

MATHEMATICAL EVALUATION
OF
MULTI-LEVEL DIVING

by

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DISCLAIMER

The suggestions made in this paper for the modification of the multi-level diving technique are based solely on mathematical evaluation and have not been subjected to testing for validation.

The use of any multi-level diving technique should be discouraged until testing has validated an acceptable technique.

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ABSTRACT

Even with the increase in multi-level diving by the diving community there has been no attempt to validate the safety of the various techniques used. The authors analyzed 101 multi-level dives using the mathematical model for the Navy's no-decompression tables. Our initial results show that the safety of the specific multi-level diving technique studied here may be questionable.

INTRODUCTION

Over the past few years people in the diving community have been exposed to a new diving technique called *Step Diving*, or *Multi-Level* diving. This technique allows divers to extend their bottom time past the Navy's no-decompression limits and still surface without any decompression. The question to be considered is: is this type of diving technique safe to the divers who are practicing it? The answer to this question could affect a trend that is becoming more pronounced each year in the diving community. Already at some Caribbean resorts this type of diving has become common practice. These practices warrant further investigation before they spread into other areas of the diving community.

The step diving or multi-level technique is analyzed in this paper through mathematical evaluation of certain multi-level dive profiles. The Navy's model for nitrogen absorption and elimination in the body is used to check the nitrogen pressure present in the body tissues when the diver surfaces. Calculations were run on a Hewlett-Packard 67 calculator specifically programmed for this study.

One hundred one multi-level dives were evaluated and are presented in this paper. It was found that 55% of the profiles pushed the tissue pressure of nitrogen to above 97% (in at least one tissue group) of the allowed tissue pressure at the surface. All the rest (except one) of the profiles raised the pressure to between 90% and 96% of the maximum allowed pressure.

The conclusion made by this paper is that if this multi-level diving technique is to be used, it must be accompanied by decompression or safety stops to lower the nitrogen pressure before surfacing. This is extremely important for divers in the Caribbean where the nearest decompression chamber may be 24 hours away. What is needed the most is testing of these profiles on divers in controlled laboratory conditions to determine if there are any symptoms of the bends or asymptomatic bubble formations that develop.

THE MULTI-LEVEL DIVING TECHNIQUE

There are a few major multi-level diving techniques used in the diving community today. The technique dealt with in this paper is one presented at IQ-8 (Graver 1976) and is used extensively at many diving resorts.

The simplest way to explain this technique is to run through a sample profile. The following example will show how the Navy no-decompression table is read for a multi-level dive profile. In this technique the diver must remain within the limits marked on the table with a heavy line.

First Step: The diver descends to 110 ft. for 13 min. (Fig. 1).

FIGURE 1

DEPTH (ft.)	NO DECOM- PRESSION LIMITS (Min.)	REPETITIVE GROUPS														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10	-	60	120	210	300											
15	-	85	70	110	160	225	350									
20	-	25	50	75	100	135	180	240	325							
25	-	20	35	55	75	100	125	160	195	245	315					
30	-	15	30	45	60	75	95	120	145	170	205	250	310			
35	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	
50	100	-	10	15	25	30	40	50	60	70	80	90	100			
60	60	-	10	15	20	25	30	40	50	55	60					
70	50	-	5	10	15	20	30	35	40	45	50					
80	40	-	5	10	15	20	25	30	35	40						
90	30	-	5	10	12	15	20	25	30							
100	25	-	5	7	10	15	20	22	25							
110	20	-	-	5	10	12	15	20								
120	15	-	-	5	10	12	15									
130	10	-	-	5	8	10										

Second Step: The diver ascends to 70 ft. According to the theory behind this technique the nitrogen absorbed by the body from a stay at 110 ft. for 13 min. is the same as if the diver had spent 20 min at 70 ft. (Fig. 2). The diver can now stay at 70 ft. for 25 min. and still require no decompression. In this example, the diver stays at 70 ft. for 20 min. (Fig. 3).

Third Step: The diver then ascends to 40 ft. for 40 min., then surfaces without any decompression (Fig. 4).

According to the technique, no decompression was needed (theoretically) and the diver is now in repetitive group K. If the official Navy procedures were followed,

the dive would have been considered a 110 ft. dive for 73 min., requiring 1 hour and 27 minutes of decompression.

FIGURE 2

DEPTH (ft.)	NO DECOM- PRESSION LIMITS (Min.)	REPETITIVE GROUPS														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10	-	60	120	210	300											
15	-	35	70	110	160	225	350									
20	-	25	50	75	100	135	180	240	325							
25	-	20	35	55	75	100	125	160	195	245	315					
30	-	15	30	45	60	75	95	120	145	170	205	250	310			
35	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	
50	100	-	10	15	25	30	40	50	60	70	80	90	100			
60	60	-	10	15	20	25	30	40	50	55	60					
70	50	-	5	10	15	20	30	35	40	45	50					
80	40	-	5	10	15	20	25	30	35	40						
90	30	-	5	10	12	15	20	25	30							
100	25	-	5	7	10	15	20	22	25							
110	20	-	-	5	10	15	20									
120	15	-	-	5	10	12	15									
130	10	-	-	5	8	10										

FIGURE 3

DEPTH (ft.)	NO DECOM- PRESSION LIMITS (Min.)	REPETITIVE GROUPS														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10	-	60	120	210	300											
15	-	35	70	110	160	225	350									
20	-	25	50	75	100	135	180	240	325							
25	-	20	35	55	75	100	125	160	195	245	315					
30	-	15	30	45	60	75	95	120	145	170	205	250	310			
35	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	
50	100	-	10	15	25	30	40	50	60	70	80	90	100			
60	60	-	10	15	20	25	30	40	50	55	60					
70	50	-	5	10	15	20	30	35	40	45	50					
80	40	-	5	10	15	20	25	30	35	40						
90	30	-	5	10	12	15	20	25	30							
100	25	-	5	7	10	15	20	22	25							
110	20	-	-	5	10	15	20									
120	15	-	-	5	10	12	15									
130	10	-	-	5	8	10										

This example shows the attractiveness of the multi-level diving technique to the sport diver. The question is, are we looking at two extremes, where the Navy's method represents ultra-conservative diving and the multi-level technique represents a pushing of the body's tissues to their limit of nitrogen capacity?

FIGURE 4

DEPTH (ft.)	NO DECOM- PRESSION LIMITS (Min.)	REPETITIVE GROUPS														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10	-	60	120	210	300											
15	-	35	70	110	160	225	350									
20	-	25	50	75	100	135	180	240	325							
25	-	20	35	55	75	100	125	160	195	245	315					
30	-	15	30	45	60	75	95	120	145	170	205	270	310			
35	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	
50	100	-	10	15	25	30	40	50	60	70	80	90	100			
60	60	-	10	15	20	25	30	40	50	55	60					
70	50	-	5	10	15	20	25	30	35	40	45	50				
80	40	-	5	10	15	20	25	30	35	40						
90	30	-	5	10	12	15	20	25	30							
100	25	-	5	7	10	15	20	22	25							
110	20	-	-	5	10	15	20									
120	15	-	-	5	10	12	15									
130	10	-	-	5	8	10										

To find if this is the case 101 multi-level dive profiles were evaluated. The profiles chosen were some of the most extreme dives that could be made by using this multi-level technique. The results of these dives did show that the tissue pressures were pushed up to, and in some cases past, their limits. As is seen by the example above, there is a great difference between the multi-level diving technique and the Navy's procedures. This is a large area within which it should be possible to find a technique that is acceptable to sport divers, and yet does not place them on the verge of the bends.

