CHAPTER 9

Air Decompression

9-1 INTRODUCTION

9-1.1 Purpose. This chapter discusses decompression requirements for air diving operations.

9-1.2 Scope. This chapter discusses five different tables, each with its own unique application in air diving. Four tables provide specific decompression schedules for use under various operational conditions. The fifth table is used to determine decompression requirements when a diver will dive more than once during a 12-hour period.

9-2 THEORY OF DECOMPRESSION

When air is breathed under pressure, nitrogen diffuses into various tissues of the body. This nitrogen uptake by the body occurs at different rates for the various tissues. It continues as long as the partial pressure of the inspired nitrogen in the circulatory and respiratory systems is higher than the partial pressure of the gas absorbed in the tissues. Nitrogen absorption increases as the partial pressure of the inspired nitrogen increases, such as with increased depth. Nitrogen absorption also increases as the duration of the exposure increases, until tissues become saturated.

As a diver ascends, the process is reversed. The partial pressure of nitrogen in the tissues comes to exceed that in the circulatory and respiratory systems. During ascent, the nitrogen diffuses from the tissues to the lungs. The rate of ascent must be carefully controlled to prevent the nitrogen pressure from exceeding the ambient pressure by too great of an amount. If the pressure gradient is uncontrolled, bubbles of nitrogen gas can form in tissues and blood, causing decompression sickness.

To reduce the possibility of decompression sickness, special decompression tables and schedules were developed. These schedules take into consideration the amount of nitrogen absorbed by the body at various depths and times. Other considerations are the allowable pressure gradients that can exist without excessive bubble formation and the different gas-elimination rates associated with various body tissues. Because of its operational simplicity, staged decompression is used for air decompression. Staged decompression requires decompression stops in the water at various depths for specific periods of time.

Years of scientific study, calculations, animal and human experimentation, and extensive field experience all contributed to the decompression tables. While the tables contain the best information available, the tables tend to be less accurate as dive depth and time increase. To ensure maximum diver safety, the tables must be strictly followed. Deviations from established decompression procedures are not

permitted except in an emergency and with the guidance and recommendations of a Diving Medical Officer (DMO) with the Commanding Officer's approval.

9-3 AIR DECOMPRESSION DEFINITIONS

The following terms are frequently used when conducting diving operations and discussing the decompression tables.

9-3.1 Descent Time. *Descent time* is the total elapsed time from when the divers leave the surface to the time they reach the bottom. Descent time is rounded up to the next whole minute.

9-3.2 Bottom Time. *Bottom time* is the total elapsed time from when the divers leave the surface to the time they begin their ascent from the bottom. Bottom time is measured in minutes and is rounded up to the next whole minute.

9-3.3 Decompression Table. A *decompression table* is a structured set of decompression schedules, or limits, usually organized in order of increasing bottom times and depths.

9-3.4 Decompression Schedule. A *decompression schedule* is a specific decompression procedure for a given combination of depth and bottom time as listed in a decompression table. It is normally indicated as feet/minutes.

9-3.5 Decompression Stop. A *decompression stop* is a specified depth where a diver must remain for a specified length of time (stop time).

9-3.6 Depth. The following terms are used to indicate the depth of a dive:

- *Maximum depth* is the deepest depth attained by the diver plus the pneumofathometer correction factor (Table 9-1). When conducting scuba operations, maximum depth is the deepest depth gauge reading.
- *Stage depth* is the pneumofathometer reading taken when the divers are on the stage just prior to leaving the bottom. Stage depth is used to compute the distance and travel time to the first stop, or to the surface if no stops are required.

Table 9-1. *Pneumofathometer Correction Factors.*

Pneumofathometer Depth	**Correction Factor**
0-100 fsw	+1 fsw
101-200	+2 fsw
201-300	+4 fsw
301-400	+7 fsw

9-3.7 Equivalent Single Dive Bottom Time. The *equivalent single dive bottom time* is the time used to select a schedule for a single repetitive dive. This time is expressed in minutes.

9-3.8 Unlimited/No-Decompression (No "D") Limit. The maximum time that can be spent at a given depth that safe ascent can be made directly to the surface at a prescribed travel rate with no decompression stops is the *unlimited/no-decompression* or *No "D" limit* (Table 9-6).

9-3.9 Repetitive Dive. A *repetitive dive is* any dive conducted more than 10 minutes and within 12 hours of a previous dive.

9-3.10 Repetitive Group Designation. The *repetitive group designation* is a letter used to indicate the amount of residual nitrogen remaining in a diver's body following a previous dive.

9-3.11 Residual Nitrogen. *Residual nitrogen* is the nitrogen gas still dissolved in a diver's tissues after surfacing.

9-3.12 Residual Nitrogen Time. *Residual nitrogen time* is the time that must be added to the bottom time of a repetitive dive to compensate for the nitrogen still in solution in a diver's tissues from a previous dive. Residual nitrogen time is expressed in minutes.

9-3.13 Single Dive. A *single dive* refers to any dive conducted more than 12 hours after a previous dive.

