

# The „little virtual dive computer museum“ 2026, Part IV:

Altitude Challenge with a  
Gradient Factor (GF = 0.8)

## Methods (1):

We simulated only one of our notorious test-profiles on air, a simple box-profile during an intercontinental flight, i.e.: only one pressure step to BD, constant for the complete BT.

- 30 m bottom depth (BD) / 30 min bottom time (BT)
- along only one symmetrical GF setting (GF High = GF Low = 0.8)
- and compared to GF = 1.00, i.e. the original ZH-86 altitude table [\[65\]](#) and:
- a simulated ZH-86 with this GF & an according reduced ambient pressure

with the following 3 diver-carried computers (pls. cf. slide #5):

→ top: SCUBAPRO / UWATEC G2 TEK, HW-Ver. & SW-Ver.: 1.0  
ID: 7500005522

→ left: SHEARWATER PERDIX AI, firmware: 102/BT13, hardware: SA-02A  
S/N: 201370DF

→ right: RATIO / DIVE Industries srl iX3M 2 Deep, firmware: 5.2.9.2 / 016,  
S/N: 73083

## Methods (2):

With these starting conditions in a commercial airplane, i.e. at a reduced ambient pressure of ca. 0.78 bar, similar to altitude-diving @ ca. 2.200 m above Sea Level (aSL), we configured all 3 boxes to:

- fresh water
- breathing mix: Air (21/79)
- ZH-L 16 C where possible
- the Gradient Factors: GF High = 0.8, GF Low = 0.8
- and then BD 30 m, BT 30 min into the computers inter-active dive planning tools (# 6 & 7).

The results have been tabulated and compared against each other at 30 min and also at 60 min into the flight. As a benchmark we used the altitude table for air-dives from A.A. Bühlmann and also a simulated ZH-86 table, derived from a fully compliant ZH-L16 C ( $\Delta$ ) desktop software product (# 15).

The ZH-86 „table“ has to be simulated, as the original printed tables have, in TEC-lingo, „a GF of 1.00, i.e. 100 %“.

## Methods (3):

(Δ):

„fully compliant“ implies, here in this context:

that a desktop decompression software should use:

- the ZH-L 16 **C** coefficient set, and
- the respective compartment half-times *as published [65], p. 158*, and:  
the possibility of parametrizing:
  - GF High & GF Low separately
  - fractions of the used gases to the 2nd. decimal
  - instantaneous descent ([65], p. 165)
  - the Bühlmann safety-factor (pls. cf. [65], p. 165!)
  - the water density and temperature ([65], p. 165)
  - the respiratory coefficient ([65], p. 90)
  - the ascent speed ([65], pp. 225 - 228)
  - the surface air pressure @ start or end of dive

to be configured according to [65] to obtain a transparent comparability and a well-defined base-line to the ZH-86 table entries,  
i.e.: GF High = GF Low = 1.00 or 100% of the original a-/b-coefficients.

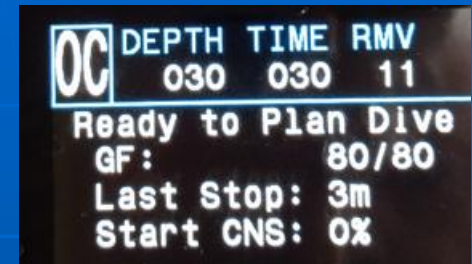
# Altitude Challenge with GF = 0.8 (in commercial airplane)

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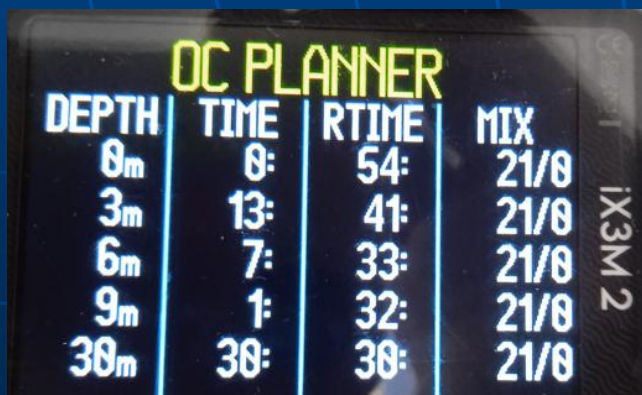
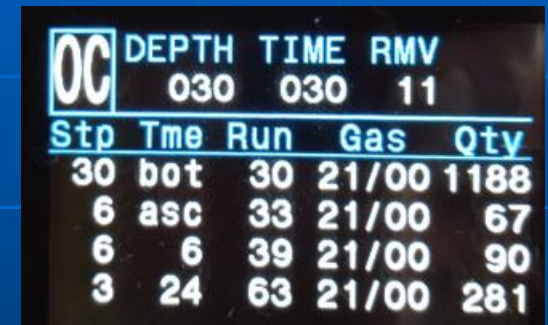