CALCULATION MODEL & PROCEDURES FOR EVALUATION

The Model

Workman developed the model that was used in this paper to evaluate the nitrogen uptake and elimination in divers, and on which the U.S. Navy decompression tables are based (Workman 1965). This model divides the body into six major tissue groups, each having a different rate of nitrogen uptake and elimination. The groups are, the 5, 10, 20, 40, 80, and 120 minute tissues. This designation refers to the "half-time" of the tissues, or the time it would take the nitrogen pressure in the tissue group to reach one-half of its saturated level.

As a diver proceeds through a dive profile, the nitrogen pressure in the body tissues increases. If that pressure is too great when the diver surfaces, then the nitrogen will come out of solution and cause decompression sickness. The body can tolerate a certain amount of saturation in the different tissue groups at the surface. The pressures that the groups can tolerate are called M_o . M_o is different for each tissue group. According to the Workman model, if the pressure in the tissue group is lower than its M_o value, the diver can surface without needing any decompression. If the nitrogen pressure in any one of the tissue groups is above the M_o value for that group, then the diver must take decompression stops in order to reduce the nitrogen pressure in that group. If, in this case, the diver does not take a decompression stop, then the chances of contracting decompression sickness are quite high.

The formula that was used to calculate the nitrogen pressure in the tissue groups is:

$$P_t = P_o + (P_a - P_o) (1 - e^{-.693t/T.5})$$

where:

P_t = Total pressure of nitrogen in the tissue group.

P_o = Initial pressure of nitrogen in the tissue group.

P_a = Ambient partial pressure of nitrogen in the breathing medium.

t = Time exposed to pressure P_a .

$T.5$ = Tissue group, half-time

The M_o values for the six tissue groups are:

5 min. tissues - 104 fsw*	40 min. tissues - 58 fsw
10 min. tissues - 88 fsw	80 min. tissues - 52 fsw
20 min. tissues - 72 fsw	120 min. tissues - 51 fsw

* The nitrogen pressure is in terms of feet of sea water pressure.

Another value that was calculated in this paper was, the percent of the maximum allowed tissue pressure (% of M.A.P.) for each tissue group. For any tissue group:

$$\% \text{ of M.A.P.} = \frac{P_t \text{ after surfacing}}{M_o}$$

This value gives a better indication of what is happening to the different tissue groups. We can use it to predict when the nitrogen pressure in a tissue group is approaching a dangerous level of saturation.

CALCULATION PROCEDURES

In order to calculate the nitrogen pressure in the different tissue groups, a program was developed for a Hewlett-Packard HP-67 programmable calculator. This program is a modification of two previous programs that were developed to calculate non-standard decompression schedules (Bassett 1974). These programs take multi-level dive profiles into account. The program that was developed for this project is listed in Appendix I along with directions for its use. It can calculate the tissue pressures for dive profiles up to 19 steps long with a maximum duration at each step of 999 minutes. It will display the final tissue pressures at the end of the profile, the tissue pressures at the end of each step, or, if the profile includes a combination of dives, it can display the tissue pressures at the end of each dive. The general display sequence is, first - the tissue group half-time, second - the nitrogen pressure in that group, and last - the % of M.A.P. for the tissue group.

One hundred one multi-level dives were selected and run through this program. The results of these profiles are listed in Appendix II. Four criteria were used in selecting the profiles for this study:

1. The profiles were pushed to the limits set by the multi-level diving technique developed by Graver (the dark line on the table, Fig. 1-4).
2. Only one step of the profile was allowed to be a depth greater than 90 ft.
3. Maximum dive time allowed was 60 minutes.
4. Minimum dive time allowed was 30 minutes.

Dives consisting of two, three, and four levels were chosen for this study.

Each profile was recorded directly from the calculator onto the typed page to reduce any chance of copying error. These results were then checked again to correct any mistakes.

RESULTS

The results of this study showed that out of the one hundred one multi-level dives evaluated, 55 of them resulted in nitrogen pressure in at least one of the tissue groups, above 96% of the maximum allowed tissue pressure. Of the remaining 46 profiles, 45 of them gave tissue pressures of between 90% M.A.P. - 96% M.A.P. Only one profile resulted in the nitrogen pressure, in all the tissue groups, being below 90% M.A.P.

DISCUSSION & RECOMMENDATIONS

The results of this study show that the safety of the multi-level dive technique is marginal in its present form. They show that the nitrogen pressure in the tissue groups was raised to a level that is extremely close to the limits that were set by Workman. In fact, eight of these profiles pushed the nitrogen pressure up to and above the M_0 value for one or more of the tissue groups. Thus, this technique is not as safe as it was thought to be. Another factor which must be taken into account when examining the resulting tissue pressures is that the limits (M_0) set by Workman in his model were for Navy divers (males between the ages of 18 and 25 years old, who are in good physical condition). In contrast, the sport diving community has divers of both sexes, all ages, varying fat content, and a wide range of physical conditioning. All these factors have been shown to affect the chances of the diver developing decompression sickness. If we are pushing the divers to the limits set for Navy divers, what are we doing to the female diver, or the 45 year old sport diver with a pot belly who has trouble swimming a length of a pool? It is because the answers to these questions are unknown at this time that we feel the multi-level diving technique presented is unsafe to the diving community in its present form.

However, multi-level diving techniques which would provide divers with more freedom from the strict Navy methods while preventing decompression sickness, could be developed for the general diving community. This paper presents some recommendations to modify the multi-level diving technique. They are based solely on the calculations performed for this paper and have not been tested. What they attempt to accomplish is to keep the nitrogen pressure in all the tissue groups below the 90% M.A.P. level. The recommendations are:

- a. Change the 120 ft. limit to 12 minutes (not 15. min.), the 70 ft. limit to 40 minutes (not 45 min.), and the 60 ft. limit to 50 minutes (not 55 min.). See Fig. 5.
- b. Take a safety decompression stop at 10 ft. for 5 - 15 min.
- c. Try to keep at least one group back from the limits on the table (circled values in Fig. 5), especially female divers, older divers, and less fit divers.
- d. When reading the time spent at a step, the time read should include the time to ascend to the next step. Ex.-If the diver descends to 100 ft. for a 15 min. stop then the 15 minutes should include the descent and the ascent to the next step.

Once again, it should be stressed that these recommendations are based on the calculations done for this paper. What is needed the most in order to develop a multi-level diving technique is controlled testing of divers who have been exposed to these types of profiles to determine if there are any adverse side effects.

