

Ascents from 100 ft (30.5m) Dives on Trimix 30/30

Comparison of V-Planner VPM-B to GAP RGBM + GF

•This compilation demonstrates that at 100 ft, VPM-B decompressions are generally more aggressive than RGBM and GF. Nonetheless, at conservatism (4), VPM-B is comparable to both RGBM and GF.

Organization

- NOTES and CONCLUSIONS
 - pages 2 – 5
- SECTION 1 VPM-B at Nominal Conservatism
 - pages 6- 14
- SECTION 2 VPM-B at Level 2 Conservatism
 - pages 15- 23
- SECTION 3 VPM-B at Level 4 Conservatism
 - pages 24- 32

Notations and Conventions

•ALL CONCLUSIONS and GENERALIZATIONS PERTAIN ONLY to the SPECIFIC DEPTHS, GAS MIXTURES, and PROGRAM SETTINGS CONSIDERED in this DOCUMENT

Profiles

- 12 profiles of 100 ft on Trimix 30/30 back gas, with bottom time ranging from 10-120 min are modeled, with deco using Trimix 30/30 and O₂.
- Total of 72 VPM-B models = 12-profiles x 3-conservatism levels x 2 deco gas combinations (Trimix 30/30, Trimix 30/30 + O₂).
- Correlations of RGBM and GF to 72 VPM-B models = 12-profiles x 3 different conservatism settings x 2 deco gas combinations.
- All ascents at 33 ft/min. No breaks included from O₂ Exposure. All descents on back gas at 100 ft/min.

Plots

- Gas mixtures denoted as percents in braces: {%O₂, %He, %N₂}
 - Trimix 30/30 is then: {30,30,40}
- Three types of plots are shown that correlate VPM-B to RGBM and GF:
 - RGBM and GF vs. VPM Total Ascent Times (pages: 11, 12, 20, 21,29, 30)
 - Overlaid stair-step profiles (pages: 7, 9, 16, 18, 25, 27)
 - RGBM, and GF Stop-times vs. VPM-B stop-times (pages: 8, 10, 17, 19, 26, 28)
- Diagonal lines in plots are *NOT* fitted correlations –they are just indications of 1:1 correlation to guide your eyes.
 - Points that lie above the lines denote longer GF and RGBM times, while points below the lines indicate longer VPM-B times.
- I use Imperial American units and conventions. cf == cubic feet (volume). 1 cf = 28.23 liters. In the USA, tank capacities are discussed in terms of the volume of gas that is contained at the maximum rated pressure. psi == pounds per square inch (pressure).

V-Planner and GAP Software Settings

- Ascents calculated by GAP RGBM v2.1.3 (Aug, 2003 Edition) and V-Planner (VPM-B) v3.22.
- VPM conservatisms are denoted: Nominal as VPM-B (N), Level 2 as VPM-B (2), and Level 4 as VPM-B (4).
- RGBM and GF run at nominal GAP conservatisms. VPM-B run at nominal (N), (2), and (4) conservatisms.

Discussion of Correlation Plots for VPM-B to RGBM and GF Total Ascent Times (TATs)

VPM-B TATs Are Much More Aggressive than RGBM and GF

General Notes

- VPM-B stop times on Trimix 30/30 are very similar to stop times for comparable dives on Nitrox 32 . RGBM stop times for comparable dives are are somewhat longer on Trimix 30/30 compared to Nitrox 32.

- All data include time to 1st stop at ascent rate of 33 ft/min.

- TATs are closely related to comparative surfacing gradients for VPM-B, RGBM, and GF because all three ascent methods employ similar stage depths. Therefore, roughly speaking, a longer TAT implies a more conservative schedule.

RGBM vs. VPM-B (pages 11, 20, and 29)

- VPM-B(N) TATs are about ½ RGBM TATs –this large difference is partially related to the very conservative schedules RGBM produced for air and nitrox at 100 ft (see air and nitrox slides). Additionally, it appears that RGBM treats He more conservatively than VPM.

- VPM-B (2) also yields substantially shorter TATs than RGBM. VPM-B(4) is comparable to RGBM for bottom times up to 120 min.

GF vs. VPM-B (pages 12, 21, and 30)

- VPM-B(N) and (2) TATs are much shorter than GF TATs, with VPM-B becoming comparatively more aggressive for longer bottom times.

- VPM-B(4) TATs are close to GF for dives less than 60 min.

Discussion of Correlation Plots of VPM-B to RGBM and GF Stop Times

General Notes

- The plots on pages 8, 10, 17, 19, 26, and 28 directly compare stop time vs. stop time for two different deco methods. They avoid the offsets that occur on the conventional stair-step depth vs. run-time plots of the same data, which are shown on pages 7, 9, 16, 18, 25, and 27.
- Data points are plots of the (x,y) pair: (VPM-B stop time, RGBM/GF stop time) for each decompression stop. Individual stop depths are not indicated, but generally, the longest stops correspond to the shallowest stops for each gas mixture. For O₂ deco, the 20 and 10 ft stops are shown as green-colored points. Stops on back gas are shown as black-colored points. For the deepest stops, more than one point will often plot on top of another point.

RGBM vs. VPM-B (pages 8, 17, and 26)

- VPM-B(N) and (2) stops start shallower and are substantially shorter than RGBM. (pages 8,17).
- VPM-B(4) stops are very similar to RGBM, but RGBM often starts stops 10 ft deeper, and has shorter O₂ stops than VPM-B (page 26).
- VPM-B(4) is increasingly more similar to RGBM with increasing dive times.

GF vs. VPM-B (pages 10, 19, and 28)

- VPM-B(N) and (2) stops are much shorter than GF.
- VPM-B(4) is similar to GF for dives shorter than 60 min (page 28).

Discussion of Plots of VPM-B Stop Times vs. Bottom Times

See pages 13, 14, 22, 23, 31, 32

- TATs and groups of stop times (e.g. times at 10+20 ft) are linearly correlated to dive times. This translates to simple rules that relate stop times to bottom times. We can use these relationships to specify analytically-based procedures for VPM-B deco-on-the-fly.

- CAUTION: remember that the rules derived from these slides are special cases that only relate to 100 ft dives on Trimix 30/30.

SECTION 1

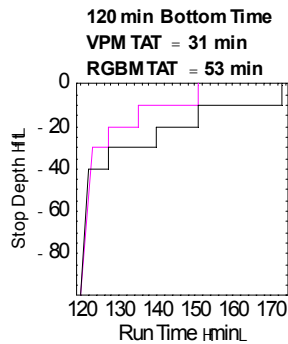
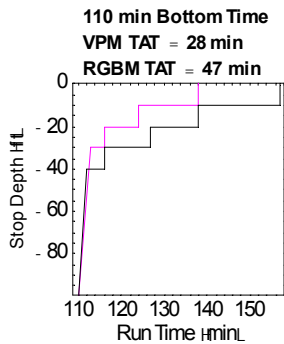
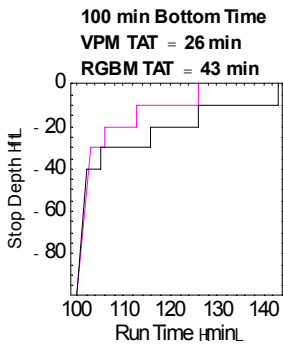
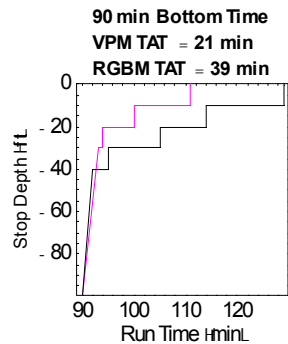
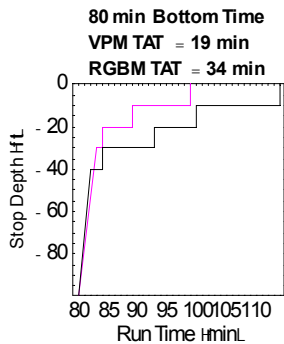
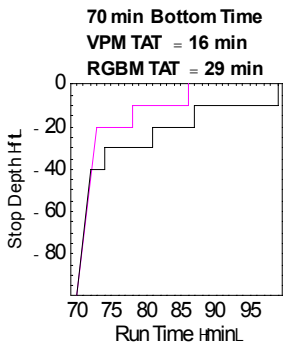
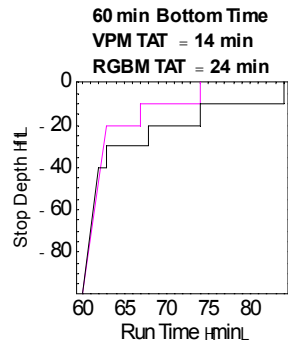
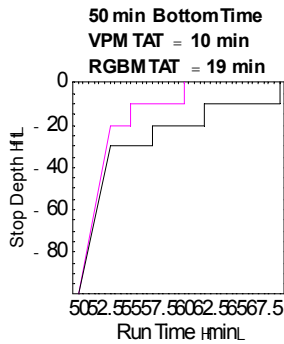
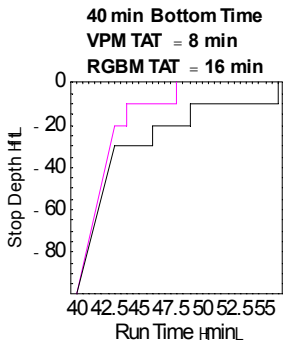
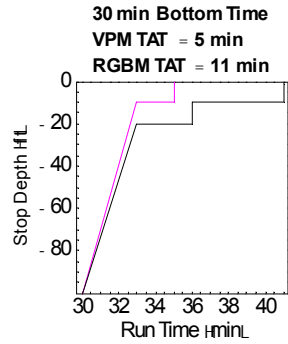
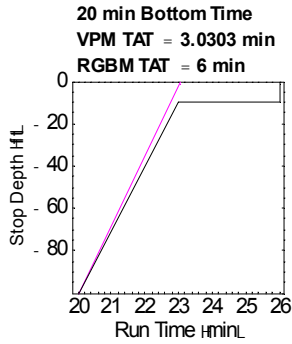
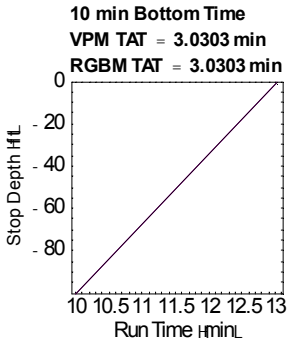
Ascents from Dives at 100 ft for 10 -120 min
12 on Trimix 30/30 with Trimix 30/30 Deco
12 on Trimix 30/30 with Trimix 30/30+O₂ Deco

VPM-B Conservatism Setting (N)

24 VPM-B profiles compared to RGBM and GF (pages 7-12)

24 VPM-B ascents with Trimix and Trimix+O₂ deco summarized (pages 13-14)

Comparison of RGBM and VPM- B HL Ascents for Array of 100 ft Dives on Back Gas O_2 , He, N_2 \leq 30, 30, 40 < Deco on 30, 30, 40 <, and 100, 0, 0 <



