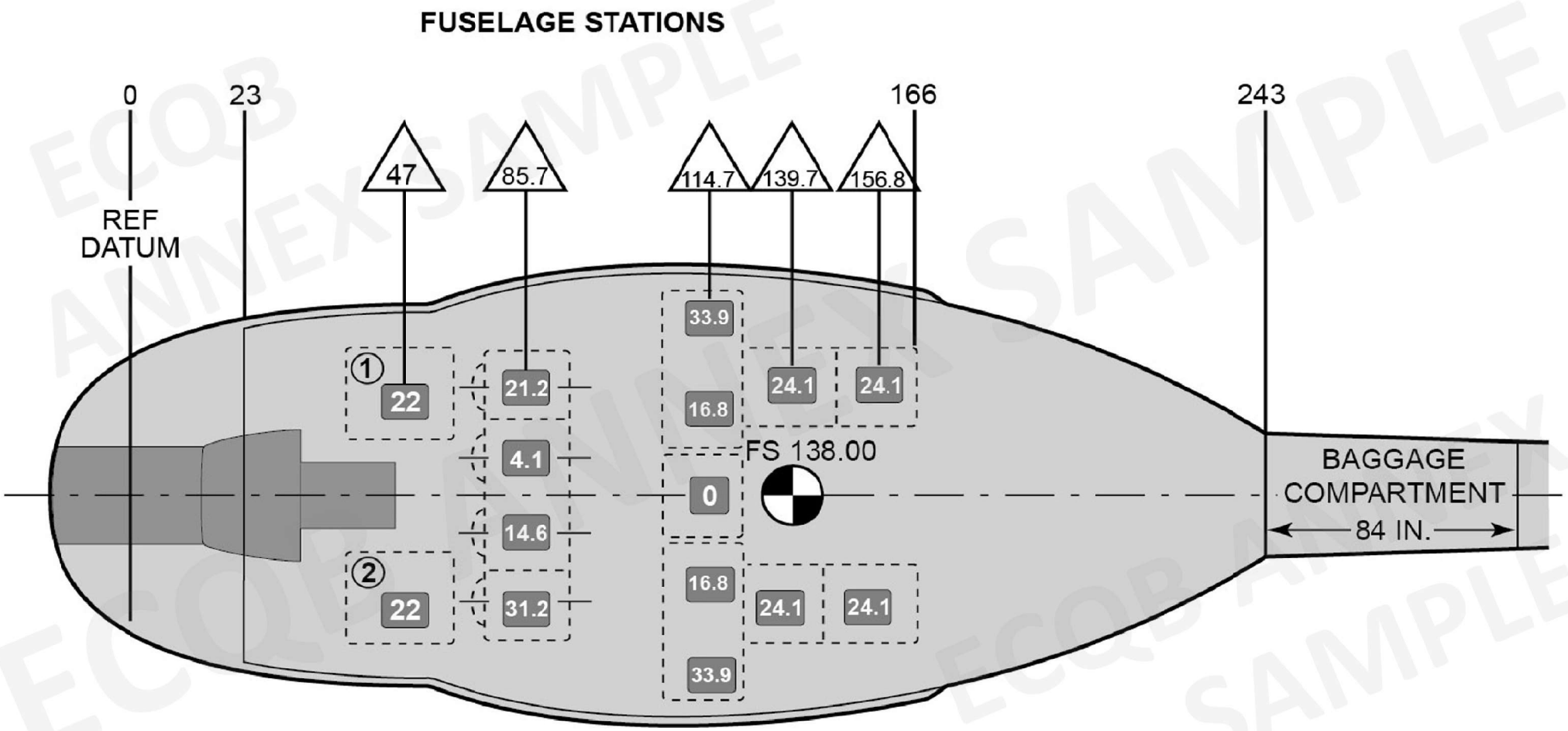
NOTES

When Calculating RTOW Use Actual Weights

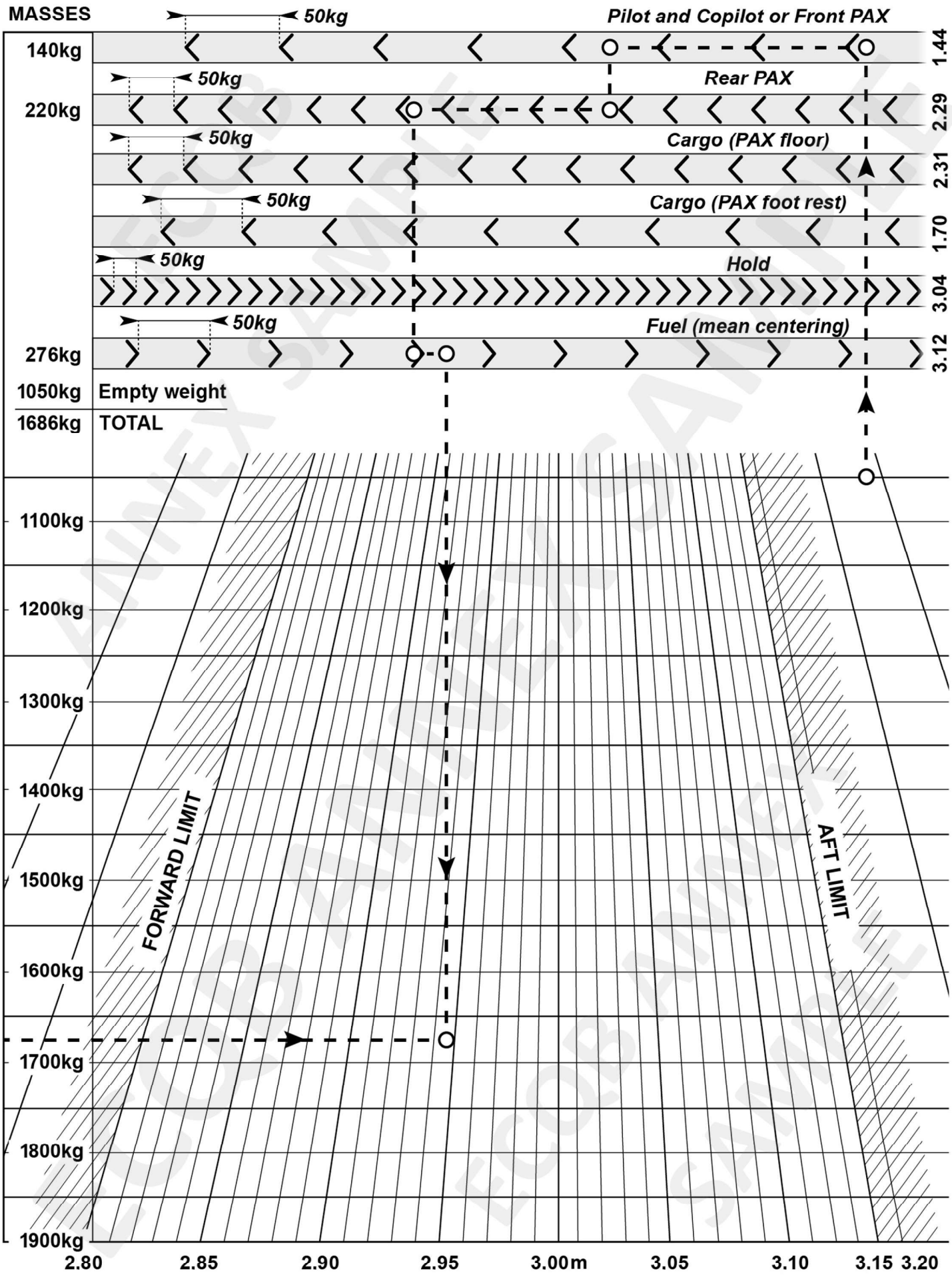
If trim sheet shows final CG to be close to a limit, carry out a mathematical check