FIGURE 5

DEPTH (ft.)	NO DECOM- PRESSION LIMITS (Min.)	REPETITIVE GROUPS														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10	-	60	120	210	300											
15	-	85	70	110	160	225	350									
20	-	25	50	75	100	135	180	240	325							
25	-	20	35	55	75	100	125	160	195	245	315					
30	-	15	30	45	60	75	95	120	145	170	205	250	310			
35	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	
50	100	-	10	15	25	30	40	50	60	70	80	90	100			
60	60	-	10	15	20	25	30	40	50	60	70	80	90	100		
70	50	-	5	10	15	20	30	35	40	50	60	70	80	90	100	
80	40	-	5	10	15	20	25	30	35	40	50	60	70	80	90	100
90	30	-	5	10	12	15	20	25	30	40	50	60	70	80	90	100
100	25	-	5	7	10	15	20	22	25	30	40	50	60	70	80	100
110	20	-	-	5	10	13	15	20	25	30	40	50	60	70	80	100
120	15	-	-	5	10	12	15	20	25	30	40	50	60	70	80	100
130	10	-	-	5	8	10	15	20	25	30	40	50	60	70	80	100

The community needs laboratory testing of multi-level diving techniques. In the meantime, divers continue to perform a diving technique that is potentially dangerous for them and their diving buddies. It is strongly suggested that any diver, who observes a situation in which people are performing this type of diving, inform the other divers of the potential dangers. Tell them not to push their dives up to the limits, and to take a safety stop at 10 ft. for at least 5 minutes. Hopefully, a tested technique that can be used safely by the entire diving community, will become available soon, but until that time divers who are following untested techniques, or are guessing at what "seems right," are playing with decompression sickness.

REFERENCES

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APPENDIX I

DETERMINATION OF N_2 BUILDUP
DURING STEP DIVING

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS	
001	LBL A	35 25 11	Start program to load dive profile. Set step counter to zero.		2	02	Store 20 min. tissue data.	
	STO A	33 11			0	00		
	0	00			STO A	33 11		
	STO 0	33 00		060	7	07		
	CF 0	35 61 00			2	02		
	CF 1	35 61 01		Clear flags.	STO B	33 12		
	1	01			GSB 4	31 22 04		Execute SP #4
	STO I	35 33		Set I register.	4	04		Store 40 min. tissue data.
	RCL A	34 11		Recall first step.	0	00		
010	LBL 1	31 25 01		Store step in (i) Add 1 to counter.	STO A	33 11		Execute SP #4.
	STO (i)	33 24			5	05		
	1	01			8	08		
	STO + 0	33 61 00			STO B	33 12		
	ISZ I	31 34	070		GSB 4	31 22 04		
	RCL I	35 34			8	08		
	1	01			0	00		
	-	51			STO A	33 11	Store 80 min. tissue data.	
	1	01			5	05		
	9	09			2	02		
020	X = Y	32 51	Check against max. number of steps. Enter next step. Last step, warning.	STO B	33 12	Execute SP #4. Store 120 min. tissue data.		
	GTO 2	22 02			GSB 4		31 22 04	
	X \geq Y	35 52			1		01	
	R/S	84			2		02	
	GTO 1	22 01			060		0	00
	LBL 2	31 25 02			STO A		33 11	
	0	00			5		05	
	DSP 9	23 09			1		01	
	-X-	31 84			STO B		33 12	
	X \geq Y	35 52			GSB 4		31 22 04	Execute SP #4.
030	DSP 2	23 02	Set nitrogen partial pressure.	0	00	Clear flags. Sub program (SP) #4.		
	RTN	35 22			ENTER		41	
	LBL B	31 25 12			CF 0		35 61 00	
	.	83			CF 1		35 61 01	
	7	07			090		RTN	35 22
	9	09			LBL 4		31 25 04	
	STO C	33 13			RCL D		34 14	
	2	02			STO E		33 15	
	6	06			1		01	
	.	83			STO I		35 33	
040	0	00	Set initial tissue pressure. Enter 5 min. tissue data. Execute SP #4	LBL 3	31 25 03	Store 10 min. tissue data.		
	7	07			RCL (i)		34 24	
	STO D	33 14			INT		31 83	
	5	05			X = 0		31 51	
	STO A	33 11		100	GSB 7		31 22 07	
	1	01			RCL (i)		34 24	
	0	00			FRAC		32 83	
	4	04			EEX		43	
	STO B	33 12			3		03	
	GSB 4	31 22 04			x		71	
050	1	01	Execute SP #4	2	02	Execute SP #4		
	0	00			LN		31 52	
	STO A	33 11			CHS		42	
	8	08			x		71	
	8	08		110	RCL A		34 11	
	STO B	33 12			÷		81	
	GSB 4	31 22 04			e ^x		32 52	

REGISTERS

0 # steps	1 _d 1.t ₁	2 _d 2.t ₂	3 _d 3.t ₃	4 _d 4.t ₄	5 _d 5.t ₅	6 _d 6.t ₆	7 _d 7.t ₇	8 _d 8.t ₈	9 _d 9.t ₉
S ₀ d ₁₀ .t ₁₀	S ₁ ...	S ₂ ...	S ₃ ...	S ₄ ...	S ₅ ...	S ₆ ...	S ₇ ...	S ₈ ...	S ₉ d ₁₉ .t ₁₉
A Depth	B Time	C Pp N ₂	D 26.07	E N ₂ pressure	I				

Program Description

15

Program Title Determination of N₂ Buildup During Step-Diving

Name Karl E. Huggins

Date 12/27/79

Address 4931 Willis Rd.

City Ypsilanti

State MI

Zip Code 48197

Program Description, Equations, Variables, etc. This program is designed to determine the build-up of N₂ in the six major tissue groups (5, 10, 20, 40, 80, 120 min. half times) during step diving. The formula used for these calculations is the Navy formula for N₂ uptake and elimination:

$$P_t = P_o + (P_a - P_o) \times (1 - EEX(-\ln 2(t)/T-1/2)) \quad \text{where-}$$

P_t = total pressure of N₂ in tissue

P_a = ambient pressure of N₂

P_o = initial pressure of N₂ in the tissues

t = time at depth

T-1/2 = tissue half-time

These final pressures are then compared to the maximum allowed pressure of N₂ for the surface and the percent of maximum is calculated. The normal display for the calculator is:

Tissue Half-time *

N₂ Pressure in those tissues ***

Percent of maximum allowed pressure ***

This can be modified by using either C or D. C will allow the pressure at every step to be displayed, and if the profile consists of more than one dive, D will allow a display of the pressure and percent at the end of each dive.

A readout of the dive profile that has been entered can be obtained by using E. This will give the depth followed by the time for all the steps.

Depth *

Time ***

Operating Limits and Warnings 1) Only 19 steps can be entered into the calculator.