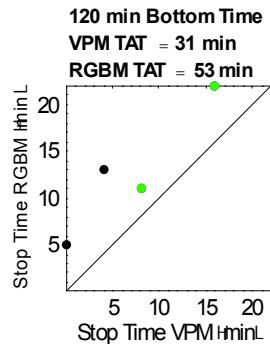
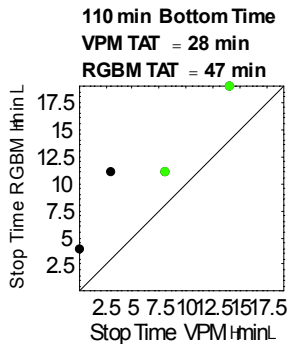
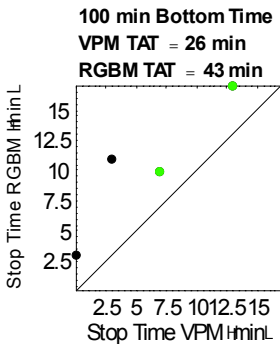
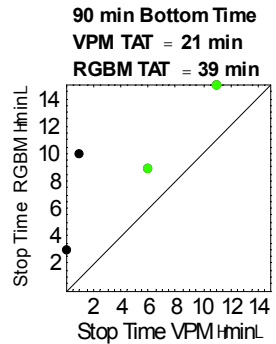
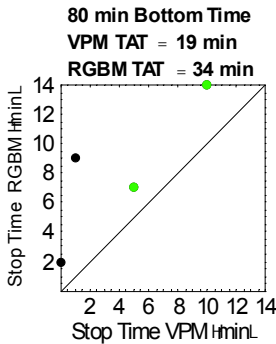
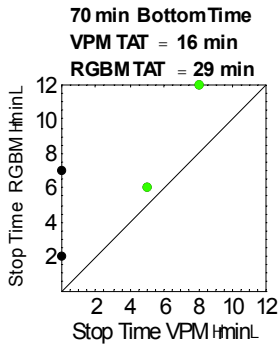
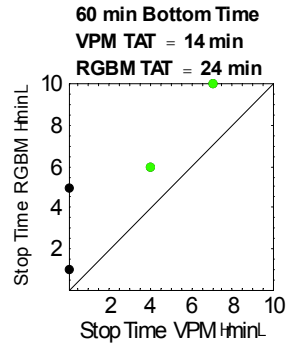
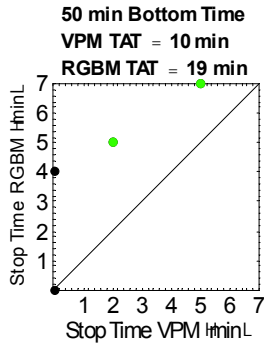
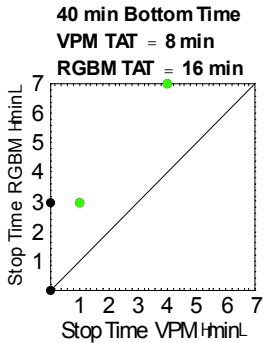
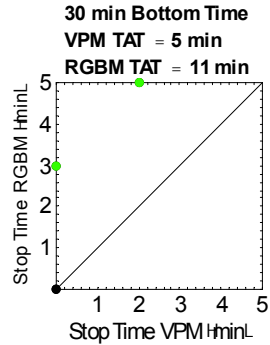
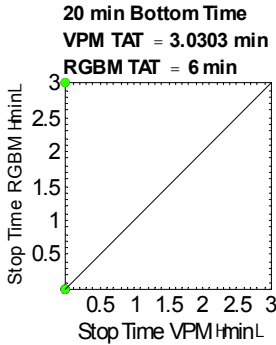
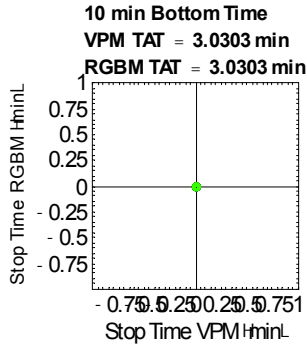
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Dive Profiles

VPM-B

RGBM

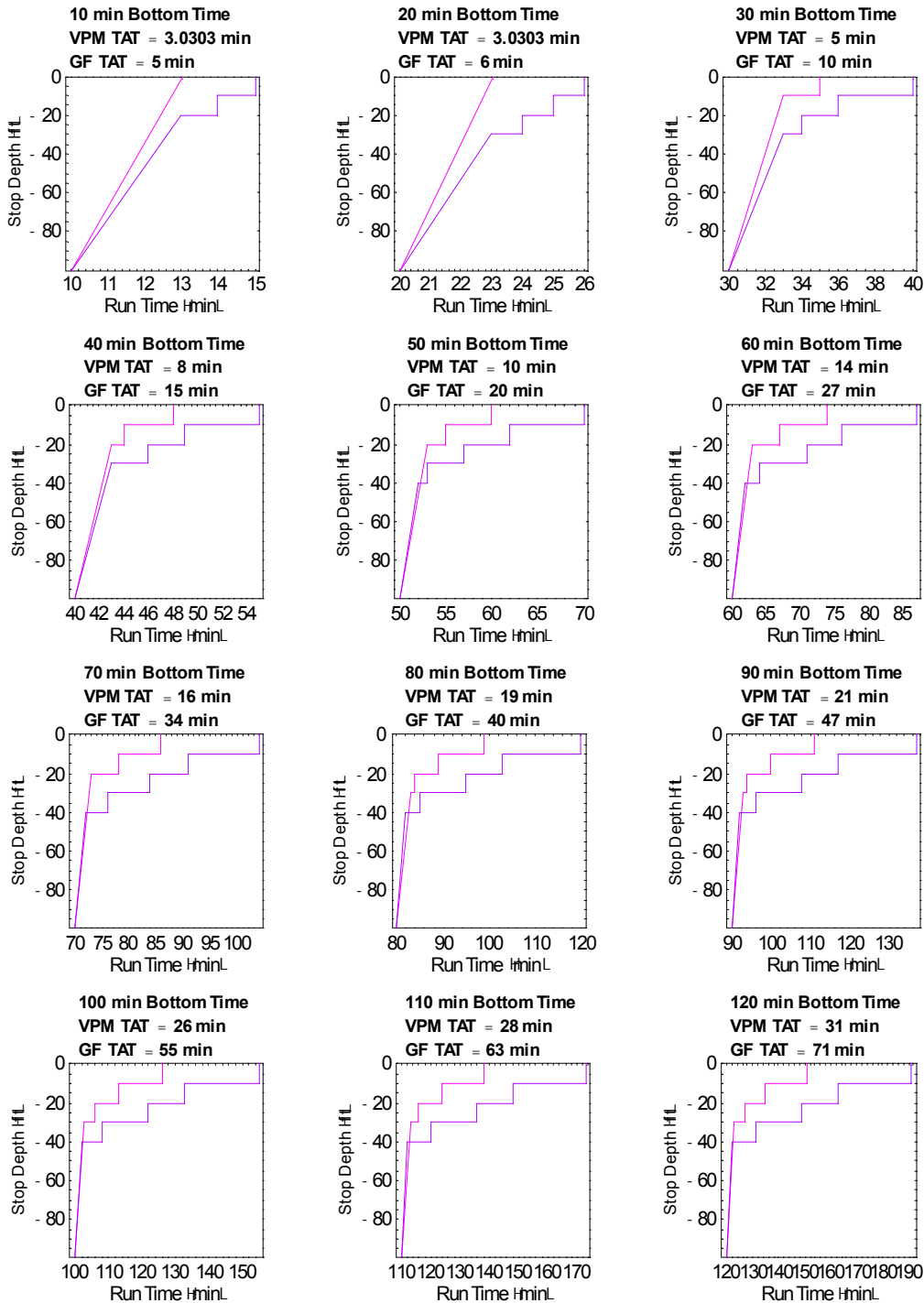
Correlation of RGBM to VPM - B HL Stop Times for Array of 100 ft Dives on Back Gas O₂, He, N₂ <= 30, 30, 40 < Deco on 30, 30, 40 <, and 100, 0, 0 <



LEGEND
Deco Gases
O₂, He, N₂
100, 0, 0

21, 0, 79

Comparison of GF and VPM- B H₂L Ascents for Array of 100 ft Dives on Back Gas O₂, He, N₂ <= 30, 30, 40 < Deco on 30, 30, 40 <, and 100, 0, 0 <

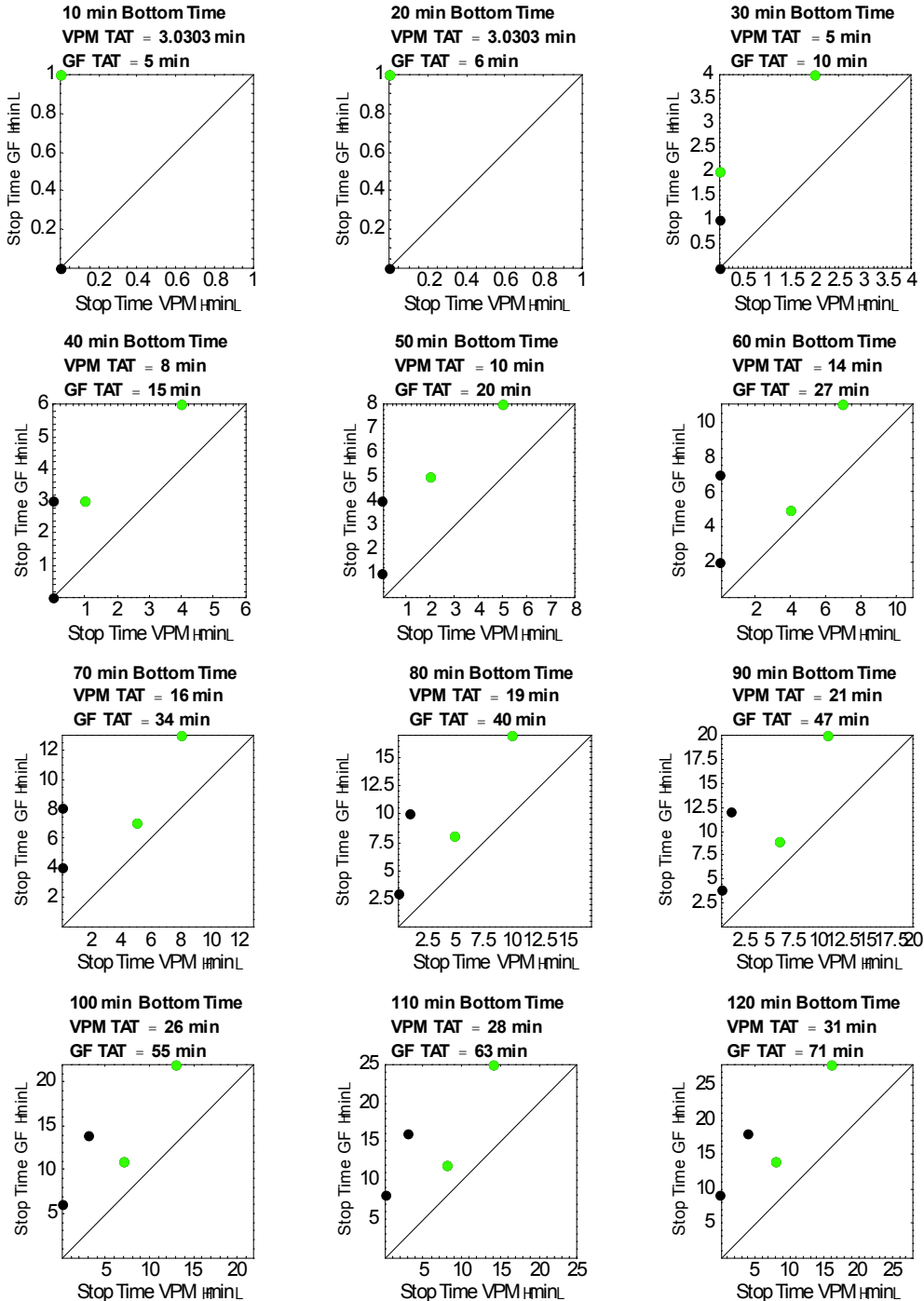


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Dive Profiles

VPM-B

GF

Correlation of GF to VPM- B HL Stop Times for Array of 100 ft Dives on Back Gas O₂, He, N₂ <= 30, 30, 40< Deco on 30, 30, 40< and 100, 0, 0<



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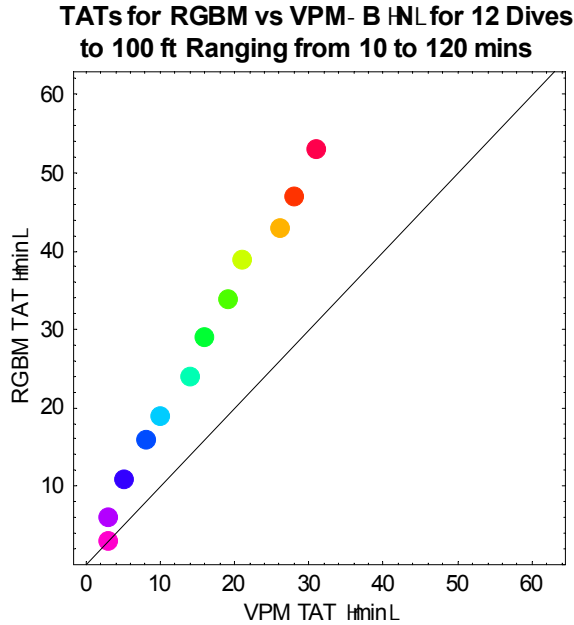
Limited Distribution

