Unit 5: *Dive Tables and Dive Computers*

- Dive Tables
- Equivalent Air Depth and Standard Air Tables
- Using NAUI's RGBM Tables
- The Rule of Halves
- Dive Computers



Student Performance:

By the end of the lesson you will be able to:

- Demonstrate the use of NAUI EAN_x Dive Tables.
- Define Equivalent Air Depth and how it is used with Air Dive Tables.
- Demonstrate how to determine and calculate Equivalent Air Depth.
- Demonstrate the use of the NAUI RGBM Nitrox Dive Tables.
- State the "Rule of Halves" and how to use it in all of your diving.
- Describe the procedures for using dive computers for EAN_x diving.

Dive Tables

- There are many different dive tables in use today
 - -NAUI Dive Tables
 - NAUI RGBM Tables
 - -U.S. Navy Tables
 - DCIEM Tables
 - -Buhlmann based tables
 - -Other Tables

Air Dive Tables

So-called "standard dive tables" are designed for diving while breathing air.



No-required Stop Times

EANx Dive Tables give increased maximum dive times for standard mixes.

		No-F	Required-	Stop Dive	Times fo	r Single D	lives		
Depth fsw	Depth msw	U.S. Navy Air Table	NAUI Air Table	NAUI RGBM Air Table	NAUI/NOAA EAN ₃₂ Table	NAUI RGBM EAN ₃₂ Table	NOAA EAN ₃₆ Table	NAUI EAN ₃₆ Table	NAUI RGBM EAN ₃₆ Table
30	9	\$10	130	150	310	150	unlimited	250	150
40	12	200	130	110	310	150	405	250	150
50	15	100	- 11	11	200	115	310	200	150
60	18	60	55	55	100	\$5	100	10	115
71	21	50	45	40	61	61	100	60	85
80	24	40	35	38	50	47	60	60	60
90	27	30	25	25	40	38	50	60	46
100	31	25	22	20	38	38	40	40	35
110	33	20	15	16	25	25	30	30	\$1
120	36	15	12	13	25	20	P0 ₂ > 1.6	P0 ₂ >1.6	P0 ₂ >1.6
130	40	11	8	11	12	N/A	P0 ₂ > 1.6	P0 ₂ >1.6	P0 ₂ >1.6

Enriched Air Nitrox Dive Tables

Enriched Air Nitrox Tables





Enriched Air Nitrox Dive

Tables continued

NAUI EAN Dive Table Rules

- Treat each dive as a square profile dive, with the deepest point reached on the dive being used as the depth for the whole dive.
- If the exact depth or time does not appear on the table, round up to the next greater number.
- The tables assume an ascent rate of 30 feet/9 meters per minute.
- Planning repetitive dives progressively shallower will yield shorter required surface interval times.
- The required surface interval between two separate dives is 10 minutes; the minimum recommended surface interval is one hour.
- The tables are designed to be used at sea-level atmospheric pressure, and adjustments must be made for altitudes above about 1000 feet/300 meters.
- If flying or ascending to altitude after diving, wait 12 hours after a single dive and 18 hours after a repetitive dive series.

Equivalent Air Depth and Standard Air Tables

- Equivalent Air Depth is determined by the partial pressure of nitrogen that the diver is actually breathing
 - Because nitrox has a lower fraction of nitrogen than air, the nitrogen partial pressure will also be less than with air for any given depth, and the diver's equivalent depth for nitrogen absorption will also be less than with air.
 - It is not the actual depth, but the partial pressure of nitrogen in the breathing gas that matters.



- EAD Example:
 - If you were breathing a mixture that is 36% oxygen, then the nitrogen percentage would be 64%, and the nitrogen fraction would be 0.64.
 - When you dive with this mixture, you expose yourself to 64/79ths the nitrogen partial pressure that you would encounter if breathing air.
 - Therefore, you can consider your depth to be 64/79ths (roughly 80%) of the absolute pressure that you would encounter at your actual depth if you were breathing air.