2) "A" must be used in entering the first step of the program and should not be used until the next profile is entered

DO NOT USE THIS SPACE

Program Listing

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
	1	01			GTO 8	22 08	
	X ≤ Y	35 52		170	R↓	35 53	
	-	51			-X-	31 84	Display tissue pressure.
	RCL (i)	34 24			LBL a	32 25 11	
	INT	31 83			RCL I	35 34	
	3	03			1	01	
	3	03			-	51	
120	+	61			STO I	35 33	
	RCL C	34 13			RTN	35 22	
	x	71			LBL 8	31 35 08	
	RCL E	34 15			F1?	35 71 01	
	-	51		180	GTO a	22 31 11	
	x	71			R'	35 53	
	RCL E	34 15			-X-	31 84	
	+	61			GTO a	22 31 11	
	STO E	33 15			LBL 7	31 25 07	SP #7.
	FO?	35 71 00	If FO is set then execute SP #6		F1?	35 71 01	
130	GSB 6	31 22 06			GSB 5	31 22 05	
	RCL I	35 34			RTN	35 22	
	RCL 0	34 00			LBL C	31 25 13	Set flag 0.
	X = Y	32 51			SF 0	35 51 00	
	GTO 5	22 05		190	RTN	35 22	
	ISZ I	31 34			LBL D	31 25 14	Set flag 1.
	GTO 3	22 03			SF 1	35 51 01	
	LBL 5	31 25 05	SP #5		RTN	35 22	
	RCL A	34 11			LBL E	31 25 15	
	PAUSE	35 72	Display tissue half time.		0	00	
140	RCL E	34 15	Display tissue pressure		STO I	35 33	
	-X-	31 84			LBL 9	31 25 09	
	RCL B	34 12			ISZ I	31 34	
	+	81			RCL (i)	34 24	
	EEX	43		200	INT	31 83	Display depth.
	2	02			PAUSE	35 72	
	x	71			RCL (i)	34 24	
	1	01			FRAC	32 83	
	+	61			EEX	43	
	INT	31 84			3	03	
150	DSP 0	23 00	Display % of allowed surface N ₂ press.		x	71	
	-X-	31 84			DSP 1	23 01	
	DSP 2	23 02			-X-	31 84	Display time.
	RTN	35 22			DSP 2	23 02	
	LBL 6	31 25 06	SP #6	210	RCL I	35 34	
	RCL I	35 34			RCL 0	34 00	
	RCL 0	34 00			X ≠ Y	32 61	
	X = Y	32 51			GTO 9	22 09	
	RTN	35 22			0	00	
	R↓	35 53			STO I	35 33	
160	R↓	35 53			RTN	35 22	
	RCL I	35 34					
	1	01					
	+	61					
	STO I	35 33					
	R'	35 53					
	RCL (i)	34 24					
	INT	31 83					
	X = 0	31 51					

LABELS					FLAGS	SET STATUS			
A	B	C	D	E	0	FLAGS		TRIG	DISP
a	b	c	d	e	1	ON OFF		DEG	FIX
0						0	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1						1	<input type="checkbox"/> <input type="checkbox"/>	GRAD <input type="checkbox"/>	SCI <input type="checkbox"/>
2						2	<input type="checkbox"/> <input type="checkbox"/>	RAD <input type="checkbox"/>	ENG <input type="checkbox"/>
3						3	<input type="checkbox"/> <input type="checkbox"/>		n_____

APPENDIX II

ONE HUNDRED ONE
MULTI-LEVEL DIVES

EXAMPLE:

ROW 1	ROW 2	ROWS 3-8					
		TISSUE GROUP PRESSURES					
DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(51)	120(51)
#29	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
<u>DR</u>	80' for 5 min.	95.69	84.30	65.75	49.56	38.89	34.88
60	40' for 40 min.	57.82	59.33	59.69	53.61	44.39	39.58
	% of M.A.P.	56%	68%	83%	93%	86%	78%

ROW 1:

Row 1 contains three pieces of information:

- A. Dive Number (from 1-101)
- B. Decompression Code (either SS, DR, or DE, see Key)
- C. Dive Time (does not include any decompression or safety stop time)

ROW 2:

Row 2 contains the dive profile. The times listed for each depth include the ascent time to the next depth.

ROWS 3-8:

Rows 3-8 contain the information on the nitrogen pressure in the body tissues. The first line contains the tissue half-time and the maximum allowed pressure for that tissue group (eg. 5(104) - the 5 min. tissue group can sustain a maximum nitrogen pressure at the surface of 104 fsw). The following lines contain the nitrogen pressure in the tissue group after the stop on the same line is completed. The final line contains the percent of the maximum allowed pressure for the tissue at the end of the dive profile.

In this case profile #29 has been chosen. The dive profile is as follows:

1. Descent to 110' and ascent to 80' in 15 min.
2. Stay at 80' and ascent to 40' - 5 min.
3. Stay at 40' for 40 min.

We then look at the decompression code which in this case is DR. This code, according to the key, means that decompression is recommended and that the diver should stop at 10' for 10 minutes.

ONE HUNDRED ONE MULTI-LEVEL DIVES

Limits

- A. In order for a change in depth to be considered a step, the change must be a decrease in depth of 20 ft. or more.
- B. Only one step at a depth greater than 90 ft. is allowed per dive.
- C. The maximum depth allowed is 130 ft.
- D. The maximum dive time allowed (not counting decompression or safety stops) is 60 minutes.
- E. The minimum dive time of a profile is 30 minutes.
- F. Times listed with the depths in the profile column include the ascent time to the next step.
- G. Total dive time listed does not include decompression or safety stops.

Key

Dive Number - profiles numbered 1 - 101.

Decompression Code

SS - Safety Stop Needed: Diver should stop at 10 ft. for 5 minutes.

DR - Decompression Recommended: Diver should stop at 10 ft. for 10 minutes before proceeding to the surface.

DE - Decompression Essential: Diver must stop at 10 ft. for a full 15 minutes.

% of M.A.P. - Percent of maximum allowed pressure. Gives the percent of the maximum allowed pressure for the tissue group at the end of the dive profile.

TISSUE GROUP PRESSURES

DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(51)
#1	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DE</u>	90' for 13 min.	96.79	86.05	67.71	51.02	39.79	35.52
31	70' for 10 min.	85.23	83.71	71.71	55.85	43.24	38.09
	% of M.A.P.	82%	96%	100%	97%	84%	75%
#2	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DE</u>	90' for 13 min.	96.79	86.05	67.71	51.02	39.79	35.52
36	60' for 15 min.	76.39	77.92	70.04	56.16	43.89	38.67
	% of M.A.P.	74%	89%	98%	97%	85%	76%
#3	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DR</u>	90' for 13 min.	96.79	86.05	67.71	51.02	39.79	35.52
41	50' for 20 min.	67.52	70.69	66.64	55.28	43.89	38.79
	% of M.A.P.	65%	81%	93%	96%	85%	77%
#4	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DR</u>	90' for 13 min.	96.79	86.05	67.71	51.02	39.79	35.52
60	40' for 39 min.	57.85	59.57	60.27	54.29	44.92	39.98
	% of M.A.P.	56%	68%	84%	94%	87%	79%
#5	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DE</u>	80' for 15 min.	89.97	82.38	66.48	50.79	39.81	35.57
38	60' for 15 min.	75.53	76.62	69.31	55.98	43.91	38.71
	% of M.A.P.	73%	88%	97%	97%	85%	76%
#6	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DR</u>	80' for 15 min.	89.97	82.38	66.48	50.79	39.81	35.57
43	50' for 20 min.	67.10	69.77	66.02	55.12	43.91	38.84
	% of M.A.P.	65%	80%	92%	96%	85%	77%
#7	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DR</u>	80' for 15 min.	89.97	82.38	66.48	50.79	39.81	35.57
60	40' for 37 min.	57.86	59.57	60.11	54.05	44.71	39.82
	% of M.A.P.	56%	68%	84%	94%	86%	79%

TISSUE GROUP PRESSURES

DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(51)
#8	130' for 8 min.	94.89	69.78	50.94	39.35	32.95	30.71
<u>DE</u>	70' for 30 min.	81.58	79.92	70.61	56.39	44.03	38.77
60	40' for 22 min.	58.80	62.51	63.71	56.80	46.40	41.02
	% of M.A.P.	57%	72%	89%	98%	90%	81%