Loading Officer's Signature

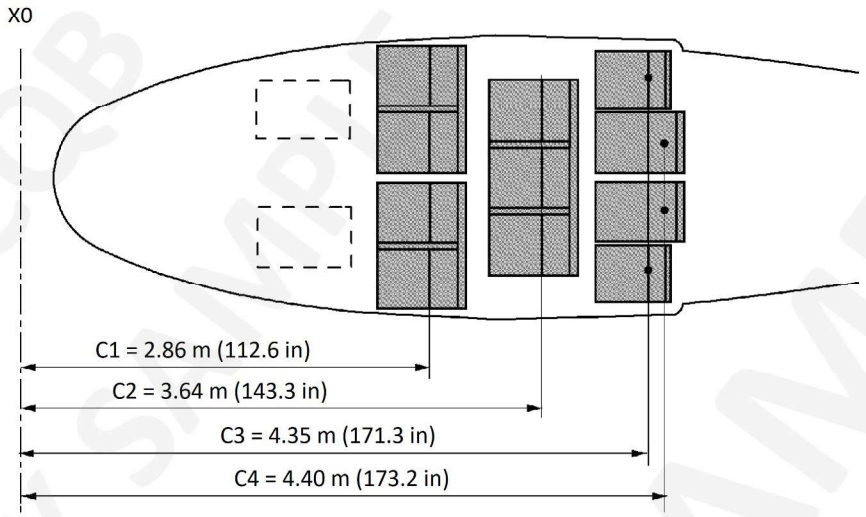
 Used e.g. in 031 04 01 Contents of mass-and-balance documentation



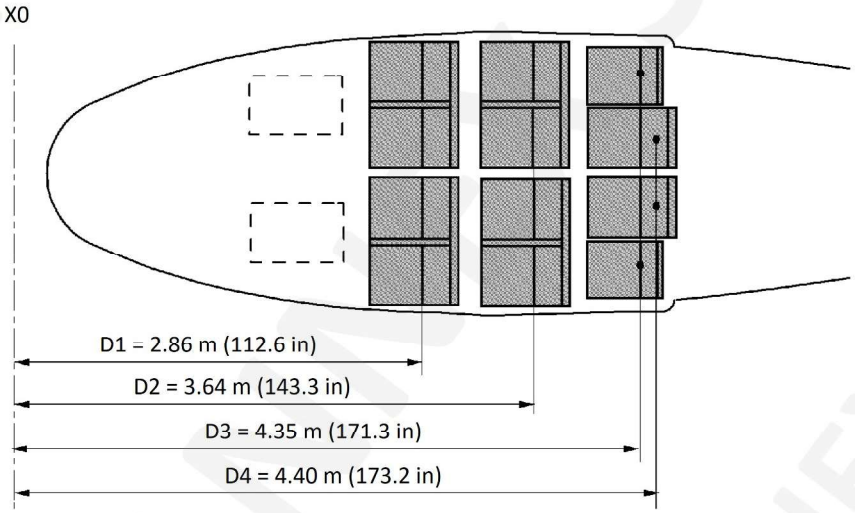
Used e.g. in 031 05 01 02 Graphic method to determine the CG position of an aircraft by using the loading graphs given in sample documents