Equivalent Air Depth by Table (imperial)

Equivalent Ai	r Dept	h (in f	sw)												
Percent O ₂	26%	27%	28%	29 %	30%	31%	32%	33%	34%	35%	36%	37%	38%	39%	40%
EAD fsw															
40	44	46	47	48	49	50	51	53	54	55	57	58	60	61	63
50	5	56	58	59	60	62	63	64	66	67	69	71	72	74	76
60	66	67	69	70	71	73	75	76	78	80	81	83	85	87	89
70	76	78	80	81	83	84	86	88	90	92	94	96	S 8	100	99
80	87	89	90	92	94	96	98	100	102	104	106	108	105	102	
90	98	100	101	103	105	107	109	112	114	116	113	109			
100	108	110	112	114	117	119	121	123	122	117					
110	119	121	123	126	128	130	132	127							
120	130	132	134	137	139	137									
130	141	143	145	148	143										
MOD/1.4 ata	145	138	132	126	121	116	111	107	102	99	95	91	88	85	82
MOD/1.6 ata	170	162	155	149	143	137	132	127	122	117	113	109	105	102	99

Equivalent Air Depth by Table (metric)

Equivale	nt Air I	Depth	(in ms	W)											
Percent O ₂	26 %	27%	28%	29%	30%	31%	32%	33%	34%	35%	36%	37%	38%	39%	40%
EAD msw															
12	13	13	14	14	14	15	15	16	- 16	- 16	17	17	18	11	19
15	16	17	17	17	18	18	- 19	19	21	20	20	21	21	22	22
18	19	Z	20	21	21	22	22	23	23	24	24	25	25	26	26
21	23	23	24	24	25	25	26	26	27	27	28	28	28	31	30
24	26	26	27	27	28	28	29	30	31	31	32	32			
27	29	31	31	31	31	32	33	33	34	35					
31	32	33	33	34	35	35	36	37	37						
33	36	36	37	37	38	39	39	40							
36	39	39	40	41	41										
48	43	44	44	45											
MOD/1.4 ata	43	41	40	38	36	35	33	36	31	31	28	27	26	25	25
MOD/1.6 ata	51	49	47	45	43	41	40	38	37	35	34	33	32	31	30

Calculating Equivalent Air Depth

- Equivalent air depth can be calculated in discrete steps, or the procedure can be combined into a single formula.
- Step 1: Determine the absolute pressure at the depth to which you will be diving.
- Step 2: Apply the nitrogen "credit" that your nitrox blend gives you.
- Step 3: Convert this air-equivalent absolute pressure to an equivalent air depth

- Step 1:
- P ata = (D fsw / 33 fsw/atm) + 1 atm
- Step 2:
- $P ata_{EAD} = (F_{in mix} / F_{in air}) \times P ata$
- Step 3:
- EAD fsw = (P ata_{EAD} 1 atm) x 33 fsw/atm

Calculating EAD

– Example: What is the equivalent air depth for a diver diving with EAN₃₂ to a depth of 80 feet/24 meters?

Step 1: Find the absolute pressure at 80 fsw using the formula from Chapter 2: or = 3.42 ata

Calculating EAD

Step 2: Apply your nitrogen "credit." Since you are diving with EAN₃₂, the nitrogen fraction of your mix is 0.68 (= 1.0 - 0.32). Your air-equivalent absolute pressure is set by the ratio between the fraction of nitrogen in your mix and the fraction of nitrogen in air, or:

P ata (air equiv) = (0.68/0.79) x 3.42 ata = 2.94 ata

- Calculating EAD
 - Step 3: Convert 2.94 ata to an equivalent air depth:
 - D fsw = (P ata 1 atm) x 33 fsw / atm
 - D fsw = (2.94 ata 1 atm) x 33 fsw / atm = 64 fsw
 - You would use for 70 feet / 21 meters on your dive tables.

Calculating EAD using a single formula

EAD fsw = $\left(\frac{(D \text{ fsw} + 33 \text{ fsw}) \text{ x FN}_2}{0.79}\right)$ - 33 fsw EAD fsw = $\left(\frac{(D \text{ fsw} + 33 \text{ fsw}) + (1 - \text{FO}_2)}{0.79}\right)$ - 33 fsw

Calculating EAD with the OCEANx

To find equivalent air depth with the OCEANx calculator, dial-in the oxygen percentage into the upper window. The long window immediately below shows the maximum actual depth to be used with each equivalent air depth, which is printed immediately to the right.