# Altitude Challenge with GF = 0.8

(in commercial airplane) simulated box-profile  
BD 30 m, BT 30 min, after 30 min into the flight:

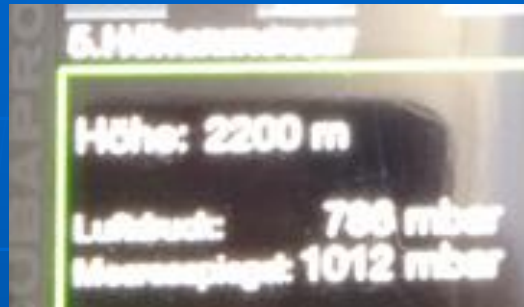


Computer	1st. stop [m] / stop time [min]	TTS [min]
G2 Tek	6 / 4	39
Perdix	6 / 6	33
iX3M 2	9 / 1	24



# Altitude Challenge with GF = 0.8

(in commercial airplane) simulated box-profile  
BD 30 m, BT 30 min, after 60 min into the flight:



Computer	1st. stop [m] / stop time [min]	TTS [min]
G2 Tek	6 / 4	36
Perdix	6 / 6	31
iX3M 2	9 / 1	24



# Altitude Challenge with GF = 0.8 (in commercial airplane)

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This test is in parts a repetition of three of our presentations:

[1] Comparison of one Gradient Factor setting in three dive computers  
(TR 2026 04) (01.06.2026)

<https://doi.org/10.13140/RG.2.2.23084.83846>

[2] On the reliability of dive computer generated run-times; Part XV:  
Altitude Challenge and Gradient Factors  
(10.01.2025)

<https://dx.doi.org/10.13140/RG.2.2.29891.11041>

but motivated because the PERDIX and iX3M 2 got new firmware releases in 1st. Q 2026.

# Altitude Challenge with GF = 0.8 (in commercial airplane)



The time steps of 30 & 60 min served to check for the desaturation of the 16 theoretical compartments from the ZH-L 16 system: by starting from SL these are super-saturated with a ca.  $pN_2$  of  $1.013 * 0.77 = 0.78$  bar in comparison to the reduced  $pN_2$  in the airplane cabin with ca.  $0.8 * 0.77 = 0.61$  bar.

The theoretical boundary conditions for these calculations are detailed from

Lufthansa resp.  
Beat Müller,  
evaluated  
for the then  
Deco-Brain ® P II-2  
dive computer.

Situation	cabin pressure	equivalent cabine altitude	equivalent cabine altitude
	(bar)	(m a.s.l.)	(ft a.s.l.)
normal flight	0.77	2'300	7'546
max. tolerated technical deviation	0.60	4'250	13'944
max. single failure	0.55	4'800	15'748
triggering of masks	0.54	5'000	16'404
Asumption for table calculations	0.58-0.60	4'400	14'436

(data as of 1986 by Lufthansa)