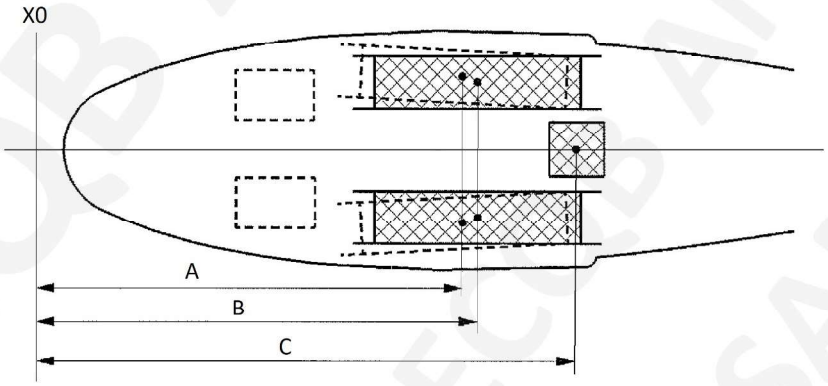
11-SEAT LAYOUT



12-SEAT LAYOUT

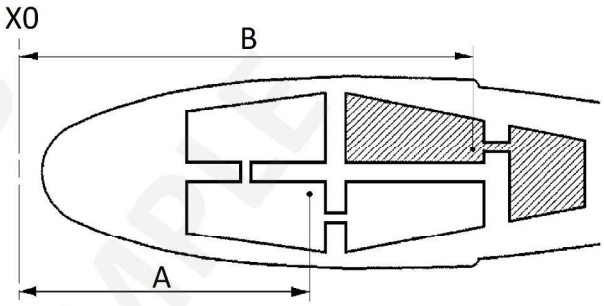


AMBULANCE LAYOUT



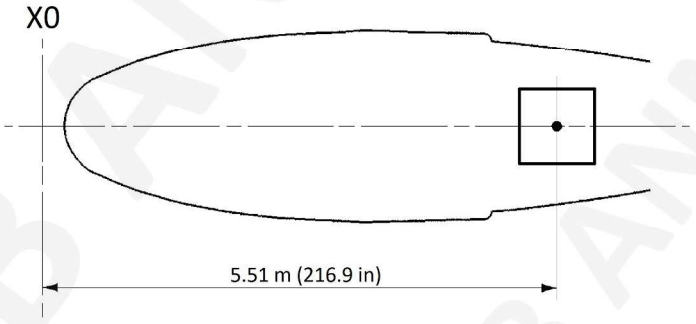
A = 3.50 m (137.8 in) - LOWER STRETCHER(S).
B = 3.60 m (141.7 in) - UPPER STRETCHER(S).
C = 4.38 m (172.4 in) MEDICAL ATTENDANT'S SEAT.

Standard fuel tanks (2 groups)



METRIC SYSTEM			
QUANTITY		MOMENT (m.kg)	
kg	l	GROUP 1 (A)	GROUP 2 (B)
50	63	170	200
75	95	250	310
100	127	328	424
125	158	405	540
150	190	481	658
175	222	558	771
200	253	635	885
225	285	710	1000
250	316	785	1115
275	348	860	1230
300	380	935	1345
325	411	1009	1466
350	443	1085	1590
375	475	1164	1721
400	506	1245	1855
425	538	1330	1990
450	570	1425	2110
453	573	1465	2125
462	585	1517	2180

Optional fuel tank



METRIC SYSTEM		
QUANTITY		MOMENT
kg	l	(m.kg)
50	63	275
75	95	413
100	127	551
125	158	689
142	180	782

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

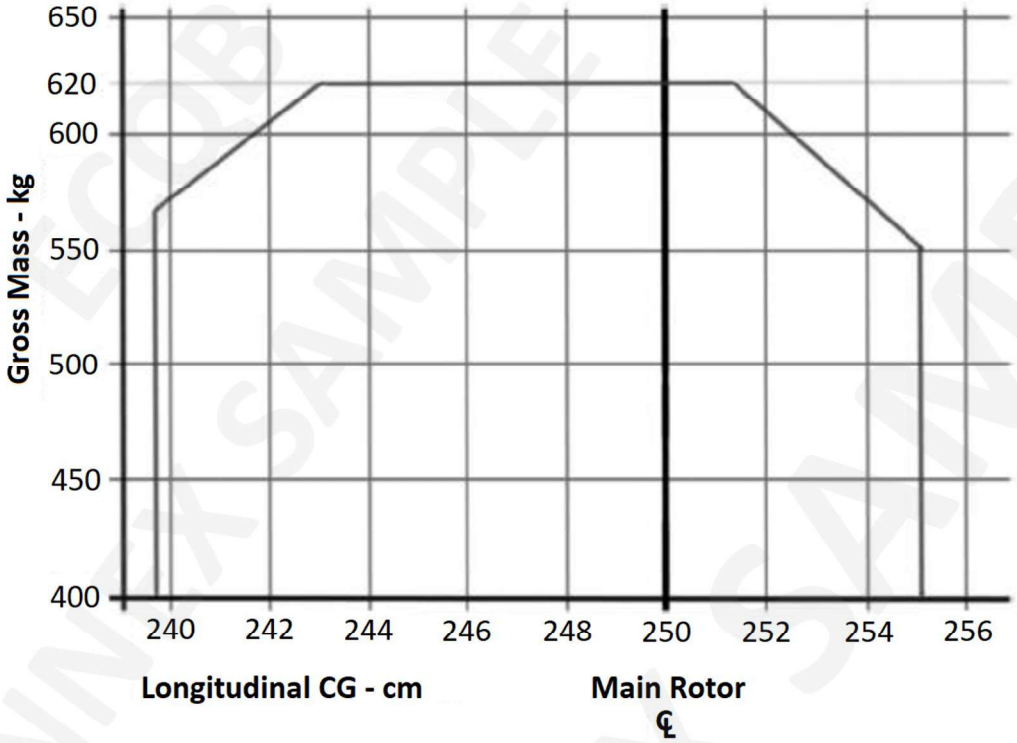
Used e.g. in 031 05 02 02 Load sheet/balance schedule and CG envelope for light aeroplanes and for helicopters

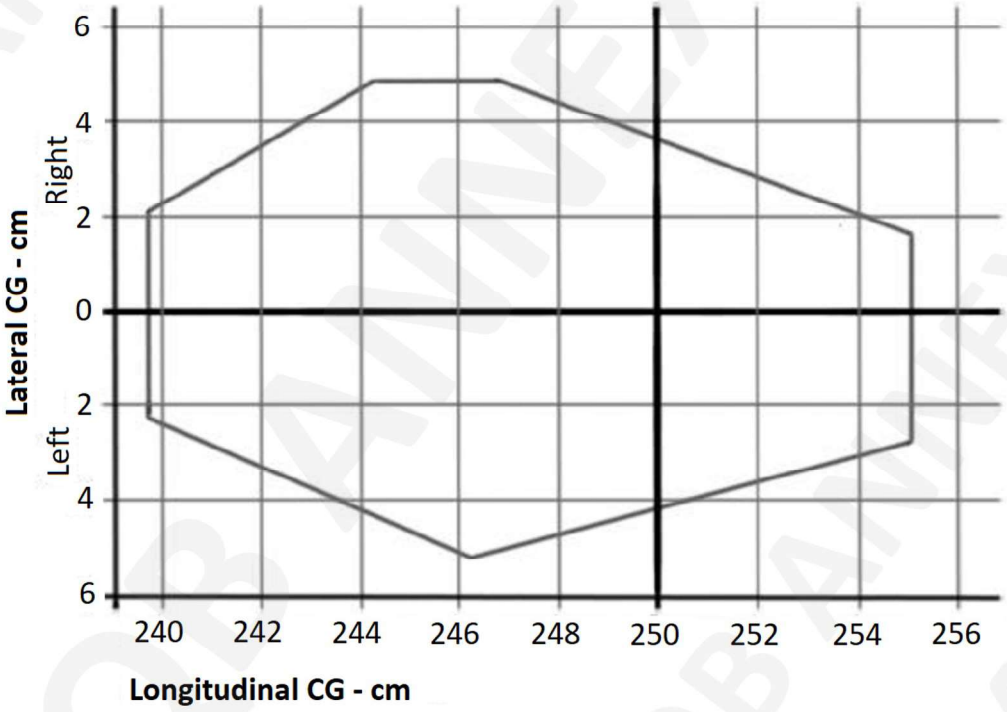
MASS AND BALANCE COMPUTATION FORM

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)			