- NAUI RGBM Dive Tables are "No-Calculation" tables and do not require use of letter groups, a surface interval credit table, or residual nitrogen times, thus making repetitive dive planning extremely easy and straightforward.
- NAUI RGBM Dive Tables have been prepared for EAN₃₂ and EAN₃₆ as well as for air diving. The sea-level tables provide dive-planning information for altitudes up to 2000 feet/610 meters.
- Additional sets of tables are available for diving at altitudes between 2000 and 6000 feet/610 to 1829 meters and for 6000 and 10,000 feet/1829 to 3048 meters.

The second	sule	Red	load Gra	diante	Bubble N	odel (RC	BIO					
			Dive '	Tabl	le - E/	AN 32	8700 I.					
1 1	10	f s	eaLev	el to :	2.000 ft	/610 m						
	DUCATE	ON										
	D	IVE TW	0		DIVE T	HREE						
NUT	MAXD	EPTHS	NET	MAX	DEPTH	6 MD	r					
inusa 20	ESW 20	mew	minutes	150	105	a minu	100					
25	75	23	47	- 40	12	15	<u> </u>					
30	70	21	60	40	12	150	,					
38	65	20	60	-40	12	150)					
47	60	18	85	-40	- 12	150)					
-60	55	17	85	-40	12	150						
85	50	15	115	-40	12	150	4					
150	-49 50	12	150	- 40	12	15						
desig	ned for	scuba	dives	empl	oving l	EAN 32						
lons of	n the bar	dk and s	ook ren	nor he	doing b	atora usi	Inn					
141.00	Pyen st	int com	niances	with th	his table	auti not						
	al dance	of date	manage	ine ei	-image		· · ·					
AN 32.			COLUMN STOCK	1011.34	LONG PROPERTY.							
ntee av	Di o mir M	R.NO.COM		U	U		×	Red	Divo	dent Bu Tablo	ble Mod	el (RGBW)
nto e av	geome te	e worsen		0				Red E S	Dive Dive Sea Lev	dient Bu Table el to 2,6	- EAN 000 ft/	el (RGBM) <mark>1 36</mark> 610 m
ntee av	fin o nue se	CNO1348		0			*	Red E S	Dive Dive Sea Lev	dient Bu Table el to 2,0 Di	bble Mod - EAN 000 ft / 0	el (RGBW) 1 36 610 m REE
ntoo ay	geomete	CNOOR				U W LOUGH NET			Dive Dive Sea Lev	dient Bu Table el to 2,0 Di MAX C	ble Mod - EAN 000 ft / 0 VE THIS	el (RGBM) 1 36 610 m REE
ntoo an	fin o me ne	C.NO.COM		D D D D D D D D D D D D D D D D D D D				Red SOM SEPTHS MW	Dive Dive Sea Lev VO MDT minutes	dient Bu Tablo el to 2,0 Di MAX 0 Isw	VE THE	el (RGBW) 1 36 610 m REE Mot minutes
ntala an Integ	i fe o me te	CNO DISC		D UAR D HAR D HAR D	ATTY IN IVE OF SPTHS MWW 33	U V DUGH NET Minutes 31		Red Solve Ty Depths May 23	Nored Gra Dive Sea Lev VO UDT Ninutas 60	dient Bu Table el to 2,0 MAX 1 Iso 50	bble Mod - EAN 000 ft/ (VE THE SEPTHS EISW 15	el (RGBM) 36 610 m REE Mot minutas 150
ntala an Intala an	fin o une re	CHOOME		0 10 10 100	ATY THE IVE OF SPTHS MOW 213 31	NET Minutes 31 - 35	UAX C IOUCAN UAX C IOU IOU IOUCAN	Red Solve TV SEPTHS Mission 23 21	No ed Gra Dive Sea Lev VO NDT Ninutes 60 60	dient Bu Table el to 2,6 MAX 1 19W 50 00	blie Mod - EAN 000 ft/ VE THE EPTHS EISW 15 15	el (RGBM) 36 610 m REE Mor minutes 150 190