#9	130' for 8 min.	94.89	69.78	50.94	39.35	32.95	30.71
<u>DR</u>	60' for 35 min.	73.64	63.14	66.77	54.87	43.55	38.54
60	40' for 17 min.	59.18	62.43	62.72	55.59	45.48	40.32
	% of M.A.P.	57%	71%	88%	96%	88%	80%

#10	130' for 8 min.	94.89	69.78	50.94	39.35	32.95	30.71
<u>DR</u>	50' for 45 min.	65.63	65.76	62.49	53.55	43.48	38.69
60	30' for 7 min.	55.78	59.61	59.75	53.12	43.85	39.13
	% of M.A.P.	54%	68%	83%	92%	85%	77%

#11	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DE</u>	90' for 5 min.	103.10	90.23	69.70	51.87	40.15	35.74
30	70' for 10 min.	85.69	87.53	78.81	62.62	47.91	41.55
	% of M.A.P.	83%	100%	110%	108%	93%	82%

#12	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DE</u>	90' for 5 min.	103.10	90.23	69.70	51.87	40.15	35.74
35	60' for 15 min.	77.17	79.40	71.23	56.81	44.21	38.87
	% of M.A.P.	75%	91%	99%	98%	86%	77%

#13	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DE</u>	90' for 5 min.	103.10	90.23	69.70	51.87	40.15	35.74
40	50' for 20 min.	67.92	71.73	67.63	55.88	44.19	38.99
	% of M.A.P.	66%	82%	94%	97%	85%	77%

#14	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DR</u>	90' for 5 min.	103.10	90.23	69.70	51.87	40.15	35.74
60	40' for 40 min.	57.85	59.70	60.68	54.77	45.28	40.26
	% of M.A.P.	56%	68%	85%	95%	88%	79%

TISSUE GROUP PRESSURES

DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(51)
#15	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DE</u>	80' for 5 min.	99.15	87.91	68.44	51.21	39.81	35.51
35	60' for 15 min.	76.68	78.58	70.48	56.31	43.92	38.66
	% of M.A.P.	74%	90%	98%	98%	85%	76%
#16	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DR</u>	80' for 5 min.	99.15	87.91	68.44	51.21	39.81	35.51
40	50' for 20 min.	67.67	71.16	67.01	55.42	43.91	38.79
	% of M.A.P.	66%	81%	94%	96%	85%	77%
#17	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DR</u>	80' for 5 min.	99.15	87.91	68.44	51.21	39.81	35.51
60	40' for 40 min.	57.83	59.56	60.36	54.44	45.04	40.08
	% of M.A.P.	56%	68%	84%	94%	87%	79%
#18	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DE</u>	70' for 15 min.	84.83	83.49	71.34	55.46	42.96	37.87
60	40' for 30 min.	58.09	60.90	62.50	56.36	46.32	41.02
	% of M.A.P.	56%	70%	87%	98%	90%	81%
#19	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DE</u>	60' for 25 min.	74.58	75.92	69.70	56.81	44.60	39.25
60	40' for 20 min.	58.73	62.23	63.68	57.06	46.68	41.26
	% of M.A.P.	57%	71%	89%	99%	90%	81%
#20	120' for 12 min.	102.91	79.61	58.33	43.87	35.43	32.42
<u>DE</u>	70' for 25 min.	82.04	81.06	71.68	57.05	44.38	39.00
60	40' for 23 min.	58.68	62.42	63.98	57.26	46.78	41.32
	% of M.A.P.	57%	71%	89%	99%	90%	82%
#21	120' for 12 min.	102.91	79.61	58.33	43.87	35.43	32.42
<u>DE</u>	60' for 30 min.	73.93	74.24	68.12	55.87	44.14	38.95
60	40' for 18 min.	59.01	62.43	63.27	56.35	46.09	40.80
	% of M.A.P.	57%	71%	88%	98%	89%	80%

TISSUE GROUP PRESSURES

DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(51)	120(51)
#22	120' for 12 min.	102.91	79.61	58.33	43.87	35.43	32.42
<u>DR</u>	50' for 40 min.	65.72	66.45	63.76	54.72	44.26	39.26
60	30' for 8 min.	55.03	59.35	60.37	54.08	44.63	39.73
	% of M.A.P.	53%	68%	84%	94%	86%	78%

#23	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
<u>DE</u>	90' for 5 min.	99.64	86.62	67.01	50.21	39.23	35.10
30	70' for 10 min	85.94	83.99	71.21	55.17	42.72	37.70
	% of M.A.P.	83%	96%	99%	96%	83%	74%

#24	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
<u>DE</u>	90' for 5 min.	99.64	86.62	67.01	50.21	39.23	35.10
35	60' for 15 min.	76.74	78.12	69.63	55.53	43.40	38.29
	% of M.A.P.	74%	89%	97%	96%	84%	76%

#25	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
<u>DR</u>	90' for 5 min.	99.64	86.62	67.01	50.21	39.23	35.10
40	50' for 20 min.	67.70	70.83	66.29	54.71	43.42	38.43
	% of M.A.P.	66%	81 %	93%	95%	84%	76%

#26	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
<u>DR</u>	90' for 5 min.	99.64	86.62	67.01	50.21	39.23	35.10
60	40' for 40 min.	57.83	59.48	60.00	53.94	44.63	39.76
	% of M.A.P.	56%	68%	84%	94%	86%	78%

#27	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
<u>DR</u>	80' for 5 min.	95.69	84.30	65.75	49.56	38.89	34.88
35	60' for 15 min.	76.25	77.30	68.88	55.03	43.11	38.08
	% of M.A.P.	74%	88%	96%	95%	83%	75%

#28	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
<u>DR</u>	80' for 5 min.	95.69	84.30	65.75	49.56	38.89	34.88
40	50' for 20 min.	67.45	70.25	65.66	54.25	43.14	38.22
	% of M.A.P.	65%	80%	92%	94%	83%	75%

TISSUE GROUP PRESSURES

VE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(51)	120(51)
9	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
OR	80' for 5 min.	95.69	84.30	65.75	49.56	38.89	34.88
50	40' for 40 min.	57.82	59.33	59.69	53.61	44.39	39.58
	% of M.A.P.	56%	68%	83%	93%	86%	78%
30	110' for 15 min.	102.11	82.25	61.25	45.96	36.66	33.28
OR	70' for 15 min.	83.96	81.68	69.44	54.07	42.11	37.27
50	40' for 30 min.	58.08	60.67	61.83	55.53	45.67	40.52
	% of M.A.P.	56%	69%	86%	96%	88%	80%
31	110' for 15 min.	102.11	82.25	61.25	45.96	36.66	33.28
DE	60' for 25 min.	74.36	75.02	68.35	55.63	43.83	38.69
50	40' for 20 min.	58.71	62.01	63.01	56.23	46.03	40.76
	% of M.A.P.	57%	71%	88%	97%	89%	80%
32	110' for 13 min.	98.64	77.68	57.59	43.60	35.33	32.36
DE	70' for 25 min.	81.91	80.72	71.37	56.88	44.29	38.95
50	40' for 22 min.	58.82	62.69	64.06	57.13	46.62	41.18
	% of M.A.P.	57%	72%	89%	99%	90%	81%
33	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.69
DE	80' for 5 min.	94.70	86.48	69.34	52.53	40.79	36.24
40	60' for 15 min.	76.12	78.07	71.01	57.33	44.77	39.33
	% of M.A.P.	74%	89%	99%	99%	87%	78%
34	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.69
DE	80' for 5 min.	94.70	86.48	69.34	52.53	40.79	36.24
45	50' for 20 min.	67.39	70.80	67.46	56.35	44.73	39.44
	% of M.A.P.	65%	81%	94%	98%	87%	78%
35	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.69
OR	80' for 5 min.	94.70	86.48	69.34	52.53	40.79	36.24
50	40' for 35 min.	57.96	60.22	61.14	54.87	45.20	40.16
	% of M.A.P.	56%	69%	85%	95%	87%	79%