Used e.g. in 031 04 01 05 Contents of mass-and-balance documentation - Lateral CG limits





Used e.g. in 031 04 03 03 Deviations from standard configuration - Extract values from given documents

DRY OPERATING MASS CONDITIONS	
MASS (1000 KG)	CG (% MAC)
I = [(CG - 20) x M x 0.025] + 100	
DRY OPERATING INDEX	

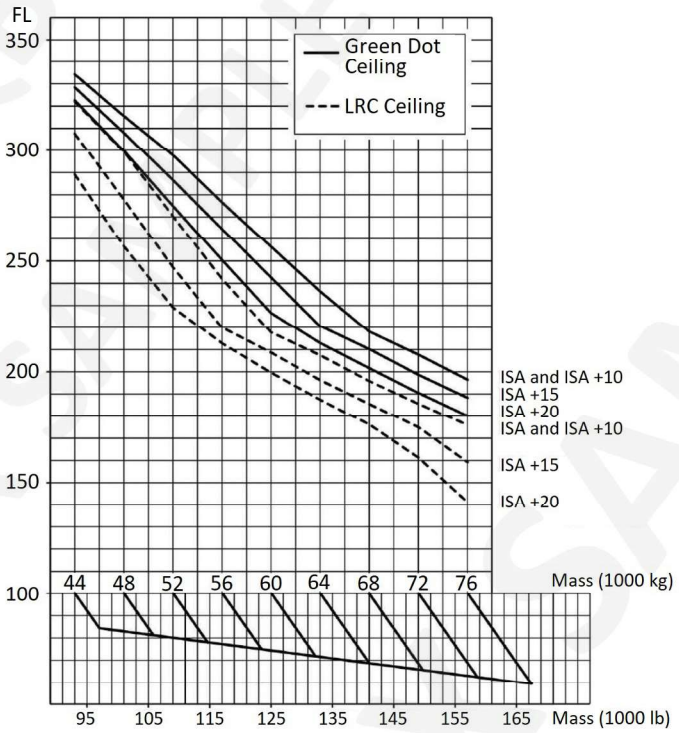
BASIC INDEX CORRECTION			
DRY OPERATING MASS DEVIATION	ZONES		
	E	F	G
+ 100 KG	-0.89	-0.52	+0.91
- 100 KG	+0.89	+0.52	-0.91
INDEX CORRECTION			

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

ONE ENGINE INOPERATIVE MAXIMUM CRUISE ALTITUDE						Cell legend *Cruise altitude* *Anti-Ice OFF*	
	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**

ONE ENGINE OUT

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



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*

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	**OAT (°C)**											
(MJ)	**-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

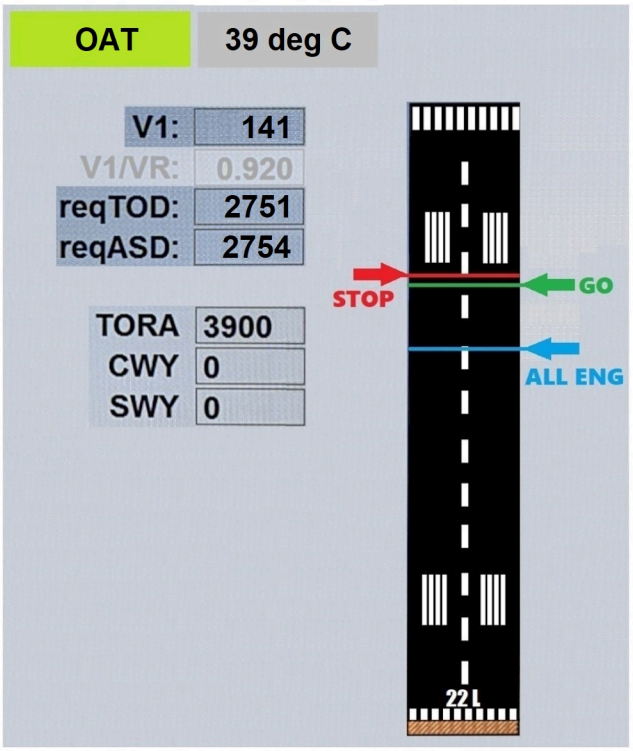
Flap/Slat position setting	1	2	3
Field limit TOM (kg)	58700	60250	60050
Climb limit TOM (kg)	62000	61300	60250
Obstacle limit TOM (kg)	62500	62150	61800

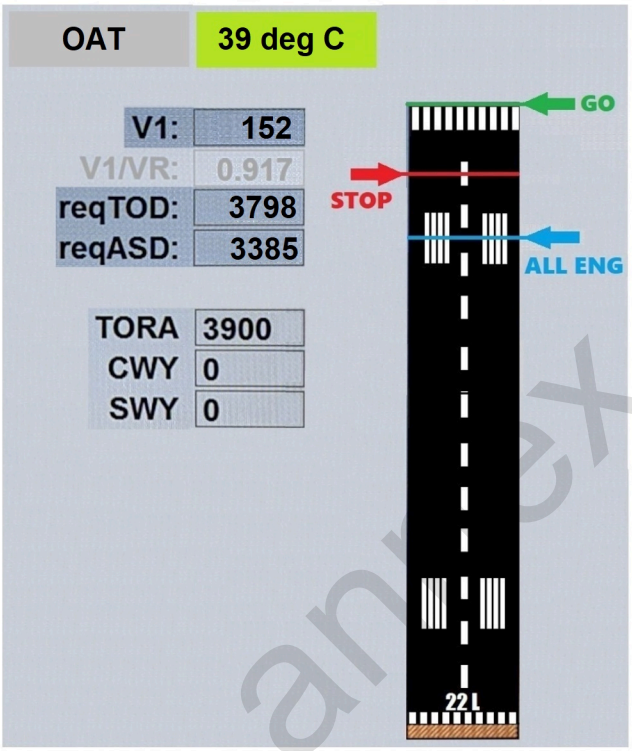
Flap/Slat position setting	1	2
Field limit TOM (kg)	17750	18300
Climb limit TOM (kg)	16500	16200
Obstacle limit TOM (kg)	17750	17400
Structural limit TOM (kg)	18300	18300