nto e an	-prome in			0 10 10 10 10 50	ATY THE FIVE OF SPTHS MWW 33 31 27	NDT Minutes 31 35 45	UAX D UAX D UAX D UAX D UAX D UAX D UAX D UAX D	Red SIDEN S SIDEN SIDEN S SIDEN SIDEN S SIDEN SIDEN S SIDEN SIDEN SIDE	Dived Gra Dive Sea Lev VO MDT Minutes 60 60 85	dient Bu Table el to 2,0 MAX 1 MAX 1 1990 50 50	bbie Mod - EAN 000 ft/ (VE THE DEPTHS FROW 15 15	el (RGBM) 36 510 m 8EE MOT minutes 150 150
ntae av	(prome te			0 10 200 100 100 100 100 100 100 100	ATY THE FIVE OF SPTHS 01 23 21 27 24	NDT Minutes 31 35 45 00	0000411 0000410 0000410 0000410 0000410 0000400 00000000	Red E ONVETV DEPTHS MOW 23 21 21 28 18	Noted Gra Dive Sea Lev VO MDT MIDT MIDT MIDT MIDT S S 85 85 85	dient Bu Table el to 2/ MAX 1 MAX 1 MAX 2 MAX 3 MAX 2 MAX 3 MAX 3	bbie Mod - EAN 000 ft // VE THIS FFTHS	el (RGBW) 36 510 m REE MOT minutes 150 150 150 150
ntee av	(prome te			0 10 10 10 10 10 10 10 10 10 10 10 10 10	ATP THE TVE OF CEPTHS 33 31 27 24 21	NDT Winuss 31 35 46 00 95	00000000000000000000000000000000000000	Red E SOVETV SEPTHS MAW 23 24 24 24 18 17	Noted Gra Dive Sea Lev WD MDT minutes 60 60 85 85 85 85 115	dient Bu Table el to 2,6 MAX 5 10W 50 50 50 50 50	bbie Mod - EAN 000 ft.// VE THIS 000 ft.// VE THIS 15 15 15 15 15 15	el (RGBW) 36 610 m REE MOT Minutes 150 150 150 160
ntee av	() o m 10	22		0 VE 3AA D NA 2 D Faw 110 50 80 70 60	ATTY THE IVE OF CEPTHS 33 30 27 24 21 18	0 W DUGH NE NDT Minutes 31 35 46 00 85 115	UAX 0 100CA11 00CA11 00CA11 10	Field Field FIELD FI	Nuced Gra Divo Sea Lev VO UDT MIDT MIDU 60 60 85 85 85 115	dient Bu Table el to 2,6 MAX 5 10W 50 50 50 50 50 50 50	bbie Mod - EAN 000 ft// VE THI 000 ft// VE THI 000 ft// 15 15 15 15 15 15 15 15 15 15	el (RGBW) 3 36 610 m REE MOT minutus 150 150 150 150 150 150 150 150
ntoo ax	() o an in	2		0 100 100 100 100 100 100 100 1	21 21 21 21 15	0 W DUGN NE NDT Minutes 31 35 46 60 85 115 150	100CAM 100CAM 100 100 100 100 100 100 100 100 100 10	Red E S DIV E TV DIV	исе Gra Divo Sea Lev Иот иют 60 60 85 85 85 115 115 150	dient Bu Table el to 2,/ MAX 5 50 50 50 50 50 50 50	bbie Mod - EAN 000 ft// VE THI 000 ft// VE THI 000 ft// 15 15 15 15 15 15 15 15 15 15	el (RGBW) 4 36 610 m 8EE 400 150 150 150 150 150 150 150 1
ntoo ax	de oue e	3		0 VE 1A D 100 100 100 100 100 100 100	ATY THE ATY THE IVE OF SPTHS 201 27 24 21 18 15 table is	NET MIDT Minutes 31 35 45 45 85 115 150 s desig	000CAM 000CAM 000CAM 000 000 000 000 000 000 000 000 000 0	Red E DDN S DDV S S DDV S S S S S S S S S S S S S	Dive Sea Lev MDT MIDT MIDT MIDU 60 85 85 115 115 150 dives	dient Bu Table el to 2,/ MAX 5 50 50 50 50 50 50 50 50 50	bble Mod - EAN 000 ft// VE THI 000 ft// VE THI 15 15 15 15 15 15 15 15 15 15	el (ROBW) 4 36 610 m 8EE 400 150 150 150 150 150 150 150 1