LEGEND

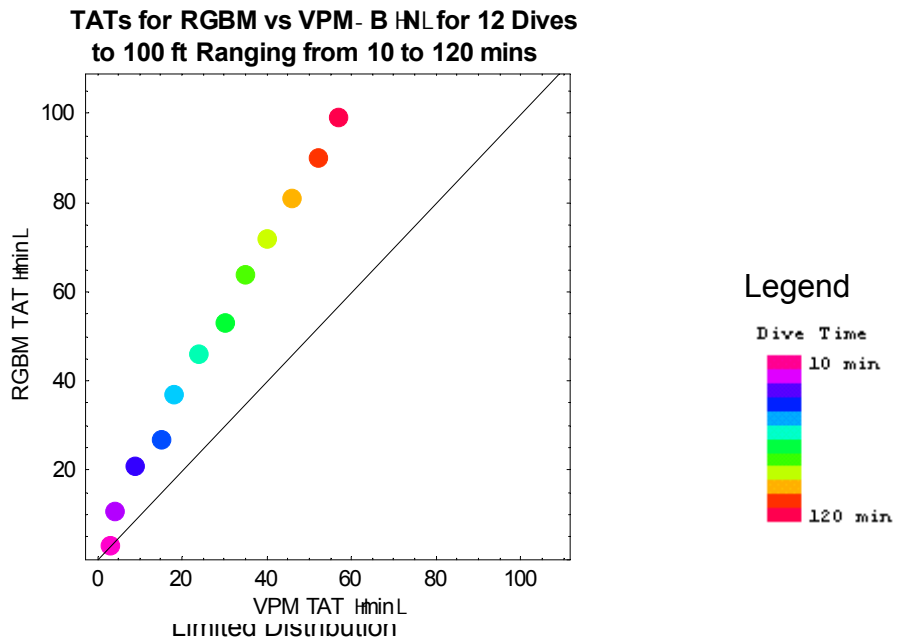
Deco Gases
O₂, He, N₂
100, 0, 0
21, 0, 79

Correlation of RGBM and VPM-B(N) TATs for 100ft Dives on Trimix 30/30

3mix 30/30+O₂ Deco



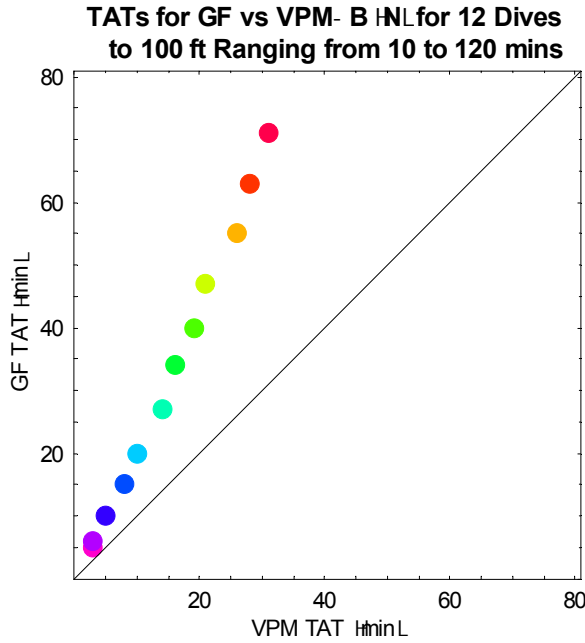
3mix 30/30 Deco



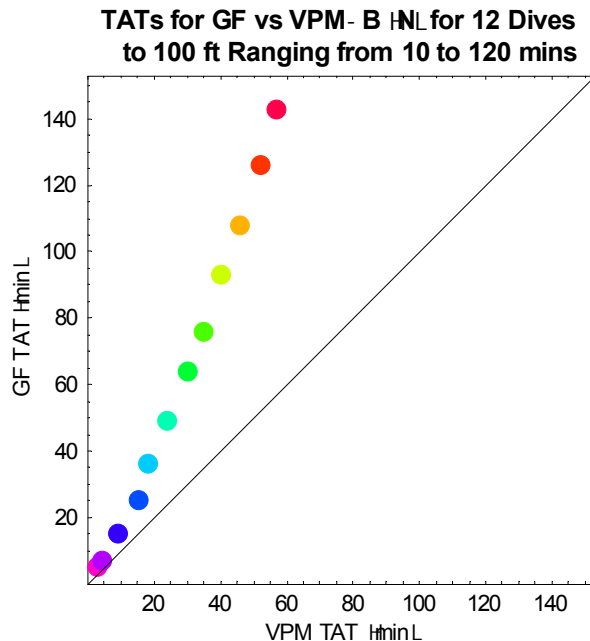
Eric Maiken, 2003

Correlation of GF and VPM-B(N) TATs for 100ft Dives on Trimix 30/30

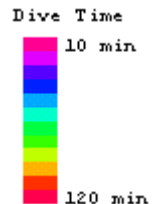
3mix30/30+O₂ Deco



3mix30/30 Deco



Legend



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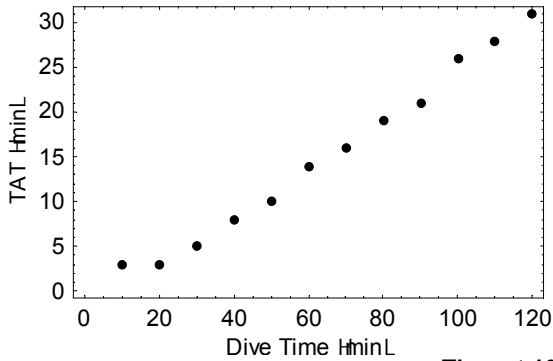
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Stop Times vs. Bottom Times

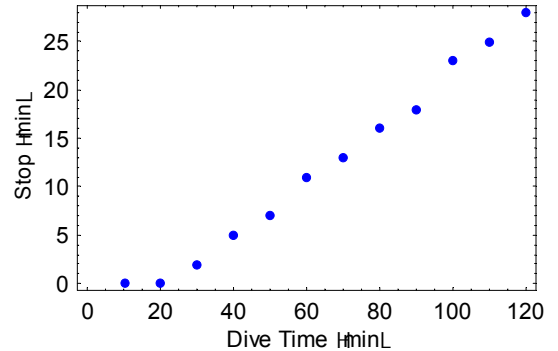
VPM-B Conservatism (N)

3mix30/30+O₂ Deco

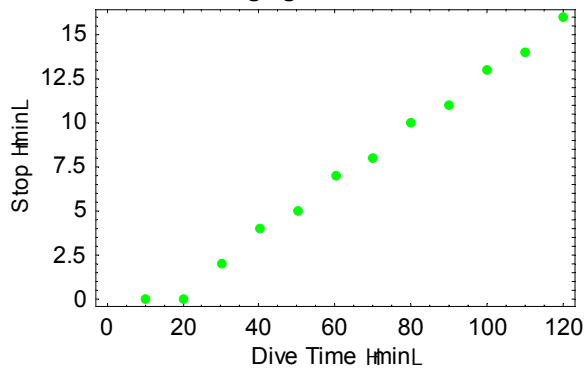
TAT vs. Bottom Time for
12 VPM- B HNL Dives to 100 ft
Ranging from 10 to 120 mins



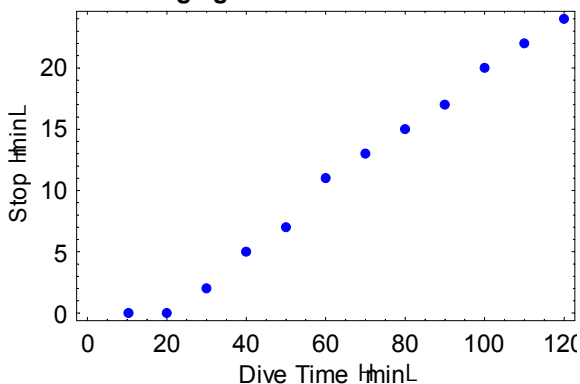
Total Time at 30- 10 ft Stops vs. Bottom Time for
12 VPM- B HNL Dives to 100 ft
Ranging from 10 to 120 mins



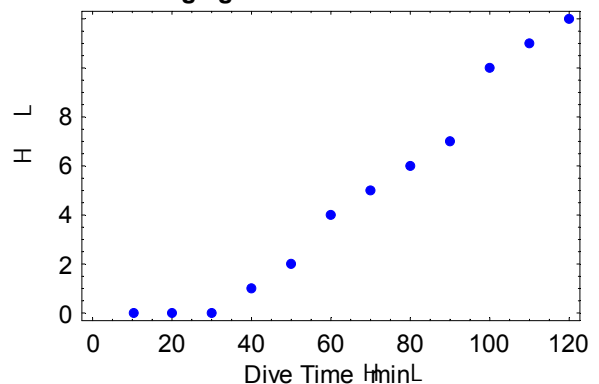
Time at 10 ft Stop vs. Bottom Time for
12 VPM- B HNL Dives to 100 ft
Ranging from 10 to 120 mins



Total Time at 20- 10 ft Stops vs. Bottom Time for
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Ranging from 10 to 120 mins



Total Time at 30- 20 ft Stops vs. Bottom Time for
12 VPM- B HNL Dives to 100 ft
Ranging from 10 to 120 mins

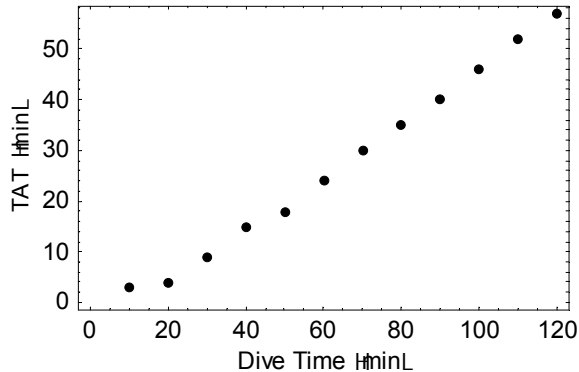


Stop Times vs. Bottom Times

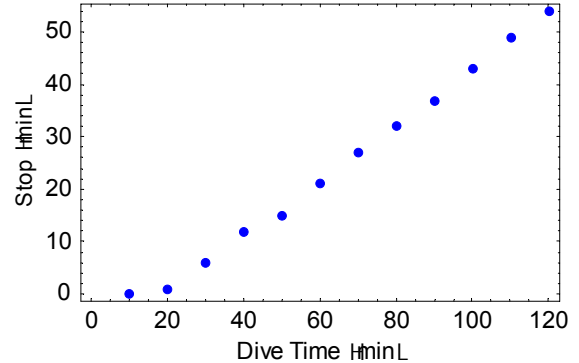
VPM-B Conservatism (N)

3mix30/30 Deco

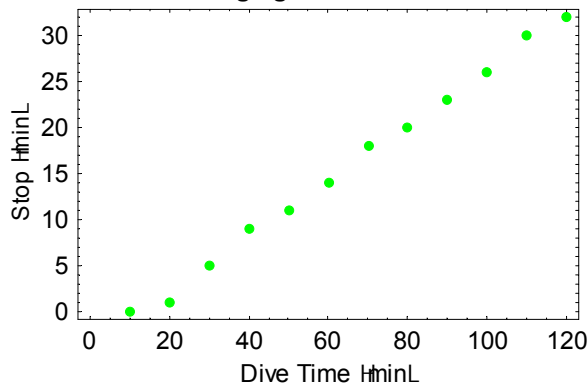
**TAT vs. Bottom Time for
12 VPM- B INL Dives to 100 ft
Ranging from 10 to 120 mins**



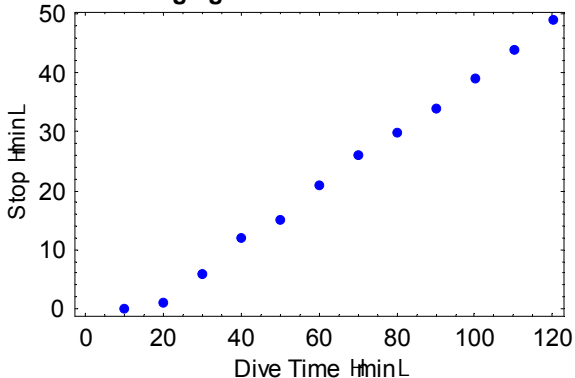
**Total Time at 30- 10 ft Stops vs. Bottom Time for
12 VPM- B INL Dives to 100 ft
Ranging from 10 to 120 mins**



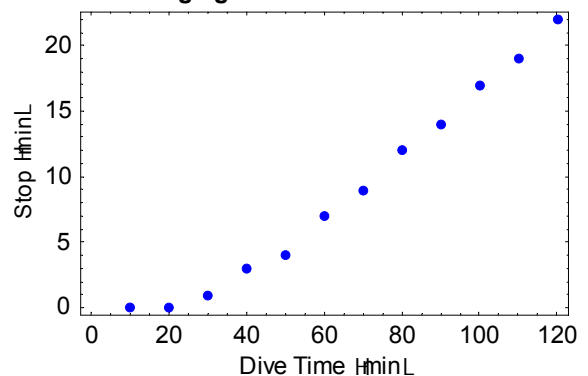
**Time at 10 ft Stop vs. Bottom Time for
12 VPM- B INL Dives to 100 ft
Ranging from 10 to 120 mins**