TISSUE GROUP PRESSURES

DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(51)	120(51)
#36	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.69
<u>DE</u>	70' for 15 min.	83.72	82.77	71.98	56.57	43.85	38.56
60	40' for 25 min.	58.48	62.11	63.68	56.96	46.54	41.13
	% of M.A.P.	57%	71%	89%	99%	90%	81%
#37	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.69
<u>DE</u>	60' for 25 min.	74.30	75.56	70.15	57.74	45.42	39.90
60	40' for 15 min.	59.75	64.00	65.09	57.72	46.92	41.38
	% of M.A.P.	58%	73%	91%	100%	91%	82%
#38	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.69
<u>DR</u>	50' for 30 min.	66.11	68.04	65.57	55.84	44.80	39.60
60	30' for 10 min.	53.86	58.90	60.94	54.88	45.22	40.17
	% of M.A.P.	52%	67%	85%	95%	87%	79%
#39	90' for 25 min.	94.95	84.60	67.28	51.07	39.92	35.63
<u>DE</u>	70' for 10 min.	84.76	82.99	71.40	55.89	43.36	38.20
60	40' for 25 min.	58.52	62.15	63.44	56.51	46.14	40.82
	% of M.A.P.	57%	71%	89%	98%	89%	81%
#40	90' for 25 min.	94.95	84.60	67.28	51.07	39.92	35.63
<u>DE</u>	60' for 15 min.	76.15	77.41	69.79	56.20	44.01	38.77
60	40' for 20 min.	58.83	62.60	63.73	56.63	46.18	40.83
	% of M.A.P.	57%	72%	89%	98%	89%	81%
#41	90' for 25 min.	94.95	84.60	67.28	51.07	39.92	35.63
<u>DR</u>	50' for 20 min.	67.41	70.33	66.42	55.32	44.00	48.90
60	30' for 15 min.	51.97	57.04	59.67	54.05	44.70	39.80
	% of M.A.P.	50%	65%	83%	94%	86%	79%
#42	90' for 15 min.	88.28	72.03	54.89	42.34	34.74	31.97
<u>DE</u>	70' for 25 min.	81.59	79.72	70.24	56.07	43.82	38.61
60	40' for 20 min.	59.16	63.18	63.95	56.54	46.02	40.69
	% of M.A.P.	57%	72%	89%	98%	89%	80%

TISSUE GROUP PRESSURES

VE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(51)	120(51)
3	90' for 15 min.	88.28	72.03	54.89	42.34	34.74	31.97
OR	60' for 30 min.	73.70	73.29	66.90	54.96	43.60	38.57
50	40' for 15 min.	59.67	63.19	63.16	55.58	45.32	40.16
	% of M.A.P.	58%	72%	88%	96%	88%	79%
4	90' for 15 min.	88.28	72.03	54.89	42.34	34.74	31.97
OR	50' for 40 min.	65.66	65.97	62.90	53.96	43.77	38.90
50	30' for 5 min.	57.71	61.23	60.81	53.61	44.02	39.21
	% of M.A.P.	56%	70%	85%	93%	85%	77%
5	90' for 12 min.	83.70	66.22	50.26	39.42	33.09	30.83
DE	70' for 30 min.	81.41	79.48	70.37	56.43	44.14	38.87
50	40' for 18 min.	59.63	63.93	64.48	56.76	46.10	40.73
	% of M.A.P.	58%	73%	90%	98%	89%	80%
6	90' for 12 min.	83.70	66.22	50.26	39.42	33.09	30.83
OR	60' for 35 min.	73.55	72.83	66.57	54.90	43.65	38.64
50	40' for 13 min.	60.29	63.83	63.34	55.46	45.15	40.01
	% of M.A.P.	58%	73%	88%	96%	87%	79%
7	90' for 12 min.	83.70	66.22	50.26	39.42	33.09	30.83
OR	50' for 45 min.	65.61	65.60	62.35	53.58	43.58	38.78
50	30' for 3 min.	60.22	62.63	61.11	53.39	43.74	38.97
	% of M.A.P.	58%	72%	85%	93%	85%	77%
8	80' for 30 min.	88.28	81.37	66.93	51.69	40.54	36.13
DE	60' for 15 min.	75.32	76.26	69.58	56.68	44.55	39.22
50	40' for 15 min.	59.88	64.24	64.75	56.90	46.15	40.76
	% of M.A.P.	58%	74%	90%	99%	89%	80%
9	80' for 30 min.	88.28	81.37	66.93	51.69	40.54	36.13
OR	50' for 20 min.	66.99	69.52	66.25	55.76	44.52	39.34
50	30' for 10 min.	54.07	59.65	61.42	54.80	44.95	39.92
	% of M.A.P.	52%	68%	86%	95%	87%	79%

TISSUE GROUP PRESSURES

DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(51)
#50	80' for 15 min.	81.37	66.93	51.69	40.54	33.77	31.32
<u>DE</u>	60' for 35 min.	73.53	72.89	67.00	55.51	44.16	39.03
60	40' for 10 min.	61.64	65.28	64.26	55.86	45.28	40.08
	% of M.A.P.	60%	75%	90%	97%	88%	79%
#51	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DE</u>	90' for 13 min.	96.79	86.05	67.71	51.02	39.79	35.52
60	70' for 10 min.	85.23	83.71	71.71	55.85	43.24	38.09
	40' for 29 min.	58.16	61.16	62.81	56.57	46.45	41.11
	% of M.A.P.	56%	70%	88%	98%	90%	81%
#52	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DE</u>	90' for 13 min.	96.79	86.05	67.71	51.02	39.79	35.52
60	60' for 15 min.	76.39	77.92	70.04	56.16	43.89	38.67
	40' for 24 min.	58.34	61.51	63.06	56.67	46.48	41.11
	% of M.A.P.	57%	70%	88%	98%	90%	81%
#53	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DR</u>	90' for 13 min.	96.79	86.05	67.71	51.02	39.79	35.52
60	50' for 20 min.	67.52	70.69	66.64	55.28	43.89	38.79
	30' for 19 min.	51.04	55.38	58.50	53.74	44.78	39.94
	% of M.A.P.	50%	63%	82%	93%	87%	79%
#54	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DE</u>	80' for 15 min.	89.97	82.38	66.48	50.79	39.81	35.57
60	60' for 15 min.	75.53	76.62	69.31	55.98	43.91	38.71
	40' for 22 min.	58.52	61.79	63.10	56.52	46.30	40.98
	% of M.A.P.	57%	71%	88%	98%	90%	81%
#55	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
<u>DR</u>	80' for 15 min.	89.97	82.38	66.48	50.79	39.81	35.57
60	50' for 20 min.	67.10	69.77	66.02	55.12	43.91	38.84
	30' for 17 min.	51.41	55.93	58.79	53.75	44.71	39.86
	% of M.A.P.	50%	64%	82%	93%	86%	79%