ntao av	de oue e	2		0 00 EAA 0 00 EAA 1100 1000 50 50 50 50 This aad th	ATY THE IVE OF SPTHS 30 27 24 21 18 15 table is e msru	NET MIDT Minutes 31 35 45 60 85 115 150 s desig ctions o	UAX D UAX D UAX D UAX D UAX D UAX D UAX D UAX D 000 000 000 000 000 000 000 000 000 0	Field Fi	Auced Grave Sea Leventon Monthead Month	dient Bu Table el to 2,6 MAX 1 50 50 50 50 50 50 50 50 50 50 50 50 50	bble Mod - EAN 000 ft// VE THI 000 ft// VE THI 000 ft// 15 15 15 15 15 15 15 15 15 15	el (RGBW) 36 610 m REE UDT minutus 150 150 150 150 150 150 150 150
ntoo av		2		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ATY THE FITY THE SPTHS 30 27 24 21 18 15 table is 800 or 800 or	NET Minutes 31 35 45 60 85 115 160 160 160 160 160 160 160 160 160 160	NAX 0 100-CAT	Red E S DIV E TY DEPTHS DEPTHS 23 21 23 21 23 21 23 21 23 21 25 16 17 15 16 17 15 16 17 16 17 16 17 17 16 17 17 17 17 17 17 17 17 17 17	Mored Graves	dient Bu Table el to 2,6 MAX 1 50 50 50 50 50 50 50 50 50 50 50 50 50	bbie Mod - EAN 000 ft// VE THIS FIEW 15 15 15 15 15 15 15 15 15 15	el (RGBW) 4 36 610 m 8EE MOT 150 150 150 150 150 150 150 150
mbao an		2	-	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ATY TH TVE OF SPTHS SPTHS 23 24 24 24 24 18 15 15 16 15 16 16 10 20 21 21 21 21 21 21 21 21 21 21	NET Minutes 31 35 45 60 85 115 160 85 115 160 85 116 160 85 116 160 85 116 160 85 116 160 85 116 160 85 116 160 85 116 116 116 116 116 116 116 116 116 11	UAX C UAX C UAX C Tow 80 70 65 60 60 65 60 60 65 60 60 65 60 60 65 60 60 65 60 60 65 60 60 65 60 60 65 60 60 65 60 60 60 60 60 60 60 60 60 60 60 60 60	Red E S DIV E TY DEPTHS DEPTHS 23 24 18 17 15 14 14 14 14 14 14 14 14 14 14	VO VO VO VO VO VO VO VO VO VO VO VO VO V	dient Bu Table el to 2,/ MAX 5 MAX 5 50 50 50 50 50 50 50 50 50 50 50 50 50	bbie Mod - EAN 000 ft// VE THIS FROM 15 15 15 15 15 15 15 15 15 15	el (RGBW) 36 610 m 8EE 400 150 150 150 150 150 150 150 1
	(Br o une re	2	T T	D NAX D NAX	ATTY THE TVE OF SPT HS DISW 30 27 24 21 18 15 15 15 16 19 10 10 10 10 10 10 10 10 10 10 10 10 10	NDT minutes 31 35 46 00 85 115 160 a desig ctions o EAN 35, rankee an	UAX 1 100CAT 100CAT 100CAT 100CAT 100CAT 80 70 65 60 65 60 65 50 70 65 60 65 50 70 65 60 65 50 70 65 60 65 50 70 65 60 65 60 60 65 60 60 60 60 60 60 60 60 60 60 60 60 60	Field Fi	Auced Gro Dive Sea Lev MDT minutes 60 60 85 85 115 150 150 150 150 150 100 100 100 10	dient Bu Table el to 2,4 MAX 5 19w 50 50 50 50 50 50 50 50 50 50 50 50 50	bbie Mod - EAN 000 ft // VE THIS PETHS 15 15 15 15 15 15 15 15 15 15	el (RGBW) 4 36 510 m 8EE 150 150 150 150 150 150 150 150
	(0 o m in	22	Tr	D NAX 0 Few 110 50 50 This and the UNAX 0	ATP THE SPTHS SPTHS SPTHS 21 21 21 18 15 table in construction able or guar	NDT Minutes 31 45 45 150 s desig ctions o EAN 35, tarrice an	UAX D UAX D	Red EDW S SOUPETHS MINW 23 24 28 18 17 15 14 14 r souba eck and s incl com e of data	Model Grave Sea Lev MDT MIDT minutes 60 85 85 85 115 115 150 150 150 150 150 150 150 15	dient Bu Table el to 2,4 MAX 1 MAX 1	bbie Mod - EAN 000 ft // VE THIS FETHS 15 15 15 15 15 15 15 15 15 15	el (RGBW) 1 36 10 m 8EE 100 150 150 150 150 150 150 150