**Total Time at 20- 10 ft Stops vs. Bottom Time for
12 VPM- B INL Dives to 100 ft
Ranging from 10 to 120 mins**



**Total Time at 30- 20 ft Stops vs. Bottom Time for
12 VPM- B INL Dives to 100 ft
Ranging from 10 to 120 mins**



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Limited Distribution

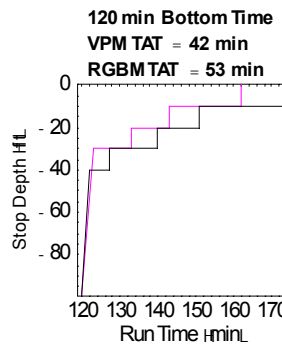
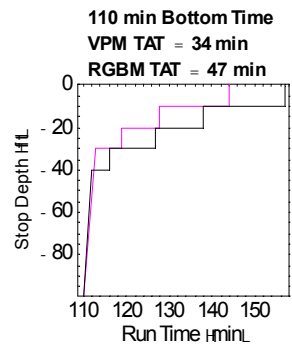
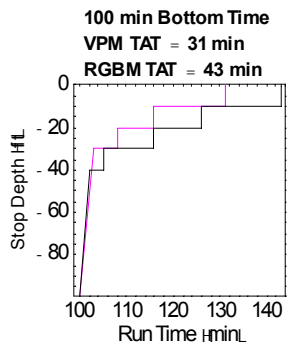
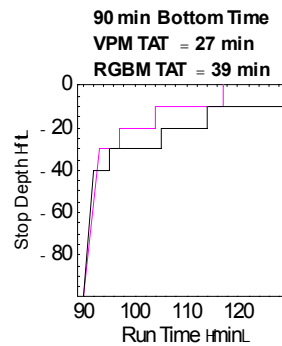
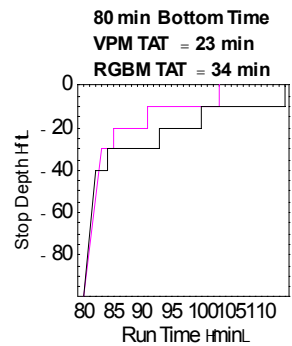
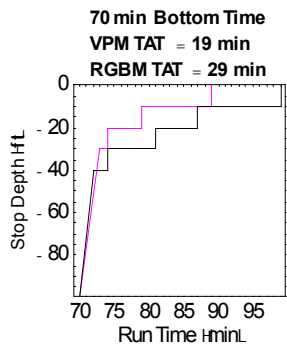
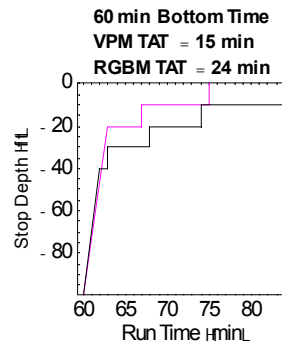
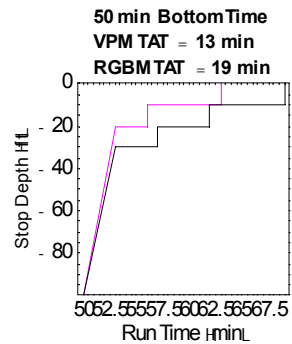
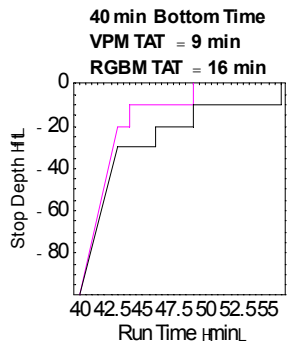
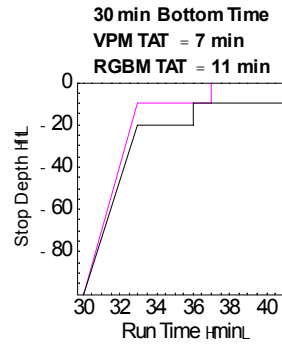
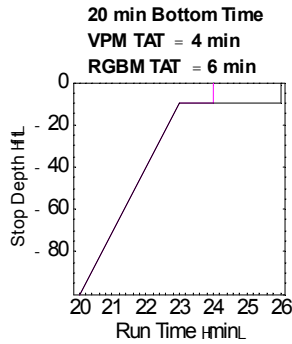
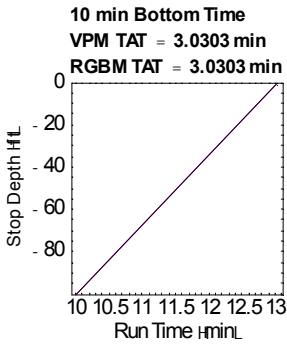
SECTION 2

Ascents from Dives at 100 ft for 10 -120 min
12 on Trimix 30/30 with Trimix 30/30 Deco
12 on Trimix 30/30 with Trimix 30/30+O₂ Deco

VPM-B Conservatism Setting (2)

24 VPM-B profiles compared to RGBM and GF (pages 16-21)
24 VPM-B ascents with Trimix and Trimix+O₂ deco summarized (pages 22-23)

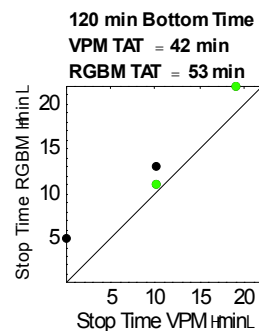
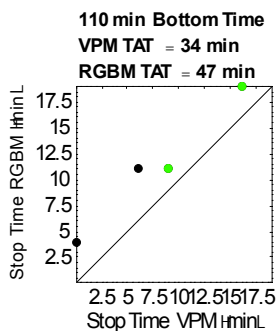
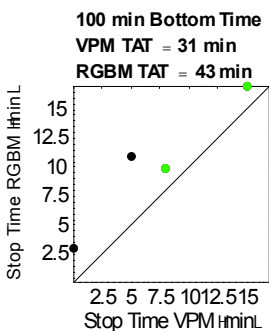
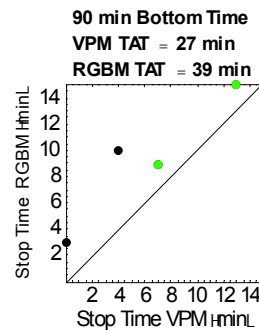
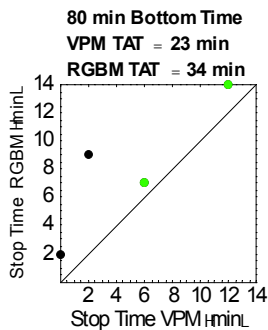
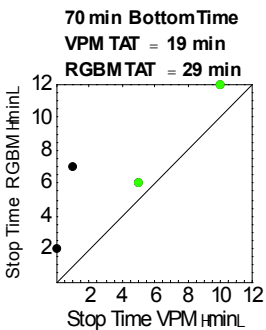
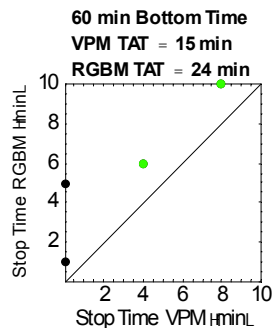
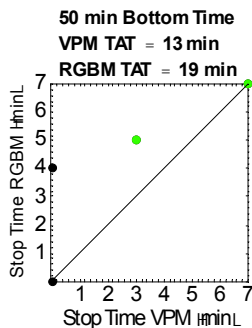
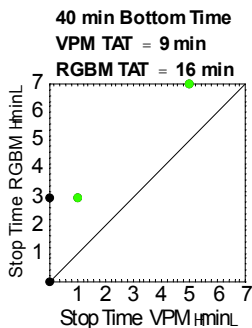
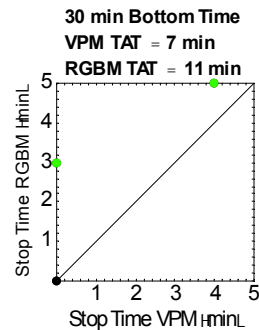
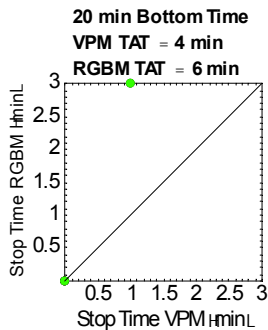
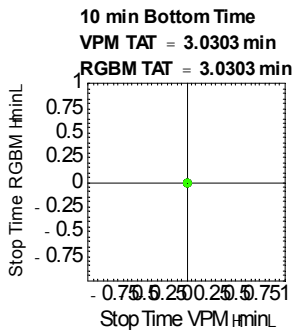
Comparison of RGBM and VPM-B HL Ascents for Array of 100 ft Dives on Back Gas O₂, He, N₂ <= 30, 30, 40 < Deco on 30, 30, 40 <, and 100, 0, 0 <



LEGEND
Dive Profiles

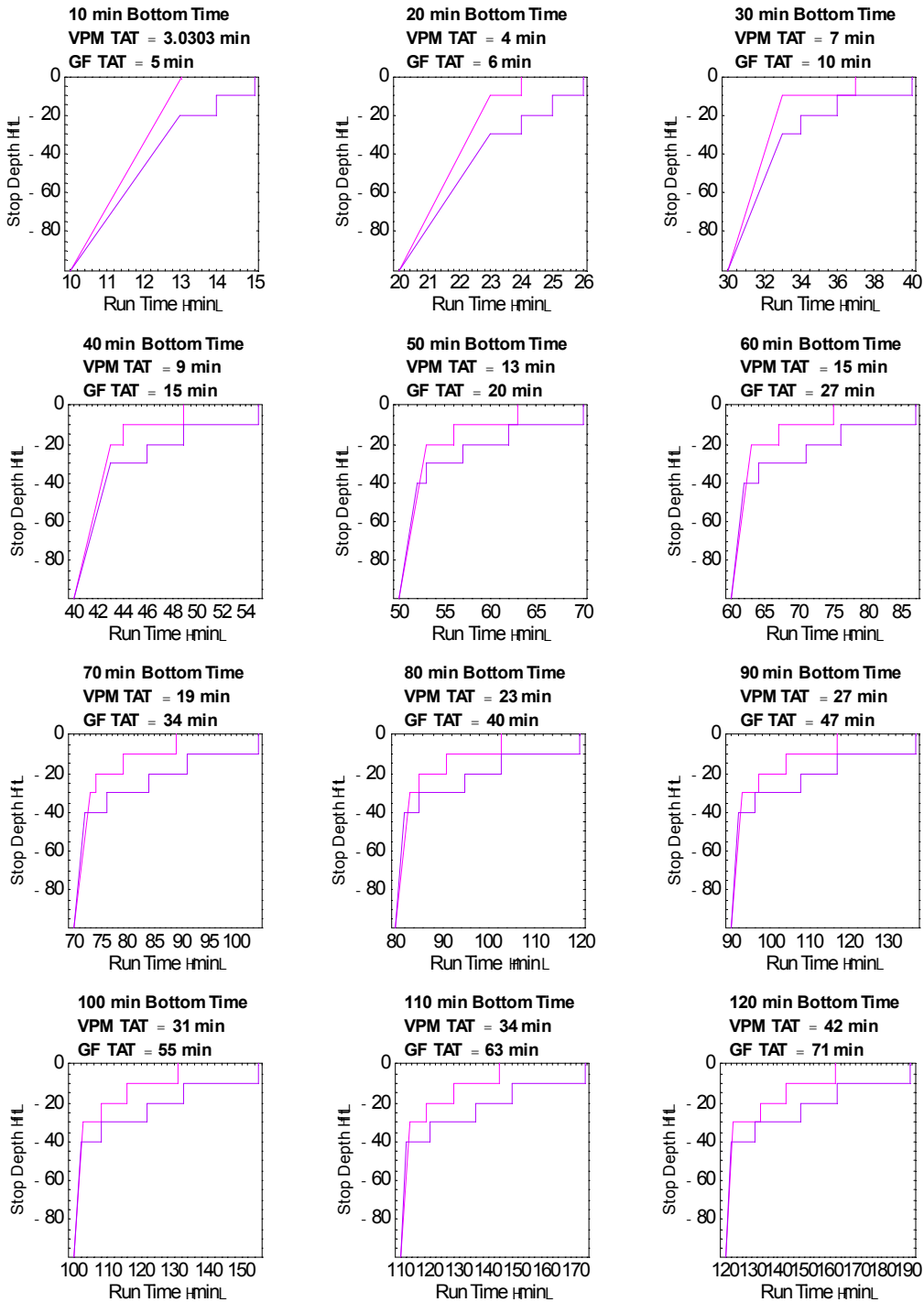
VPM-B
RGBM

Correlation of RGBM to VPM - B₁₂L Stop Times for Array of 100 ft Dives on Back Gas O₂, He, N₂ <= 30, 30, 40< Deco on 30, 30, 40< and 100, 0, 0<