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

Used e.g. in 032 04 01 04 CS-25/EU-OPS PERFORMANCE CLASS A – Take-off – Balanced field length concept





OAT: TOGA thrust
39 deg. C: assumed / FLEX temperature thrust
ALL ENG: TOD all engines
GO: TOD engine out
STOP: ASD

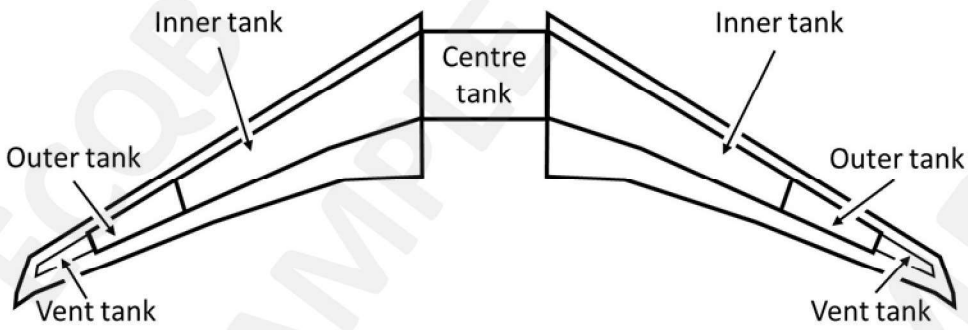
Used in e.g. 033 01 01 00 VFR navigation plan

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

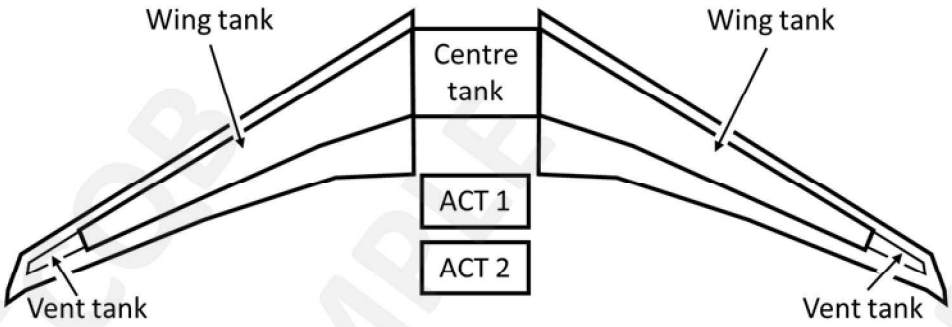
Used e.g. in 033 03 01 Fuel planning – general and in 033 03 02 Pre-flight fuel planning for commercial flights



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*

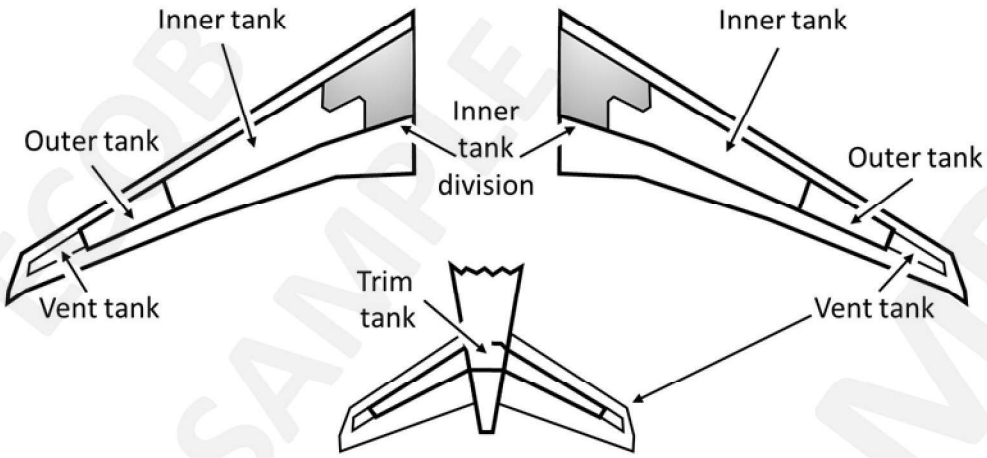
Used in e.g. 033 03 01 00 Fuel planning - general, 033 03 04 00 Pre-flight fuel planning



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*

Used in e.g. 033 03 01 00 Fuel planning - general



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*

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

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 03 02 05 calculation of total fuel and completion of the fuel section of the navigation plan (fuel plan)

Navigation and Fuel Plan

Line	From	To	FL	°C	W/V	Tk °T	Hdg °T	Var	Hdg °M	TAS	GS	Dist	Time	Fuel flow kg/h	Fuel reqd kg
1	A	B	70	1	290/15	295	295	4°E	291	138	123	33	00:16	380	102
2	B	C	70	1	300/15	310	309	4°E	305	138	123	60	00:29	380	184
3	C	D	70	1	300/15	265	269	4°E	265	138	124	86	00:42	380	
4	D	E	70	1	270/15	265	265	4°E	261	138	125	54	00:26	380	
										Trip totals		233			
													Taxi fuel		15
													Contingency fuel		
													Alternate fuel		140
													Final reserve fuel		
													Extra fuel		0
													Total fuel reqd		

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	~~CLB~~ ↗	247°	**120 kt**	*310°* *26 kt*	258°	1°W	259°	**106 kt**	20 NM	**0:11** **0:11**
2	WPT A	WPT B	2500	247°	**120 kt**	*310°* *26 kt*	258°	1°W	259°	**106 kt**	30 NM	**0:17** **0:28**
3	WPT B	WPT C	2500	333°	**120 kt**	*355°* *18 kt*	336°	1°W	337°	**103 kt**	45 NM	**0:26**
4	WPT C	DEST	~~DES~~ ↘	196°	**125 kt**	*335°* *28 kt*	204°	1°W	205°	**145 kt**	20 NM	
5	DEST	ALTN	-	354°	**100 kt**	*335°* *22 kt*	350°	1°W	351°	**79 kt**	40 NM	

Used e.g. in 033 06 02 01 03 Calculate the revised destination/alternate aerodrome landing mass from given latest data

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)			
EXTRA	....	***1077***				
TOF	6094	***7171***				
TAXI	370	....				
BLOCK	6464	***7541***				