TISSUE GROUP PRESSURES

DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(51)
#56	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DE</u>	90' for 5 min.	103.10	90.23	69.70	51.87	40.15	35.74
60	70' for 10 min.	85.69	87.53	78.81	62.62	47.91	41.55
	40' for 30 min.	58.13	61.19	63.13	57.01	46.80	41.38
	% of M.A.P.	56%	70%	88%	99%	90%	82%

#57	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DE</u>	90' for 5 min.	103.10	90.23	69.80	51.87	40.15	35.74
60	60' for 15 min.	77.17	79.40	71.23	56.81	44.21	38.87
	40' for 25 min.	58.28	61.51	63.37	57.11	46.83	41.40
	% of M.A.P.	57%	70%	89%	99%	91%	82%

#58	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DR</u>	90' for 5 min.	103.10	90.23	69.80	51.87	40.15	35.74
60	50' for 20 min.	67.92	71.73	67.63	55.88	44.19	38.99
	30' for 20 min.	50.90	55.26	58.70	54.09	45.08	40.17
	% of M.A.P.	49%	63%	82%	94%	87%	79%

#59	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DE</u>	80' for 5 min.	99.15	87.91	68.44	51.21	39.81	35.51
60	60' for 15 min.	76.68	78.58	70.48	56.31	43.92	38.66
	40' for 25 min.	58.26	61.37	63.06	56.79	46.59	41.22
	% of M.A.P.	57%	70%	88%	98%	90%	81%

#60	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
<u>DR</u>	80' for 5 min.	99.15	87.91	68.44	51.21	39.81	35.51
60	50' for 20 min.	67.67	71.16	67.01	55.42	43.91	38.79
	30' for 20 min.	50.89	55.12	58.39	53.76	44.84	39.99
	% of M.A.P.	49%	63%	82%	93%	87%	79%

#61	120' for 12 min.	102.91	79.61	58.33	43.87	35.43	32.42
<u>DE</u>	90' for 10 min.	98.60	88.39	69.70	52.35	40.56	36.05
60	70' for 10 min.	85.68	84.88	73.12	56.97	43.94	38.60
	40' for 28 min.	58.25	61.58	63.52	57.24	46.90	41.44
	% of M.A.P.	57%	70%	89%	99%	91%	82%

TISSUE GROUP PRESSURES

DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(40)
#62	120' for 12 min.	102.91	79.61	58.33	43.87	35.43	32.4
<u>DE</u>	90' for 10 min.	98.60	88.39	69.70	52.35	40.56	36.0
60	60' for 15 min.	76.61	78.74	71.23	57.18	44.57	39.1
	40' for 23 min.	58.45	61.95	63.78	57.34	46.93	41.4
	% of M.A.P.	57%	71%	89%	99%	91%	82%

#63	120' for 12 min.	102.91	79.61	58.33	43.87	35.43	32.4
<u>DR</u>	90' for 10 min.	98.60	88.39	69.70	52.35	40.56	36.0
60	50' for 20 min.	67.63	71.27	67.64	56.22	44.54	39.1
	30' for 18 min.	51.24	55.95	59.34	54.49	45.29	40.1
	% of M.A.P.	50%	64%	83%	94%	88%	80%

#64	120' for 12 min.	102.91	79.61	58.33	43.87	35.43	32.4
<u>DE</u>	80' for 10 min.	92.68	84.44	67.39	51.09	39.90	35.6
60	60' for 15 min.	75.87	77.35	69.85	56.21	43.99	38.7
	40' for 23 min.	58.42	61.67	63.16	56.69	46.46	41.1
	% of M.A.P.	57%	71%	88%	98%	90%	81%

#65	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.2
<u>DE</u>	90' for 5 min.	99.64	86.62	67.01	50.21	39.23	35.1
60	70' for 10 min.	85.94	83.99	71.21	55.71	42.72	37.7
	40' for 30 min.	58.11	60.96	62.46	56.18	46.15	40.8
	% of M.A.P.	56%	70%	87%	97%	89%	81%

#66	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.2
<u>DE</u>	90' for 5 min.	99.64	86.62	67.01	50.21	39.23	35.1
60	60' for 15 min.	76.74	78.12	69.63	55.53	43.40	38.1
	40' for 25 min.	58.27	61.28	62.70	56.29	46.18	40.8
	% of M.A.P.	57%	70%	88%	98%	89%	81%

#67	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.2
<u>DR</u>	90' for 5 min.	99.64	86.62	67.01	50.21	39.23	35.1
60	50' for 20 min.	67.70	70.83	66.29	54.71	43.42	38.1
	30' for 20 min.	50.89	55.04	58.03	53.26	44.43	39.1
	% of M.A.P.	49%	63%	81%	92%	86%	78%

TISSUE GROUP PRESSURES

IVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(51)
68	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
DE	80' for 5 min.	95.69	84.30	65.75	49.56	38.89	34.88
60	60' for 15 min.	76.25	77.30	68.88	55.03	43.11	38.08
	40' for 25 min.	58.25	61.14	62.38	55.96	45.94	40.71
	% of M.A.P.	57%	70%	87%	97%	89%	80%
69	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
DR	80' for 5 min.	95.69	84.30	65.75	49.56	38.89	34.88
60	50' for 20 min.	67.45	70.25	65.66	54.25	43.14	38.22
	30' for 20 min.	50.88	54.89	57.71	52.93	44.19	39.48
	% of M.A.P.	49%	63%	81%	92%	85%	78%
70	110' for 13 min.	98.64	77.68	57.59	43.60	35.33	32.36
DE	90' for 10 min.	97.54	87.42	69.18	52.12	40.46	35.99
60	70' for 10 min.	85.41	84.40	72.75	56.77	43.86	38.54
	40' for 27 min.	58.33	61.78	63.59	57.11	46.74	41.30
	% of M.A.P.	57%	71%	89%	99%	90%	81%
71	110' for 13 min.	98.64	77.68	57.59	43.60	35.33	32.36
DE	90' for 10 min.	97.54	87.42	69.18	52.12	40.46	35.99
60	60' for 15 min.	76.48	78.40	70.92	57.01	44.48	39.10
	40' for 22 min.	58.56	62.18	63.85	57.22	46.77	41.32
	% of M.A.P.	57%	71%	89%	99%	90%	82%
72	110' for 13 min.	98.64	77.68	57.59	43.60	35.33	32.36
DR	90' for 10 min.	97.54	87.42	69.18	52.12	40.46	35.99
60	50' for 20 min.	67.57	71.03	67.38	56.06	44.45	39.22
	30' for 17 min.	51.46	56.31	59.54	54.46	45.18	40.21
	% of M.A.P.	50%	64%	83%	94%	87%	79%
73	110' for 13 min.	98.64	77.68	57.59	43.60	35.33	32.36
DE	80' for 10 min.	91.61	83.47	66.87	50.86	39.80	35.55
60	60' for 15 min.	75.74	77.01	69.55	56.04	43.91	38.70
	40' for 22 min.	58.53	61.88	63.21	56.56	46.30	40.96
	% of M.A.P.	57%	71%	88%	98%	90%	81%