LEGEND
Deco Gases
O₂, He, N₂
100, 0, 0
21, 0, 79

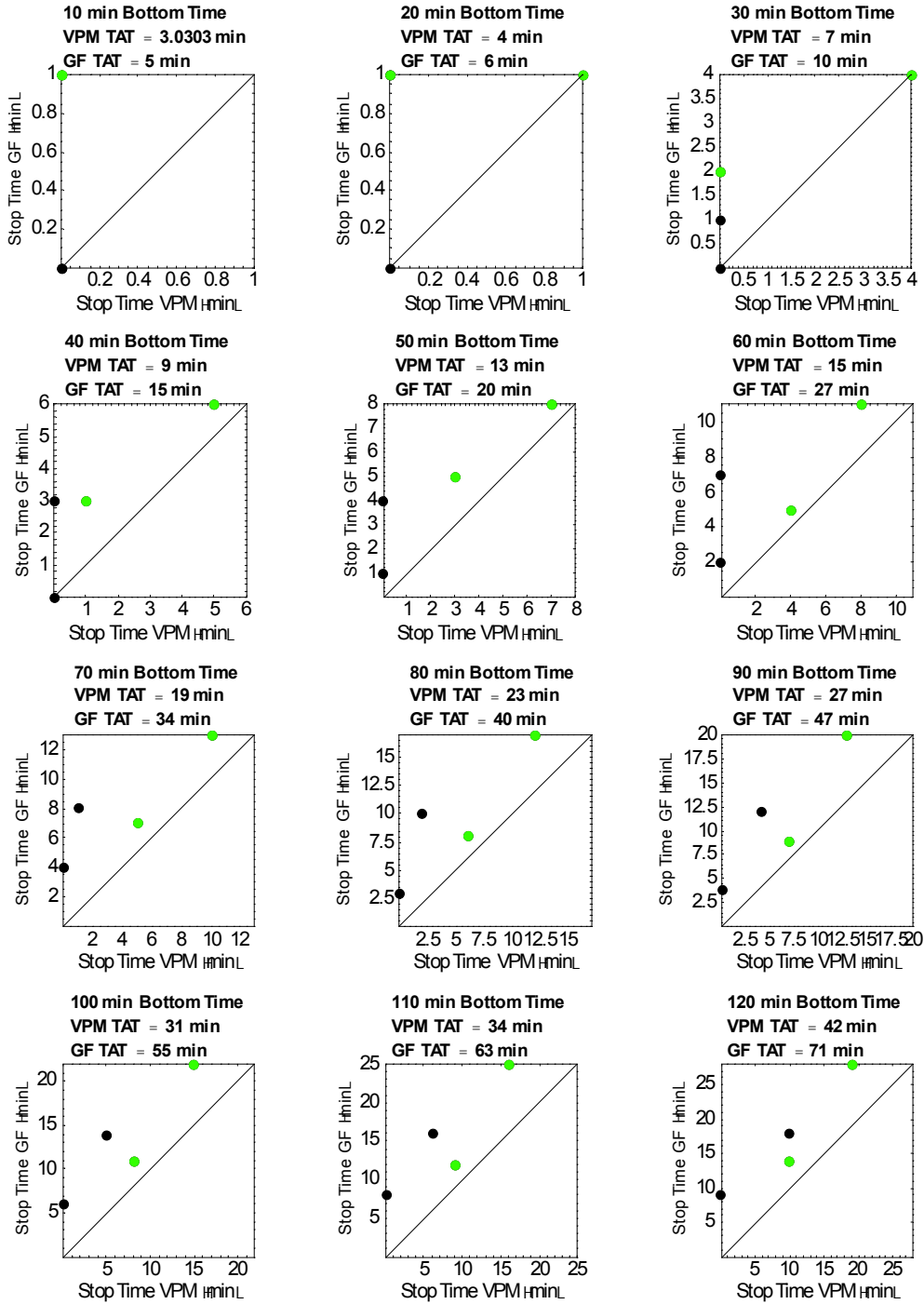
Comparison of GF and VPM- B 12L Ascents for Array of 100 ft Dives on Back Gas O_2 , He, N_2 = 80, 30, 40< Deco on 80, 30, 40<, and 100, 0, 0<



LEGEND
Dive Profiles

VPM-B
GF

Correlation of GF to VPM- B I2L Stop Times for Array of 100 ft Dives on Back Gas O₂, He, N₂ <= 30, 30, 40< Deco on 30, 30, 40<, and 100, 0, 0<

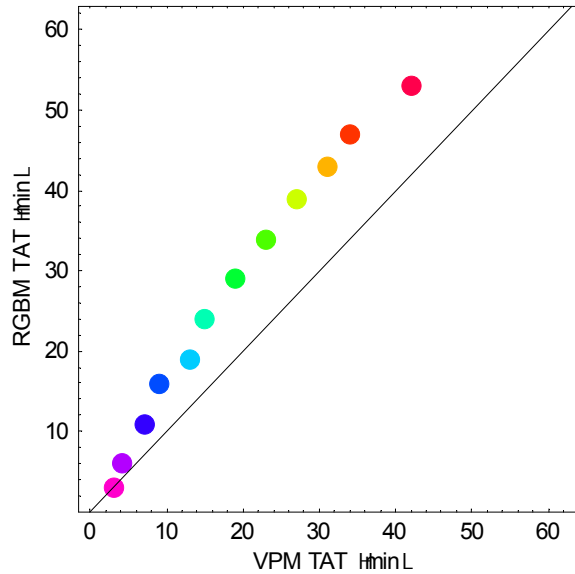


LEGEND
 Deco Gases
 O₂, He, N₂
 100, 0, 0
 21, 0, 79

Correlation of RGBM and VPM-B(2) TATs for 100ft Dives on Trimix 30/30

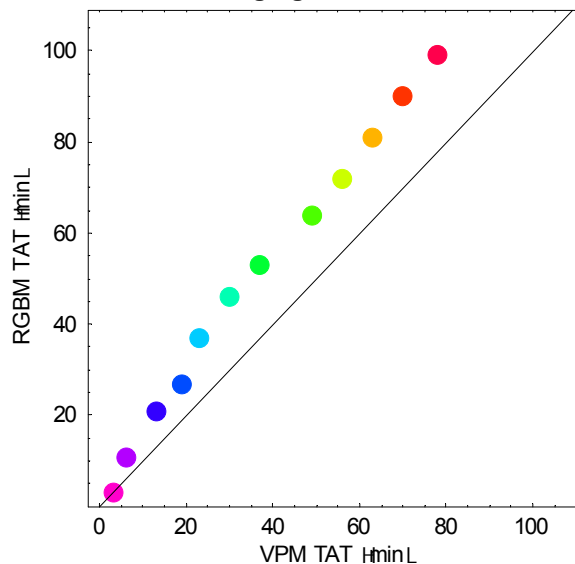
3mix 30/30+O₂ Deco

TATs for RGBM vs VPM- B I2L for 12 Dives to 100 ft Ranging from 10 to 120 mins

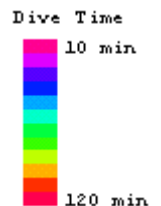


3mix 30/30 Deco

TATs for RGBM vs VPM- B I2L for 12 Dives to 100 ft Ranging from 10 to 120 mins

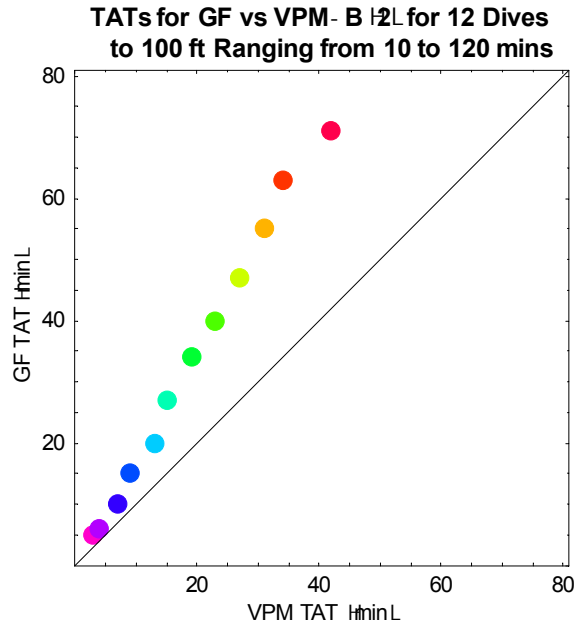


Legend

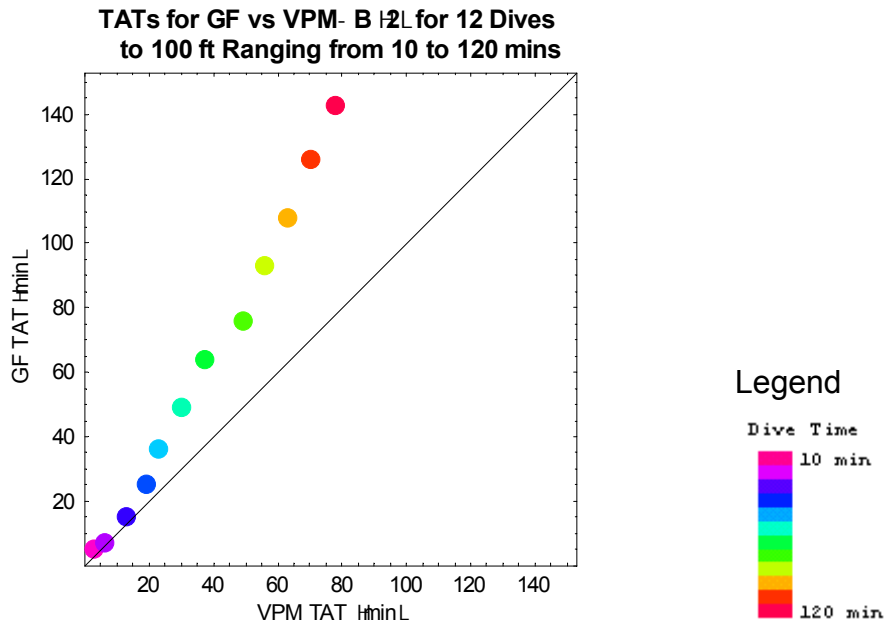


Correlation of GF and VPM-B(2) TATs for 100ft Dives on Trimix 30/30

3mix30/30+O₂ Deco



3mix30/30 Deco

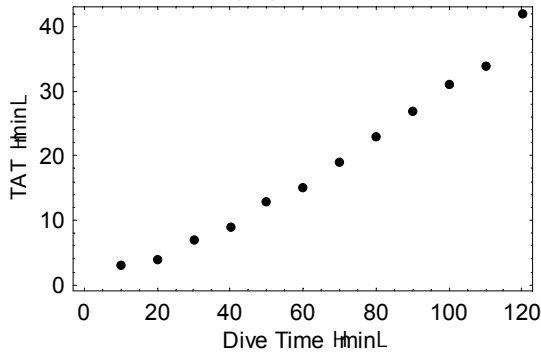


Stop Times vs. Bottom Times

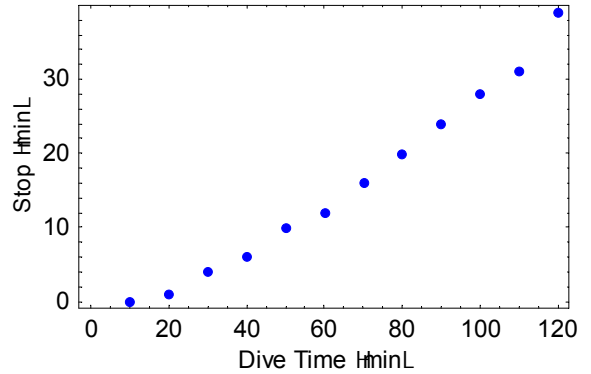
VPM-B Conservatism (2)

3mix30/30+O₂ Deco

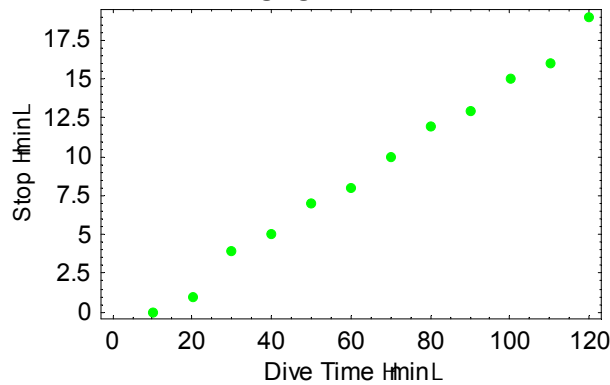
TAT vs. Bottom Time for
12 VPM- B 12L Dives to 100 ft
Ranging from 10 to 120 mins