CONT SUMMARY			
CONT90 -2		CONT99 3	
ENRT ALTN		----	
CONT CORR		38 /MIN	
MEAN		-6	

WAYPNT / AWY	RTE- MORA	TRK	DIS	M GS	ETO /ATO ETE /TTE	FL	TP	TMP	WIND	EFOB 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	455	0001/0026					
LIMBI		345		787	..../....		37	-57	238/009	4.2
UP603	20		0028	453	0004/0030					
GREFI		342		787	..../....		37	-57	243/011	4.0
P603	20		0049	453	0006/0036					
GARKA		354		786	..../....		37	-58	240/013	3.8
P603	20		0010	453	0002/0038					
BUSOM		003		786	..../....		37	-58	239/013	3.7
P603	20		0026	455	0003/0041					***4.6***
NAMIK		004		786	..../....		37	-58	238/013	3.6
P603	20		0037	457	0005/0046					
KARLI		002		786	..../....		38	-58	234/015	3.4
UP603	20		0038	457	0005/0051					
RIRUT		002		786	..../....		38	-59	231/017	3.2
UP603	34		0030	459	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	TAXI: Taxi Fuel
BLOCK: Block Fuel	TOF: Take-Off Fuel
EFOB: Estimated Fuel On Board	TOW: Take-Off Weight
EXTRA: Extra Fuel	ZFW: Zero Fuel Weight
LAW: Landing 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

Based on 280/0.78 climb, Long Range Cruise, and 0.78/280/250 descent.

Used e.g. in 033 03 02 01 Pre-flight fuel planning for commercial flights - Taxi fuel

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	100 kt	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 03 03 02 Specific fuel-calculation procedures - Isolated aerodrome or heliport procedure

DESTINATION VIA PISPU

FUEL	ARPT	FUEL	TIME
TRIP	GVAC	15768	0533
CONT 3 %	GCTS	473	0010
ALTN		0	0000
FINRES		.....	.....
ADDFU PDP		.....	.....
MIN T/O FUEL		.....	.....
TAXI		240	0020
MIN BLOCK FUEL			
BLOCK FUEL		.....	.....
EXTRA		.....	.....
TOTAL FUEL		.....	.....

DESTINATION ALTERNATE VIA PISPU

FUEL	ARPT	FUEL	TIME
TRIP	GCTS	22073	0747
CONT 3 %	GQNO	662	0014
ALTN		0	0000
FINRES		.....	.....
ADDFU PDP		.....	.....
MIN T/O FUEL		.....	.....
TAXI		240	0020
MIN BLOCK FUEL			
BLOCK FUEL		.....	.....
EXTRA		.....	.....
TOTAL FUEL		.....	.....

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

Used e.g. in 033 06 01 01 Monitoring of track and time and 033 06 01 02 06 In-flight fuel management

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	1943				
ADDFU		0	0000		.....	.....
BLOCK FUEL		19433	0658		.....	.....
EXTRA		.....	.....	POSS EXTRA 3226C	.....	.....
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

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

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		
TARGET	03.43	8367 KG		
BLOCK FUEL	.....	8965 KG		

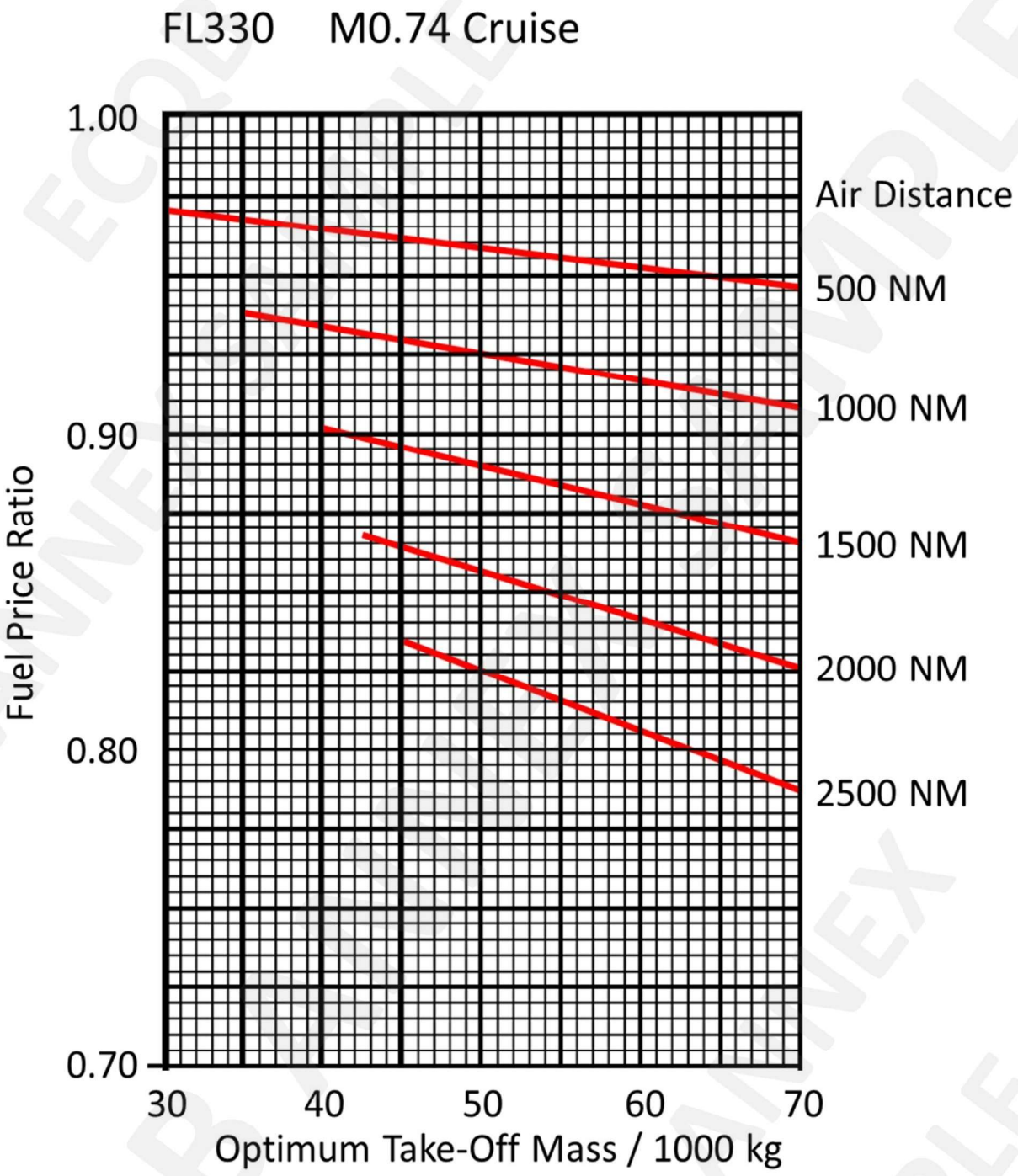
2000 FT ABOVE TRIP MS 16 / TIME 02.21
2000 FT BELOW TRIP PS 100 / TIME 02.21
WEIGHT CHANGE PER 1000 KG 94 KG TO TOTAL FUEL
FUEL CARRIAGE COST: 49 US DOLLARS PER 1000 KG