continued

- The important RGBM table rules are:
 - A minimum surface interval of one hour is required between each dive.
 - If the actual dive depth is not listed, round up to the next greater depth.
 - The depth of each repetitive dive must be no greater than the depth shown on the row immediately to the right of the previous dive's depth; of course, it may be shallower than this maximum repetitive-dive depth.

continued

- The important RGBM table rules are:
 - As the tables are designed, there can be no shallow dive followed by a deeper dive.
 - The maximum ascent rate is 30 feet/9 meters per minute.
 - All dives require a 3-minute safety stop at 15 feet (± 3 feet)/5 meters (± 1 meter)

DIVE SAFETY THROUGH EDUCATION

continued

- The important RGBM table rules are:
 - On the sea level to 2,000 feet tables, no more than three repetitive dives within a 12-hour period. In actual practice, the "third dive" may be a series of repetitive dives not exceeding the total maximum dive time of 150 minutes.
 - The flying after diving rule is to wait at least 12 hours after a single dive within the prior 18hour period, 15 hours after two dives, and 18 hours after three dives.

continued

- Dive example (using EAN32)
 - Dive 1: 24 m/80 feet for 47 minutes
 - 1hour Surface Interval
 - Dive 2: 18 m/60 feet for 85 minutes
 - 1 hr Surface Interval
 - Dive 3: 12 m/40 feet for up 150 minutes

DIVE SAFETY THROUGH EDUCATION

continued

- When using the NAUI RGBM Tables, you may also switch tables from leaner to richer oxygen fractions from dive one to dive two (or dive two to dive three) by simply following the maximum depth constraints as you move between the appropriate dive tables.
- For example, it is possible to use air and the NAUI RGBM Air Table on Dive One, then switch to EAN₃₆ and use the RGBM EAN₃₆ Table on Dive Two.

Rule of Halves

 When ending any no-decompression dive in excess of 12 meters / 40 feet, halve the distance from the dive's deepest depth to the surface. Ascend to that depth and make a one-minute safety stop. Then continue your ascent to the 5 meter/15 foot safety stop and complete the last two minutes of your three-minute safety stop at 5 meters/15 feet.

Dive Computers and Nitrox

- Dive computers perform real time dive calculations.
- Generally, their algorithms are quite conservative.
- Because they sample the diver's depth and dive time every few seconds and recalculate nitrogen absorption over a range of theoretical tissue compartments, divers enjoy extended dive times when using a dive computer.
- In effect, the diver receives "credit" for the shallow portions of the dive, which is not possible with the "square-profile" assumptions of dive tables.

Dive Computers and Nitrox

continued

- Two basic options
 - Use a Nitrox capable computer
 - Use an Air capable computer to increase your safety margins.

Note: Currently, many manufacturers have incorporated the NAUI RGBM algorithms as well as the NAUI Rule of Halves into their dive computers.

End of Unit 5 Dive Tables and Dive Computers

- Dive Tables
- Equivalent Air Depth and Standard Air Tables
- Using NAUI's RGBM Tables
- The Rule of Halves
- Dive Computers



Student Performance:

By the end of the lesson you will be able to:

- Demonstrate the use of NAUI EANx Dive Tables.
- Define Equivalent Air Depth and how it is used with Air Dive Tables.
- Demonstrate how to determine and calculate Equivalent Air Depth.
- Demonstrate the use of the NAUI RGBM Nitrox Dive Tables.
- State the "Rule of Halves" and how to use it in all of your diving.
- Describe the procedures for using dive computers for EAN_x diving.