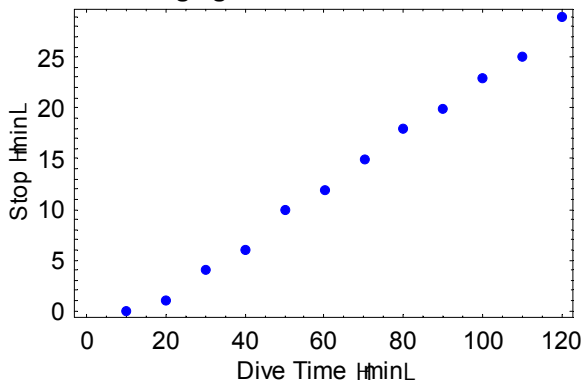
Total Time at 30- 10 ft Stops vs. Bottom Time for
12 VPM- B 12L Dives to 100 ft
Ranging from 10 to 120 mins



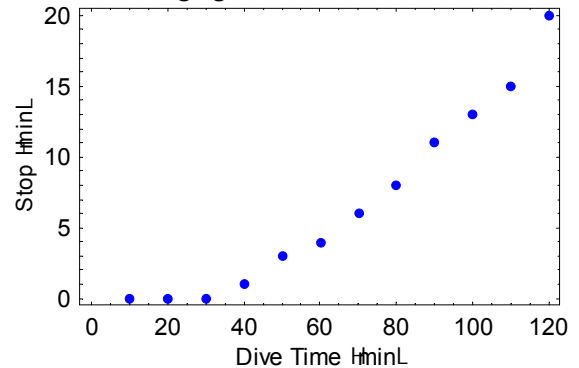
Time at 10 ft Stop vs. Bottom Time for
12 VPM- B 12L Dives to 100 ft
Ranging from 10 to 120 mins



Total Time at 20- 10 ft Stops vs. Bottom Time for
12 VPM- B 12L Dives to 100 ft
Ranging from 10 to 120 mins



Total Time at 30- 20 ft Stops vs. Bottom Time for
12 VPM- B 12L Dives to 100 ft
Ranging from 10 to 120 mins



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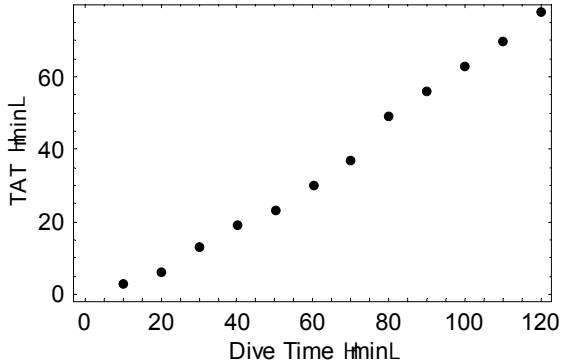
Limited Distribution

Stop Times vs. Bottom Times

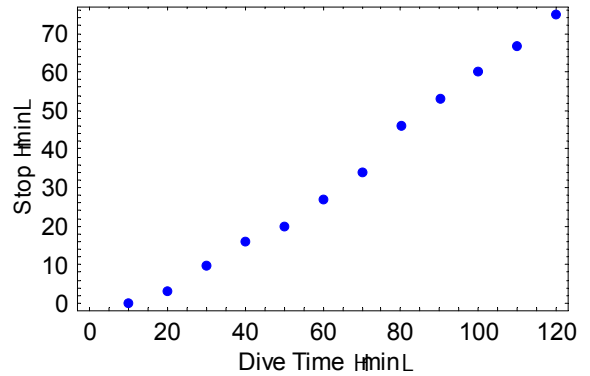
VPM-B Conservatism (2)

3mix30/30 Deco

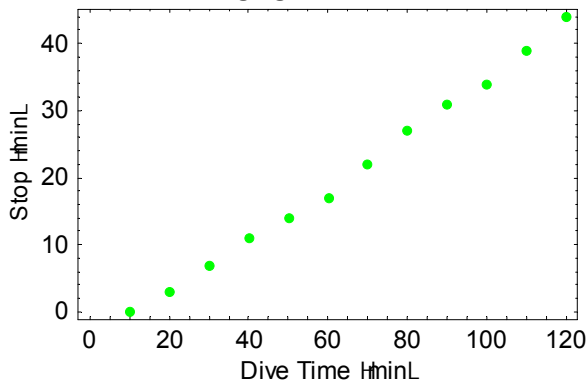
TAT vs. Bottom Time for
12 VPM-B 12L Dives to 100 ft
Ranging from 10 to 120 mins



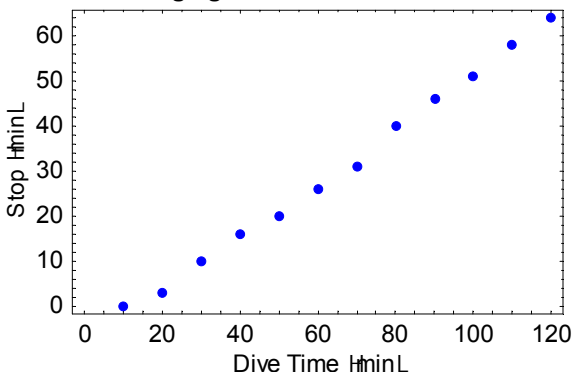
Total Time at 30- 10 ft Stops vs. Bottom Time for
12 VPM-B 12L Dives to 100 ft
Ranging from 10 to 120 mins



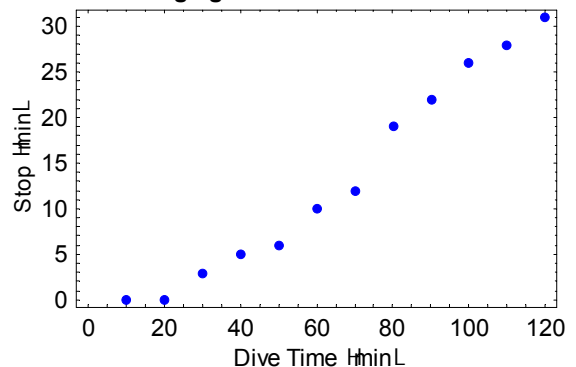
Time at 10 ft Stop vs. Bottom Time for
12 VPM-B 12L Dives to 100 ft
Ranging from 10 to 120 mins



Total Time at 20- 10 ft Stops vs. Bottom Time for
12 VPM-B 12L Dives to 100 ft
Ranging from 10 to 120 mins



Total Time at 30- 20 ft Stops vs. Bottom Time for
12 VPM-B 12L Dives to 100 ft
Ranging from 10 to 120 mins



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Limited Distribution

SECTION 3

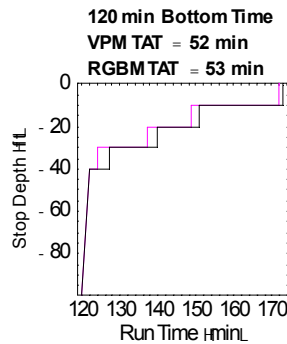
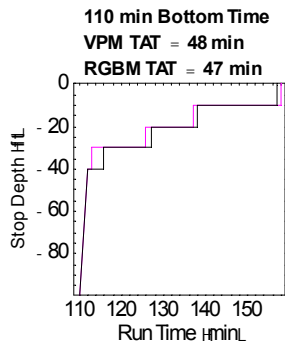
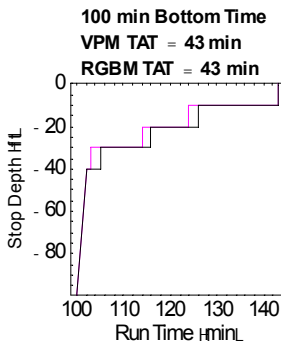
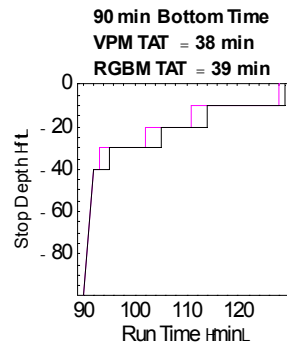
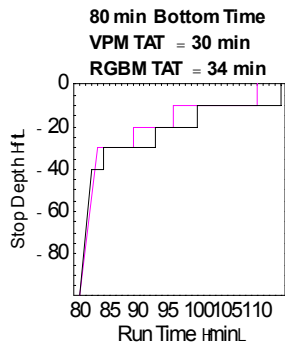
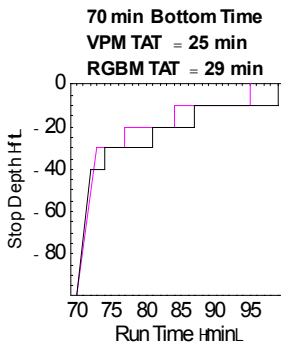
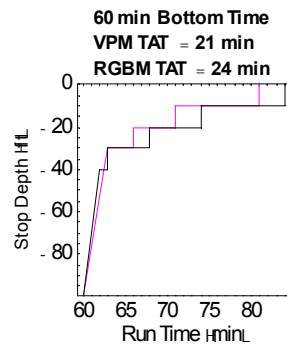
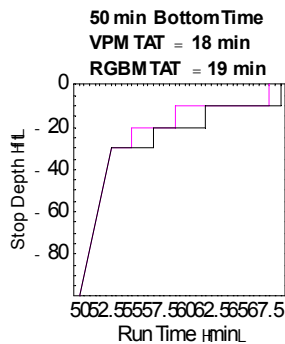
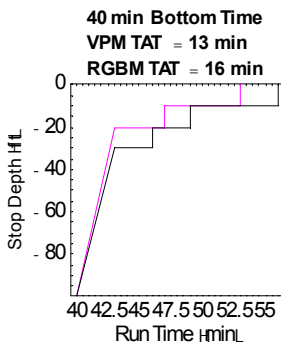
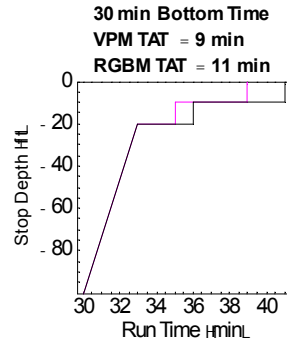
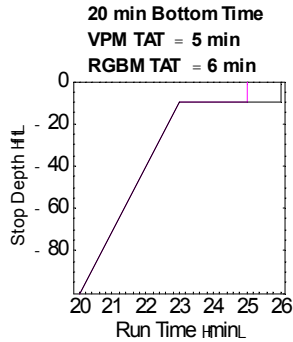
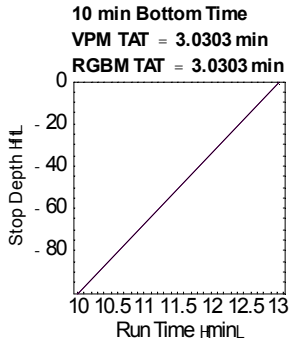
Ascents from Dives at 100 ft for 10 -120 min
12 on Trimix 30/30 with Trimix 30/30 Deco
12 on Trimix 30/30 with Trimix 30/30+O₂ Deco

VPM-B Conservatism Setting (4)

24 VPM-B profiles compared to RGBM and GF (pages 25-30)

24 VPM-B ascents with Trimix and Trimix+O₂ deco summarized (pages 31-32)

Comparison of RGBM and VPM-B HL Ascents for Array of 100 ft Dives on Back Gas O_2 , He, $N_2 \leq 30, 30, 40$ Deco on $30, 30, 40$, and $100, 0, 0$