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

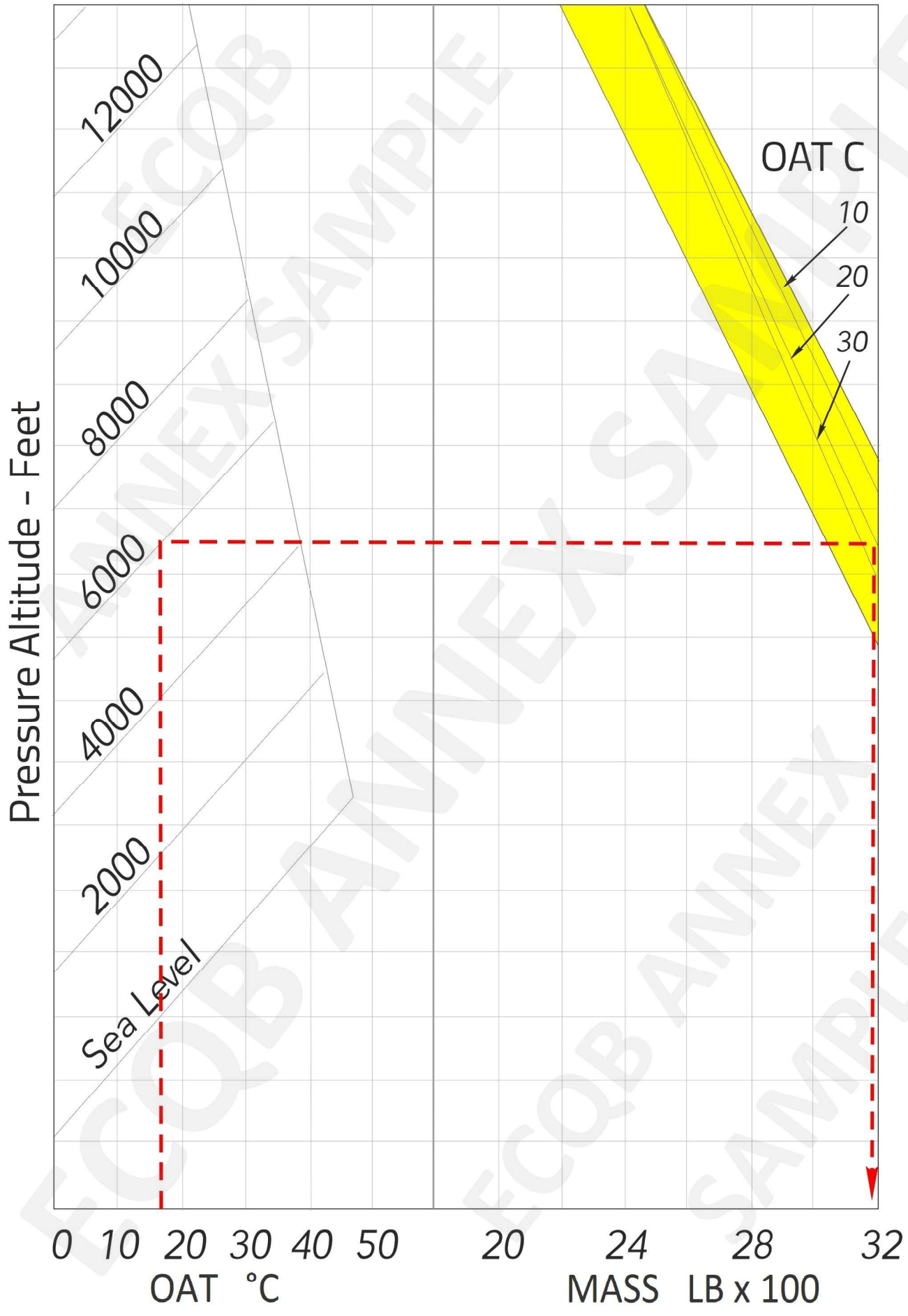
Legends:
- TM: Time to waypoint
- ETO: Estimated time overhead (HHMM or MM)
- ATO: Actual time overhead (MM or HHMM)
- DST: Distance to waypoint (NM)
- MF REQD: Minimum fuel required (KG)
- AREM: Actual fuel remaining (KG)

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	

Used e.g. in 033 03 03 04 02 Specific fuel-calculation procedures - Fuel-tankering