# Altitude Challenge with GF = 0.8 (in commercial airplane)

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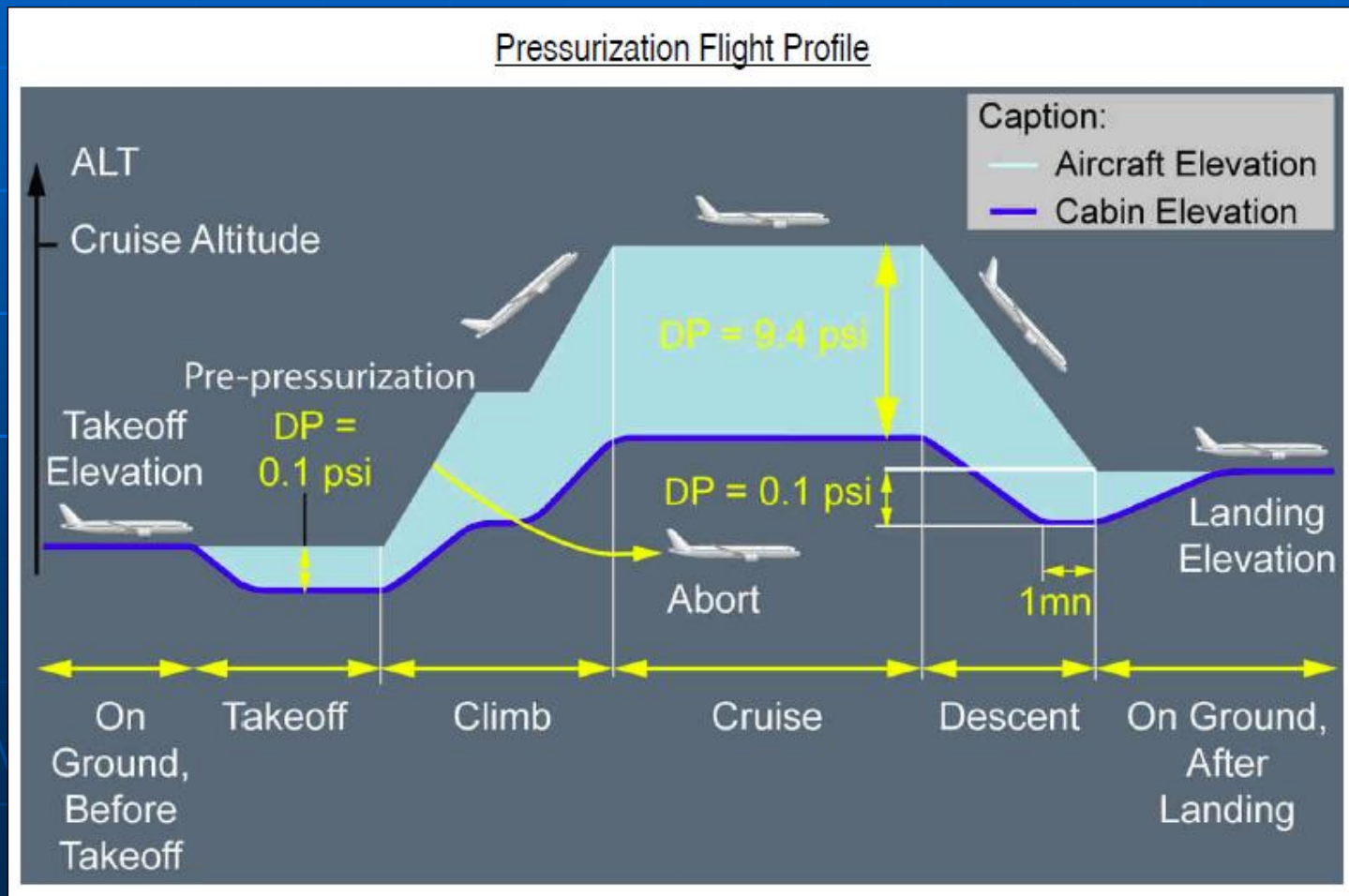
The actual cabin pressures during cruise, taken in the cockpit of a commercial airplane on various flights MUC/FRA ↔ TLV:

LH 671:  
 $\Delta p = 7.9 \text{ psi}$   
cabin altitude: 7250 ft  
02/28/19, ~ 18.30 IL time



# Altitude Challenge with GF = 0.8 (in commercial airplane)

As soon as the airplane's cabin door is locked and the passengers could hear „Boarding completed“ the pressure reduction starts and triggers the dive computers: the airplane still on the runway. The DP is a „delta pressure“ of max. 9.4 psi (= ca. 0.7 bar), the actual values on the next slide.



# Altitude Challenge with GF = 0.8 (in commercial airplane)

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For a direct comparison with the printed ZH-86 altitude table an adaption time of 60 min to the reduced ambient pressure is required.

This is also simulated in the DIVE software as a SI (surface intervall) @ the corresponding, reduced ambient pressures.