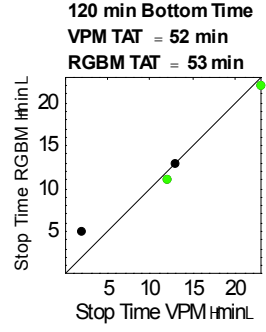
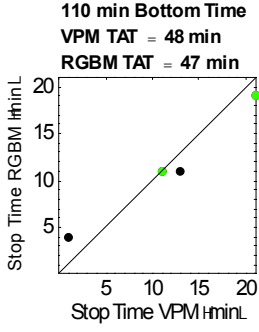
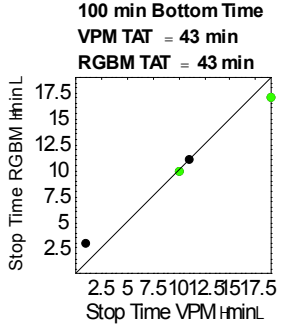
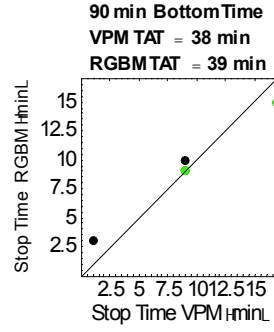
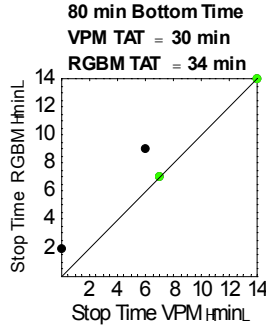
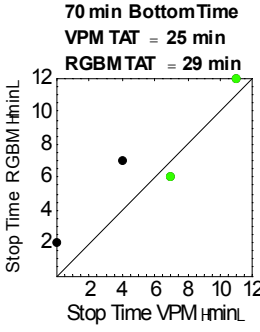
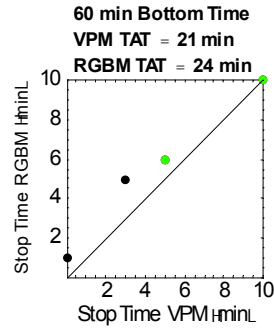
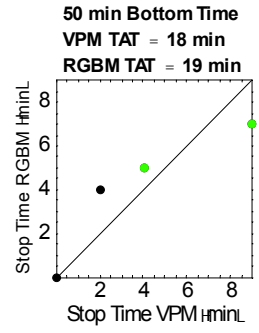
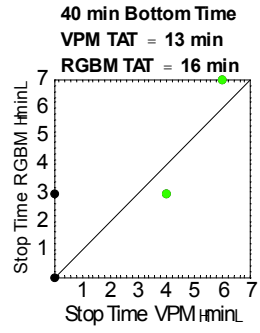
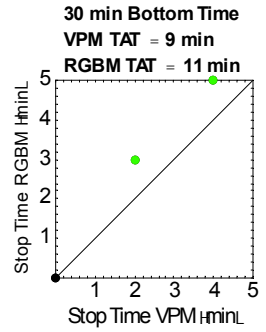
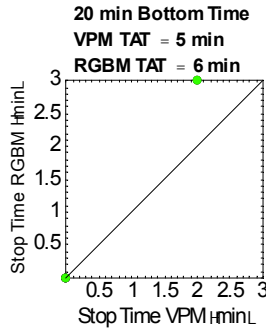
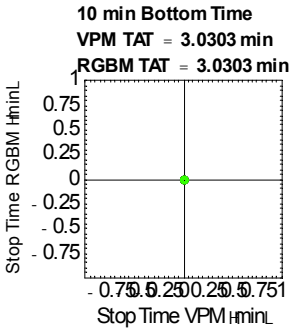


LEGEND
Dive Profiles

VPM-B

RGBM

Correlation of RGBM to VPM - Bottom Stop Times for Array of 100 ft Dives on Back Gas O₂, He, N₂ <= 30, 30, 40 < Deco on 30, 30, 40 <, and 100, 0, 0 <



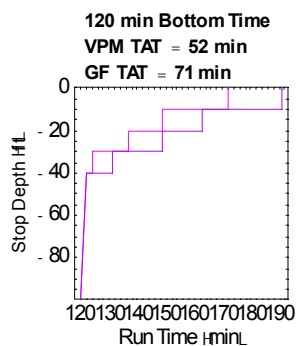
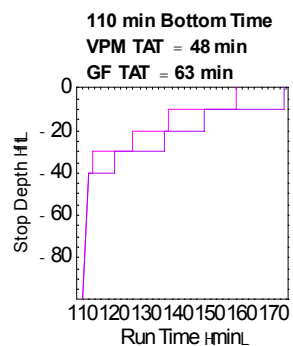
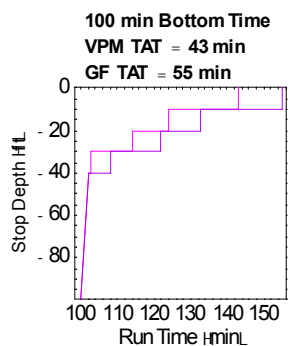
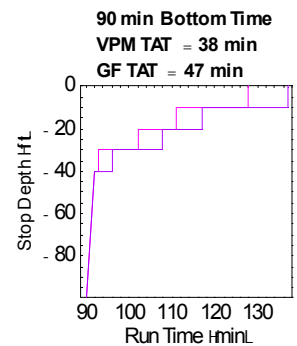
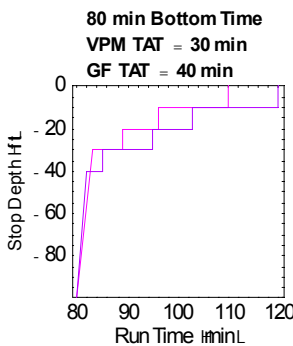
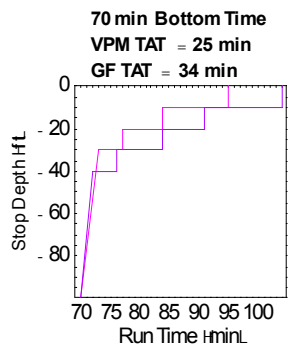
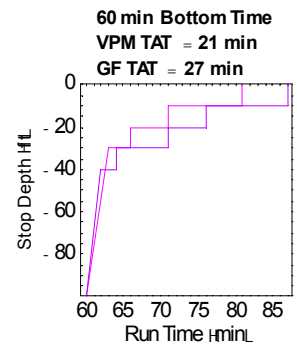
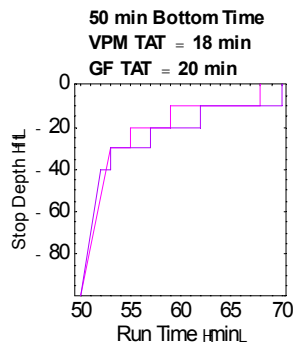
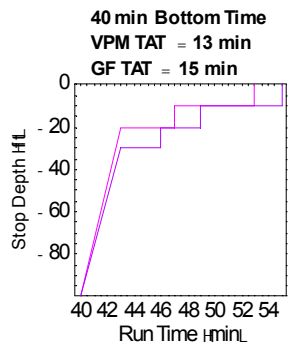
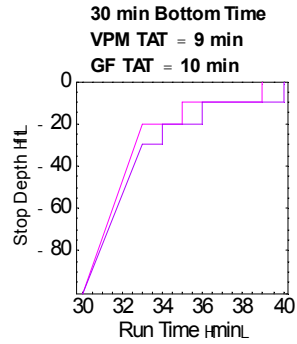
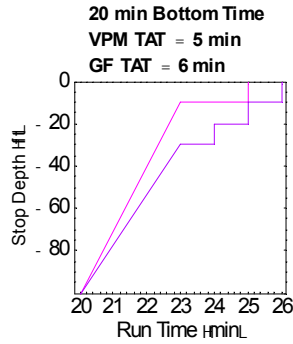
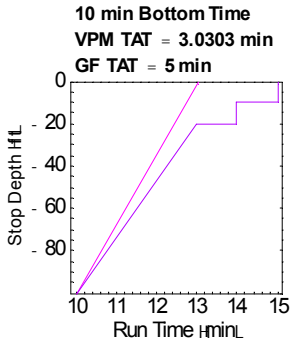
LEGEND

Deco Gases
O₂, He, N₂

100, 0, 0

21, 0, 79

Comparison of GF and VPM- B HL Ascents for Array of 100 ft Dives on Back Gas O_2 , He, N_2 = 80, 30, 40< Deco on 80, 30, 40<, and 100, 0, 0<



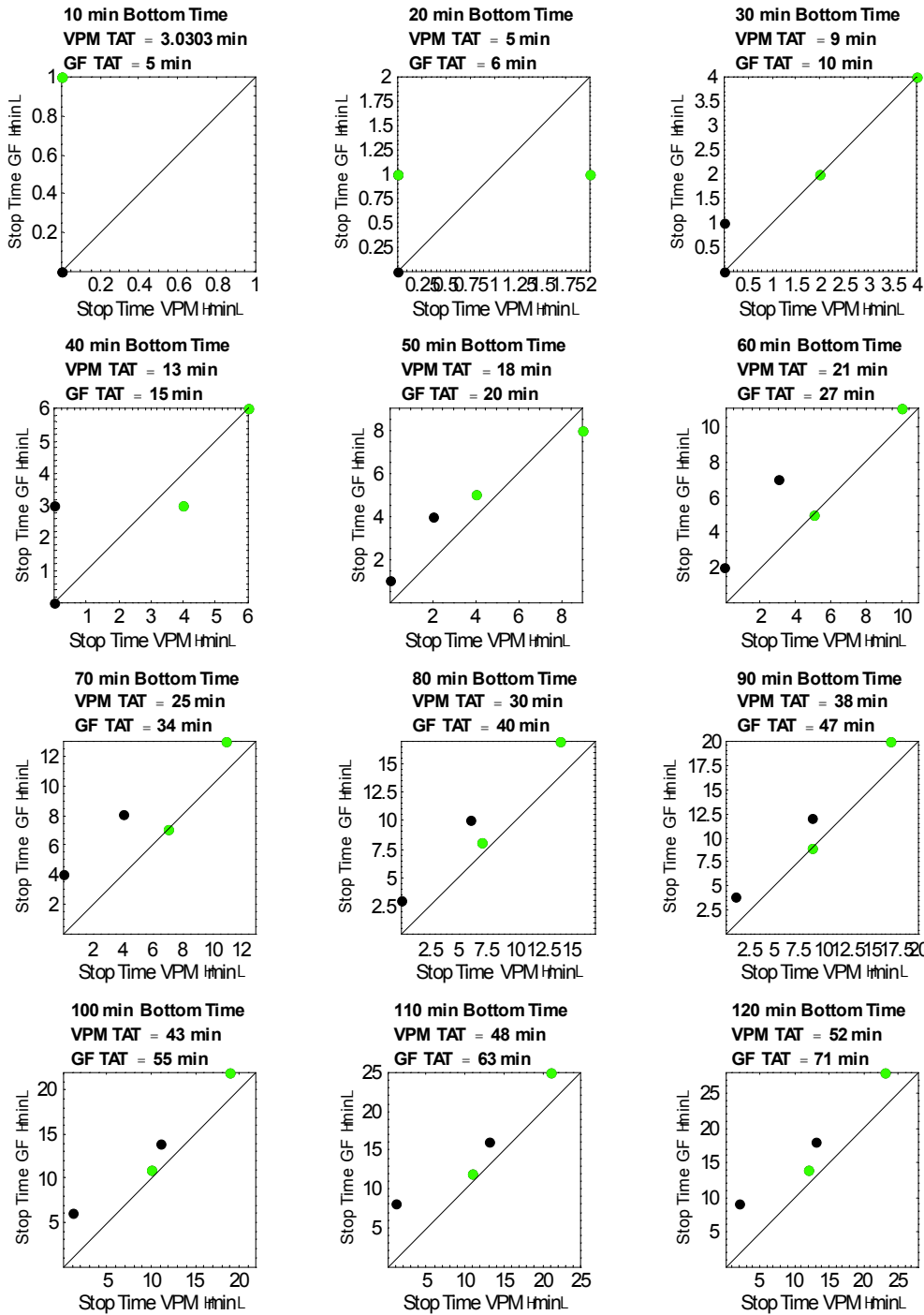
LEGEND

Dive Profiles

VPM-B

GF

Correlation of GF to VPM- B HL Stop Times for Array of 100 ft Dives on Back Gas O₂, He, N₂ <= 30, 30, 40< Deco on 30, 30, 40<, and 100, 0, 0<