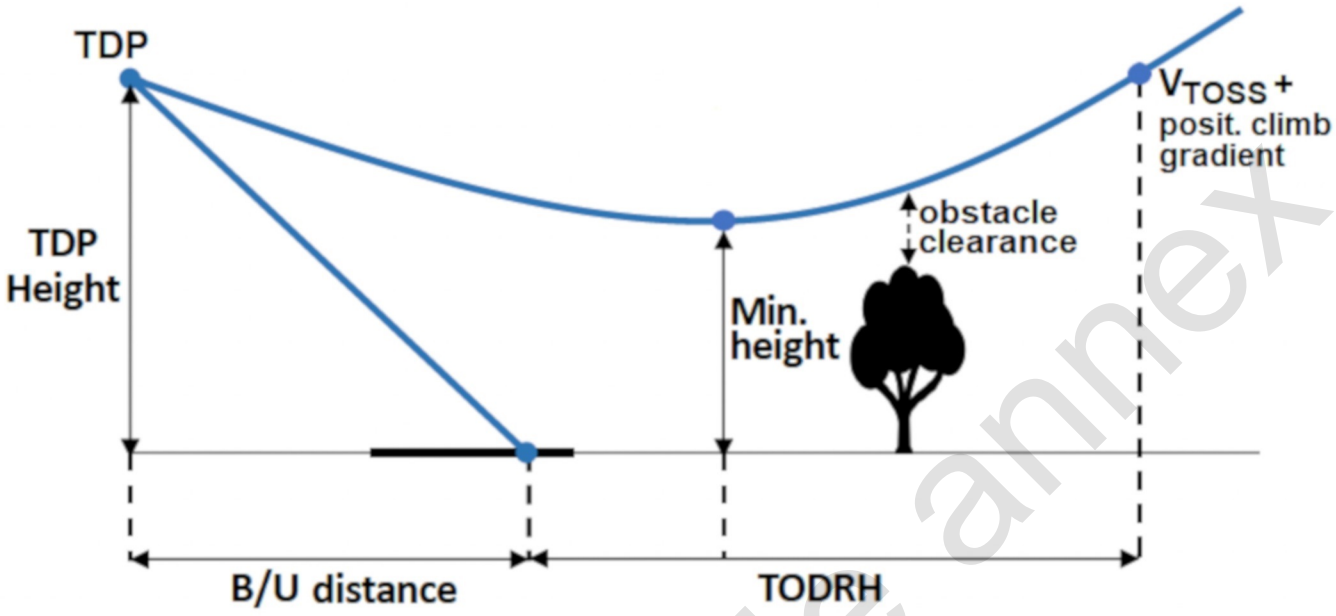


Used e.g. in 034 02 04 01 02 SINGLE-ENGINE HELICOPTERS - Use of helicopter performance data
Take-off (including hover) - Find the maximum allowed take-off mass for certain conditions



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				

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	

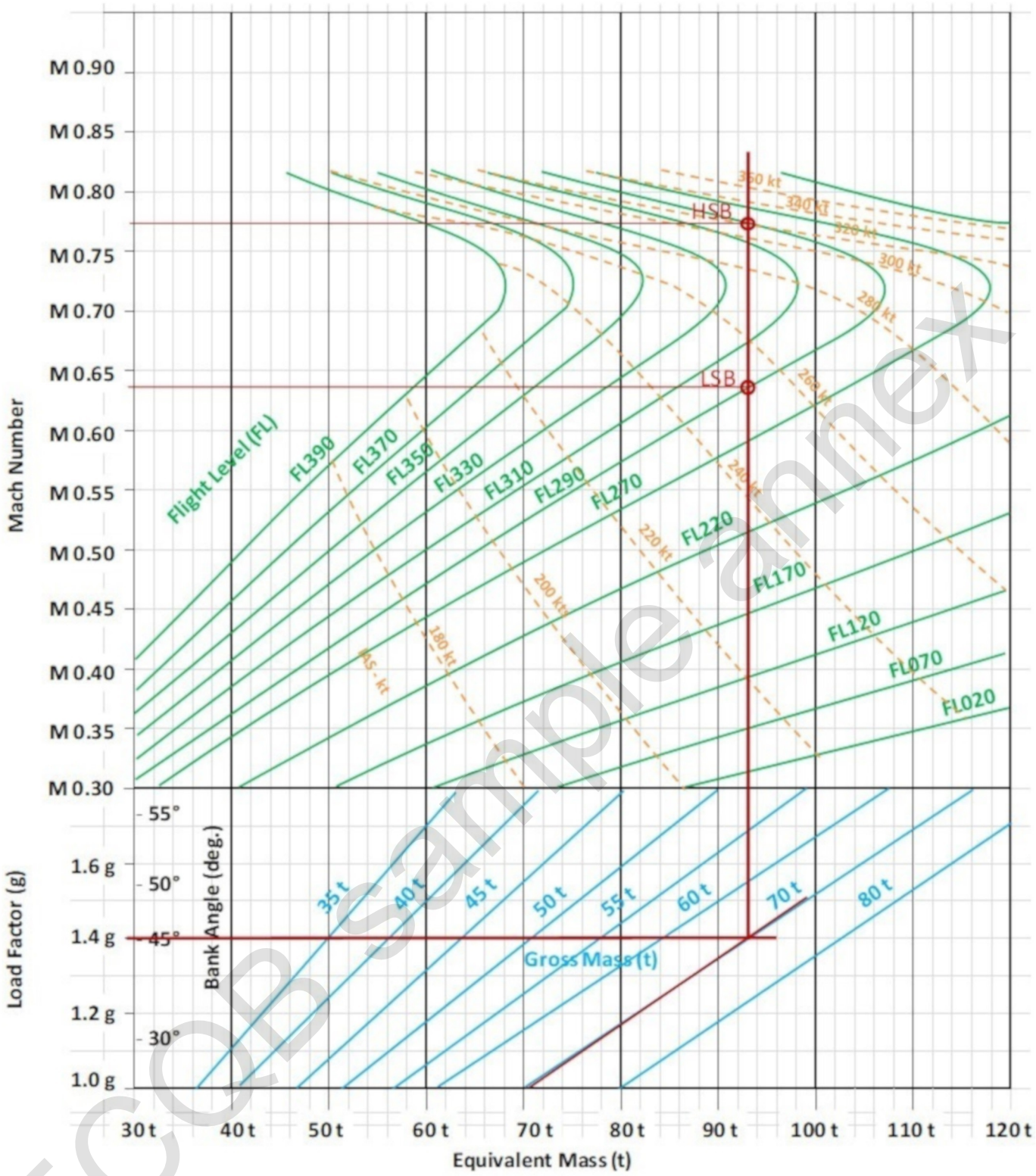
From	To	FL/Alt	TAS [kt]	Track (M)	Hdg (M)	GS [kt]	Distance [NM]	Time [minutes]	ETO	ATO	Plan Fuel	Min Fuel	Fuel check	Notes
A	TOC	Climb	145	47	58	121	48	24	*08:15*	*08:12*	460	422	*474*	
TOC	B	FL90	190	47	55	167	65	23	*08:38*	*08:34*	414	376	*472*	
B	C	FL90	190	47	55	167	43	15	*08:53*	*08:48*	383	345	*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		

Used e.g. in 081 03 02 02 Shock stall - buffet onset

Situation 1

Situation 2

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



Example:	Gross mass = 70 t	Results:
	Load factor = 1.4 g	High speed buffet boundary (HSB) = M 0.775
	Fligh Level= FL290	Low speed buffet boundary (LSB) = M 0.64

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