# Altitude Table for air-diving from ZH-86 (\*):

Tabelle 32 (Fortsetzung) B. 701–2500 m ü. NN. Aufstieg zur Höhe 60 min oder länger

Tiefe [m]	Grundzeit [min]	Aufstieg zum 1. Halt [min]	Haltezeiten [m] [min]					Gesamtaufstiegszeit [min]	Repetitivgruppe
			12	9	6	4	2		
30	15	3					1	4	D
	20	3					3	6	E
	25	3				2	6	11	F
	30	3			1	4	11	19	G
	35	3			2	7	15	27	G
	40	2		1	5	10	20	38	G
	45	2		2	6	12	23	45	G

**(\*) Source: A. A. Bühlmann [65], p. 230:**

valid for 701 – 2,500 m aSL, fits to measured cabin pressure;  
adaption time to reduced ambient pressure:

60 min or longer;

stop depths: 6, 4 and 2 m;

Ascent speed:  $(30 - 6) \text{ m} / 3 \text{ min} = 8 \text{ m/min}$ ;

(published: 10 m/min, but obviously not used as such).

# Simulated Altitude Table with DIVE Version 3 11:

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D3\_11 - [Graphic1]

```
deco prognosis:
  6m stop  prognosis deco time:      2.0  comp.#:  3
  3m stop  prognosis deco time:     14.0  comp.#:  6
TTS =     19.0 min      0:19.0 (hrs:min)
deco prognosis with gradient factors:  GF HI=  0.8000 GF LO=  0.8000
  6m stop  prognosis deco time:      6.0  GF =  0.8000  comp.#:  4
  3m stop  prognosis deco time:     23.0  GF =  0.8000  comp.#:  7
TTS =     32.00 min      0:32.0 (hrs:min)
what next?
```

The median of the allowed surface pressure for 701 – 2,500 m aSL  
ca. 0.86 bar, ascent speed 8 m/min, fresh water,  
surface interval @ 0.86 bar ca. 60 min,  $R_q = 1.0$

Top lines:

without GF, i.e.  $GF = 1.00$ : the TTS = 19 min matches the ZH-86  
tabulated entry on slide #13.

Bottom lines:

with  $GF\ High = 0.8$ ,  $GF\ Low = 0.8$ , at least TTS  $\geq 32$  min.

# Altitude Challenge with GF = 0.8 (in commercial airplane) Synopsis & Conclusions:

Computer / Table	1st. stop [m] / stop time [min]	TTS [min]	slide # & rem.
ZH-86	6 / 1	19	13, original table (GF = 1.0)
ZH-86	6 / 6	32	14, simulation with GF = 0.8
G2 Tek	6 / 4	36	7
Perdix	6 / 6	31	7
iX3M 2	9 / 1	24	7

As also per [1], [2] & [3] and all the references therein, we have very similar and quite comparable results:

- ➔ the G2 TEK & the Perdix are following closely, the different ascent speeds visible,
- ➔ the iX3M 2 falls short of at least 8 min TTS, which is substantial, i.e.: ca. 25 %, for this schedule! This even more so: the adaption phase is obviously not properly adressed. Also the %CNS (NOAA Ox-Tox dose) is with 4 short of 50 %(!) to the 6 from both the G2 TEK and the PERDIX! (and, btw., also from DIVE 3\_11 ...)

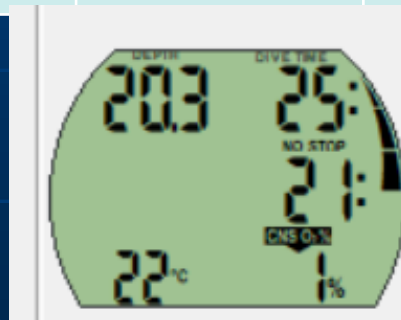
During one real dive @ SL, ca. 25 min @ ca. 20 m, we have the following with the GF = 0.8:



Computer	displayed depth [m]	displayed „NDL“ [min]	displayed stop time @ 3m [min]
G2 Tek	20.2	-	1
iX3M 2	20.3	3	-
Perdix	20.4	4	-
Aladin (*)	20.3	21	-



(\*) Aladin TEC 2G without any GF



## Altitude Challenge with GF = 0.8

### Final Remark:

Some time ago, in winter last year, we stated in [3], that:  
a Gradient Factor of 93%, i.e.:  
a GF = 0.93 is not equal a GF = 0.93!!!

And now we can conclude for a GF = 0.8:  
... apparently, it isn't either ...

**[3] On the reliability of dive computer generated run-times;  
Part XVII: GF = 0.93 is not equal GF = 0.93! (11.11.2025)**

<https://doi.org/10.13140/RG.2.2.17175.84643>