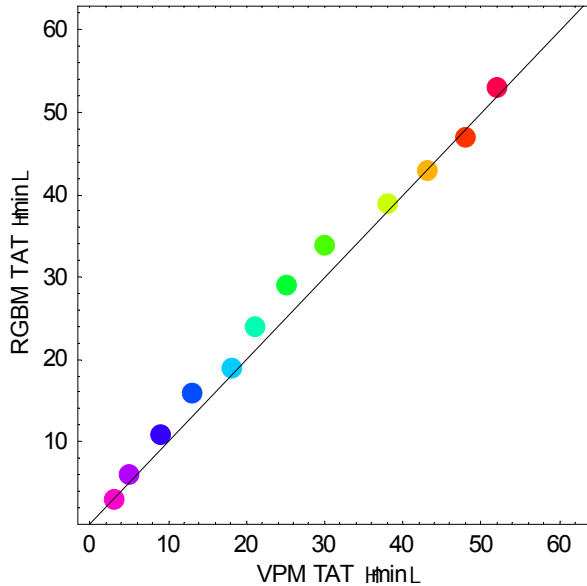


LEGEND
Deco Gases
O₂, He, N₂
100, 0, 0
21, 0, 79

Correlation of RGBM and VPM-B(4) TATs for 100ft Dives on Trimix 30/30

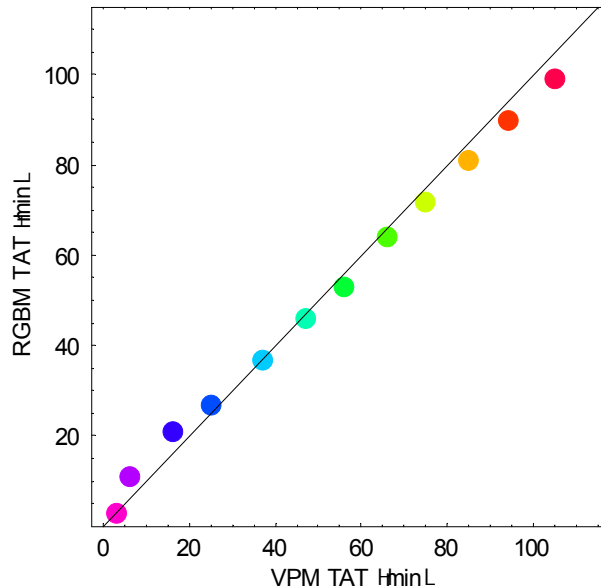
3mix 30/30+O₂ Deco

TATs for RGBM vs VPM-B(4) for 12 Dives to 100 ft Ranging from 10 to 120 mins

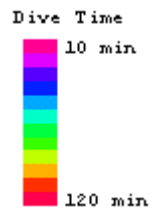


3mix 30/30 Deco

TATs for RGBM vs VPM-B(4) for 12 Dives to 100 ft Ranging from 10 to 120 mins



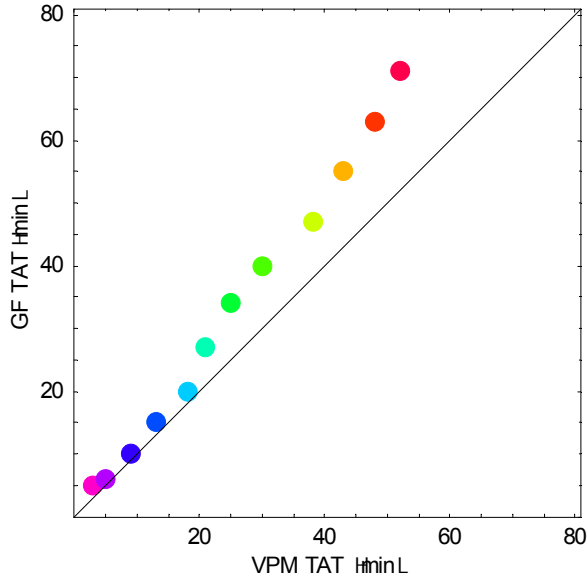
Legend



Correlation of GF and VPM-B(4) TATs for 100ft Dives on Trimix 30/30

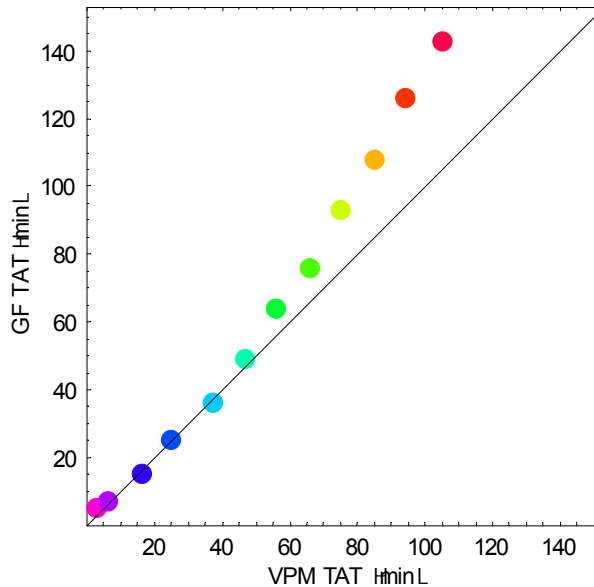
TATs for GF vs VPM- B(4) for 12 Dives to 100 ft Ranging from 10 to 120 mins

3mix30/30+O₂ Deco

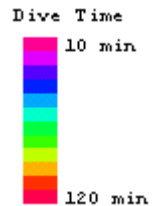


TATs for GF vs VPM- B(4) for 12 Dives to 100 ft Ranging from 10 to 120 mins

3mix30/30 Deco



Legend

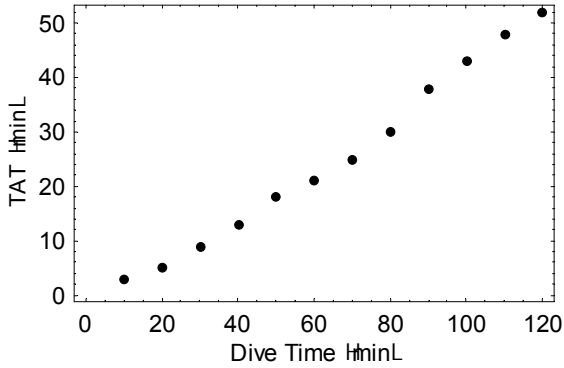


Stop Times vs. Bottom Times

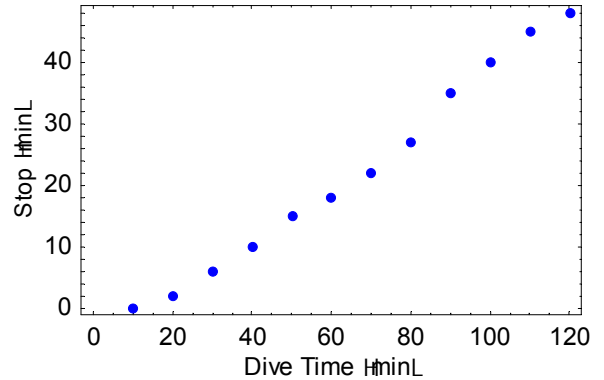
VPM-B Conservatism (4)

3mix30/30+O₂ Deco

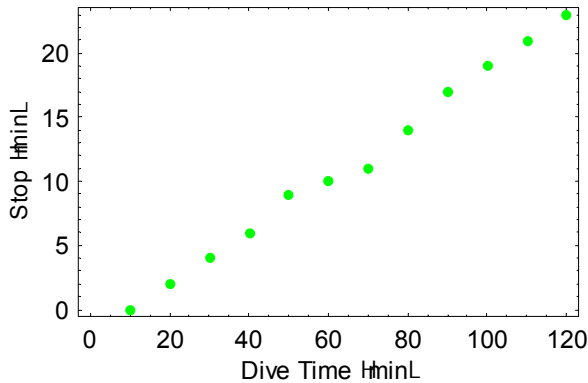
TAT vs. Bottom Time for
12 VPM-B HAL Dives to 100 ft
Ranging from 10 to 120 mins



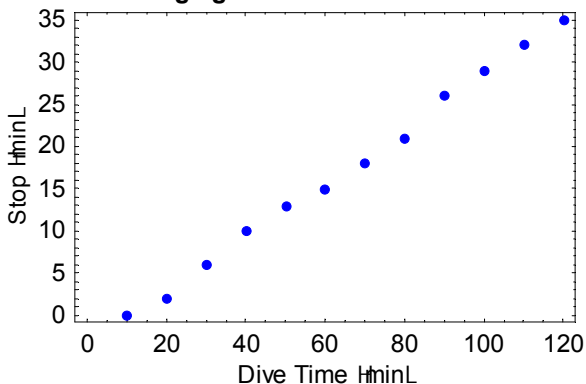
Total Time at 30- 10 ft Stops vs. Bottom Time for
12 VPM-B HAL Dives to 100 ft
Ranging from 10 to 120 mins



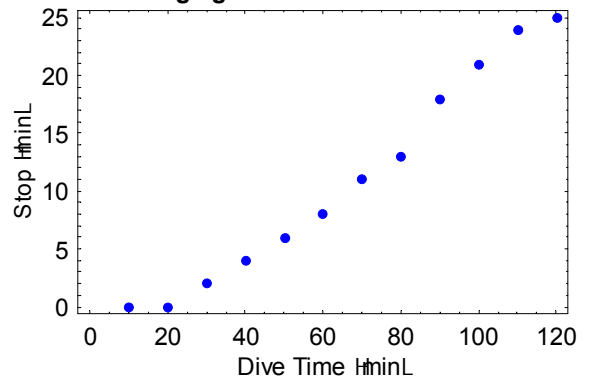
Time at 10 ft Stop vs. Bottom Time for
12 VPM-B HAL Dives to 100 ft
Ranging from 10 to 120 mins



Total Time at 20- 10 ft Stops vs. Bottom Time for
12 VPM-B HAL Dives to 100 ft
Ranging from 10 to 120 mins



Total Time at 30- 20 ft Stops vs. Bottom Time for
12 VPM-B HAL Dives to 100 ft
Ranging from 10 to 120 mins



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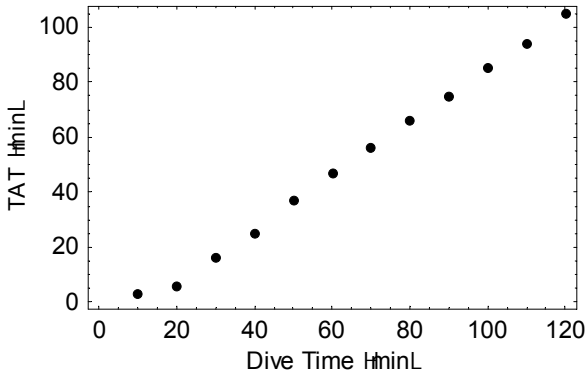
Limited Distribution

Stop Times vs. Bottom Times

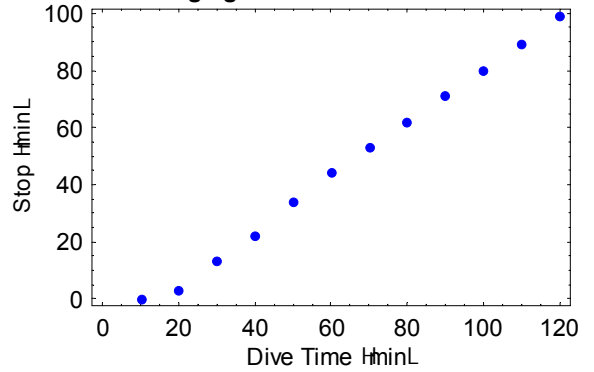
VPM-B Conservatism (4)

3mix30/30 Deco

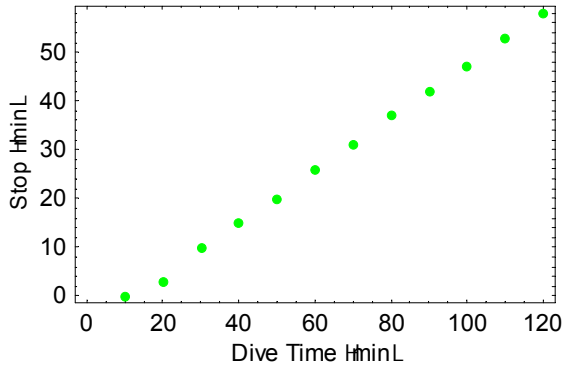
TAT vs. Bottom Time for
12 VPM-B HL Dives to 100 ft
Ranging from 10 to 120 mins



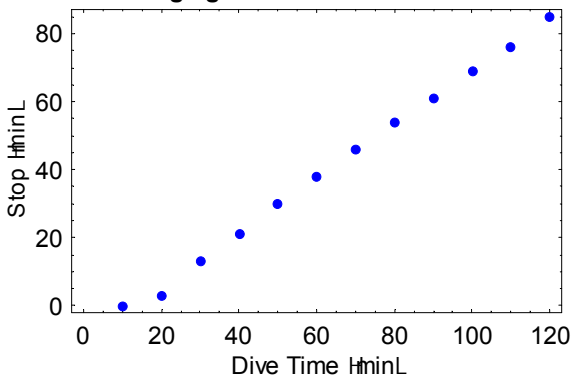
Total Time at 30- 10 ft Stops vs. Bottom Time for
12 VPM-B HL Dives to 100 ft
Ranging from 10 to 120 mins



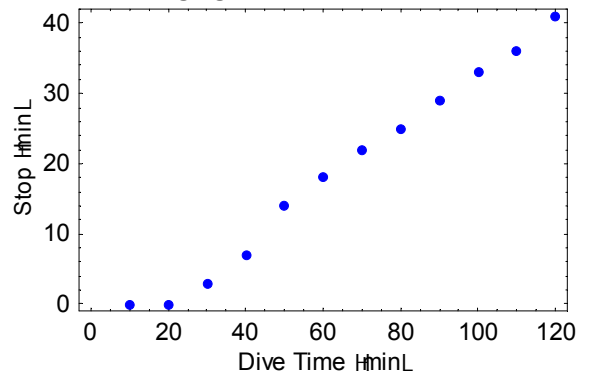
Time at 10 ft Stop vs. Bottom Time for
12 VPM-B HL Dives to 100 ft
Ranging from 10 to 120 mins



Total Time at 20- 10 ft Stops vs. Bottom Time for
12 VPM-B HL Dives to 100 ft
Ranging from 10 to 120 mins



Total Time at 30- 20 ft Stops vs. Bottom Time for
12 VPM-B HL Dives to 100 ft
Ranging from 10 to 120 mins



Eric Maiken, 2003

Limited Distribution