TISSUE GROUP PRESSURES

DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(5)
#74	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.6
<u>DE</u>	80' for 5 min.	94.70	86.48	69.34	52.53	40.79	36.2
60	60' for 15 min.	76.12	78.07	71.01	57.33	44.77	39.3
	40' for 20 min.	58.82	62.77	64.34	57.43	46.82	41.3
	% of M.A.P.	57%	72%	90%	100%	91%	82%
#75	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.6
<u>DR</u>	80' for 5 min.	94.70	86.48	69.34	52.53	40.79	36.2
60	50' for 20 min.	67.39	70.80	67.46	56.35	44.73	39.4
	30' for 15 min.	51.97	57.20	60.29	54.85	45.34	40.3
	% of M.A.P.	50%	66%	84%	95%	88%	80%
#76	100' for 10 min.	85.32	65.57	49.21	38.64	32.63	30.5
<u>DE</u>	80' for 15 min.	88.78	80.89	65.45	50.23	39.53	35.3
60	60' for 15 min.	75.38	76.09	68.70	55.55	43.67	38.5
	40' for 20 min.	58.78	62.28	63.19	56.17	45.89	40.6
	% of M.A.P.	57%	71%	88%	97%	89%	80%
#77	100' for 10 min.	85.32	65.57	49.21	38.64	32.63	30.5
<u>DR</u>	80' for 15 min.	88.78	80.89	65.45	50.23	39.53	35.3
60	50' for 20 min.	67.02	69.40	65.51	54.72	43.67	38.6
	30' for 15 min.	51.93	56.71	59.13	53.59	44.42	39.6
	% of M.A.P.	50%	65%	83%	93%	86%	78%
#78	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.7
<u>DE</u>	70' for 30 min.	81.58	79.92	70.61	56.39	44.03	38.7
38	% of M.A.P.	79%	91%	99%	98%	85%	77%
#79	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.7
<u>DR</u>	60' for 35 min.	73.64	73.14	66.77	54.87	43.55	38.5
43	% of M.A.P.	71%	84%	93%	95%	84%	76%
#80	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.7
<u>DR</u>	50' for 45 min.	65.63	65.76	62.49	53.55	43.48	38.6
53	% of M.A.P.	64%	75%	87%	93%	84%	76%

TISSUE GROUP PRESSURES

IVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(51)
81	130' for 8 min.	94.89	69.78	50.94	39.36	32.95	30.71
SS	40' for 52 min.	57.70	58.00	56.56	50.24	41.91	37.70
60	% of M.A.P.	56%	66%	79%	87%	81%	74%
82	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
DE	70' for 15 min.	84.83	83.49	71.34	55.46	42.96	37.87
30	% of M.A.P.	82%	95%	100%	96%	83%	75%
83	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
DE	60' for 25 min.	74.58	75.92	69.70	56.81	44.60	39.25
40	% of M.A.P.	72%	87%	97%	98%	86%	77%
84	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
DR	50' for 30 min.	66.25	68.29	65.19	54.99	44.02	38.97
45	% of M.A.P.	64%	78%	91%	95%	85%	77%
85	120' for 15 min.	109.02	87.35	64.50	47.77	37.62	33.94
DR	40' for 45 min.	57.77	58.98	59.11	53.13	44.10	39.37
60	% of M.A.P.	56%	68%	83%	92%	85%	78%
86	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
DE	70' for 15 min.	83.96	81.68	69.44	54.07	42.11	37.27
30	% of M.A.P.	81%	93%	97%	94%	81%	74%
87	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
DR	60' for 25 min.	74.36	75.02	68.35	55.63	43.83	38.69
40	% of M.A.P.	72%	86%	95%	96%	85%	76%
88	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
DR	50' for 30 min.	66.14	67.65	64.06	53.91	43.28	38.42
45	% of M.A.P.	64%	66%	81%	93%	84%	76%
89	110' for 15 min.	102.11	82.25	61.30	45.96	36.66	33.28
DR	40' for 45 min.	57.76	58.76	58.43	52.30	43.44	38.86
60	% of M.A.P.	56%	67%	82%	91%	84%	77%

TISSUE GROUP PRESSURES

DIVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(50)
#90	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.6
DE	70' for 15 min.	83.72	82.77	71.98	56.57	43.85	38.5
35	% of M.A.P.	81%	95%	100%	98%	85%	76%
#91	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.6
DE	60' for 25 min.	74.30	75.56	70.15	57.74	45.42	39.9
45	% of M.A.P.	72%	86%	98%	100%	88%	79%
#92	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.6
DE	50' for 30 min.	66.11	68.04	65.57	55.84	44.80	39.6
50	% of M.A.P.	64%	78%	92%	97%	87%	78%
#93	100' for 20 min.	100.13	85.32	65.57	49.21	38.64	34.6
DR	40' for 40 min.	57.84	59.40	59.65	53.44	44.21	39.4
60	% of M.A.P.	56%	68%	83%	93%	86%	78%
#94	90' for 25 min.	94.95	84.60	67.28	51.07	39.92	35.6
DE	70' for 10 min.	84.76	82.99	71.40	55.89	43.36	38.2
35	% of M.A.P.	82%	95%	100%	97%	84%	75%
#95	90' for 25 min.	94.95	84.60	67.28	51.07	39.92	35.6
DE	60' for 15 min.	76.15	77.41	69.79	56.20	44.01	38.7
40	% of M.A.P.	74%	88%	97%	97%	85%	77%
#96	90' for 25 min.	94.95	84.60	67.28	51.07	39.92	35.6
DR	50' for 20 min.	67.41	70.33	66.42	55.32	44.00	38.9
45	% of M.A.P.	65%	80%	93%	96%	85%	77%
#97	90' for 25 min.	94.95	84.60	67.28	51.07	39.92	35.6
DR	40' for 35 min.	57.96	60.05	60.53	54.07	44.56	39.6
60	% of M.A.P.	56%	69%	85%	94%	86%	78%
#98	80' for 30 min.	88.28	81.37	66.93	51.69	40.54	36.2
DE	60' for 15 min.	75.32	76.26	69.58	56.68	44.55	39.2
45	% of M.A.P.	73%	87%	97%	98%	86%	77%

TISSUE GROUP PRESSURES

IVE	PROFILE	5(104)	10(88)	20(72)	40(58)	80(52)	120(51)
99	80' for 30 min.	88.28	81.37	66.93	51.69	40.54	36.13
DE	50' for 20 min.	66.99	69.52	66.25	55.76	44.52	39.34
50	% of M.A.P.	65%	80%	93%	97%	86%	78%

100	80' for 30 min.	88.28	81.37	66.93	51.69	40.54	36.13
DR	40' for 30 min.	58.15	60.63	60.94	54.11	44.46	39.55
60	% of M.A.P.	56%	69%	85%	94%	86%	78%

101	70' for 45 min.	81.26	78.93	69.74	56.01	43.92	38.73
DE	40' for 15 min.	60.62	65.19	64.85	56.39	45.60	40.30
60	% of M.A.P.	59%	75%	91%	98%	88%	80%

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