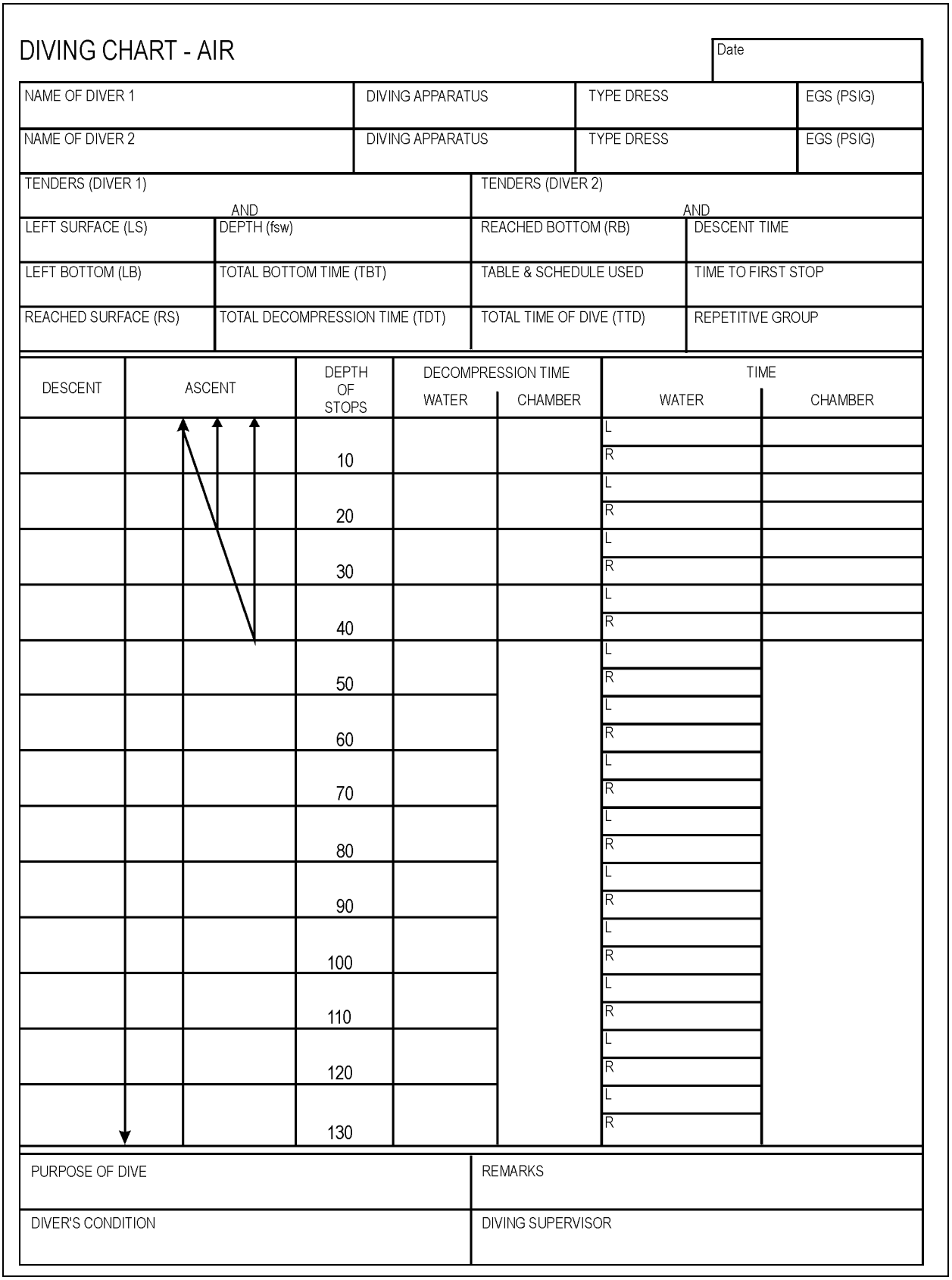
9-3.14 Single Repetitive Dive. A *single repetitive dive is* a dive for which the bottom time used to select the decompression schedule is the sum of the residual nitrogen time and the actual bottom time of the dive.

9-3.15 Surface Interval. The *surface interval is* the time a diver has spent on the surface following a dive. It begins as soon as the diver surfaces and ends as soon as he starts his next descent.

9-4 DIVE RECORDING

Chapter 5 provides information for maintaining a Command Diving Log and personal diving log and reporting individual dives to the Naval Safety Center. In addition to these records, every Navy air dive may be recorded on a diving chart similar to Figure 9-1. The diving chart is a convenient means of collecting the dive data, which in turn will be transcribed in the dive log. Diving Record abbreviations that may be used in the Command Diving Log are:

- LS - Left Surface
- RB - Reached Bottom
- LB - Left Bottom



DIVING CHART - AIR

Date

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
NAME OF DIVER 2	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)

TENDERS (DIVER 1) AND		TENDERS (DIVER 2) AND	
LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
LEFT BOTTOM (LB)	TOTAL BOTTOM TIME (TBT)	TABLE & SCHEDULE USED	TIME TO FIRST STOP
REACHED SURFACE (RS)	TOTAL DECOMPRESSION TIME (TDT)	TOTAL TIME OF DIVE (TTD)	REPETITIVE GROUP

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME		TIME	
			WATER	CHAMBER	WATER	CHAMBER
		10			L R	
		20			L R	
		30			L R	
		40			L R	
		50			L R	
		60			L R	
		70			L R	
		80			L R	
		90			L R	
		100			L R	
		110			L R	
		120			L R	
		130			L R	

PURPOSE OF DIVE	REMARKS
DIVER'S CONDITION	DIVING SUPERVISOR

Figure 9-1. Air Diving Chart.

- R - Reached a stop
- L - Left a stop
- RS - Reached Surface
- TBT - Total Bottom Time (computed from leaving the surface to leaving the bottom)
- TDT - Total Decompression Time (computed from leaving the bottom to reaching the surface)
- TTD - Total Time of Dive (computed from leaving the surface to reaching the surface).

Figure 9-2 illustrates these abbreviations in conjunction with a dive profile.

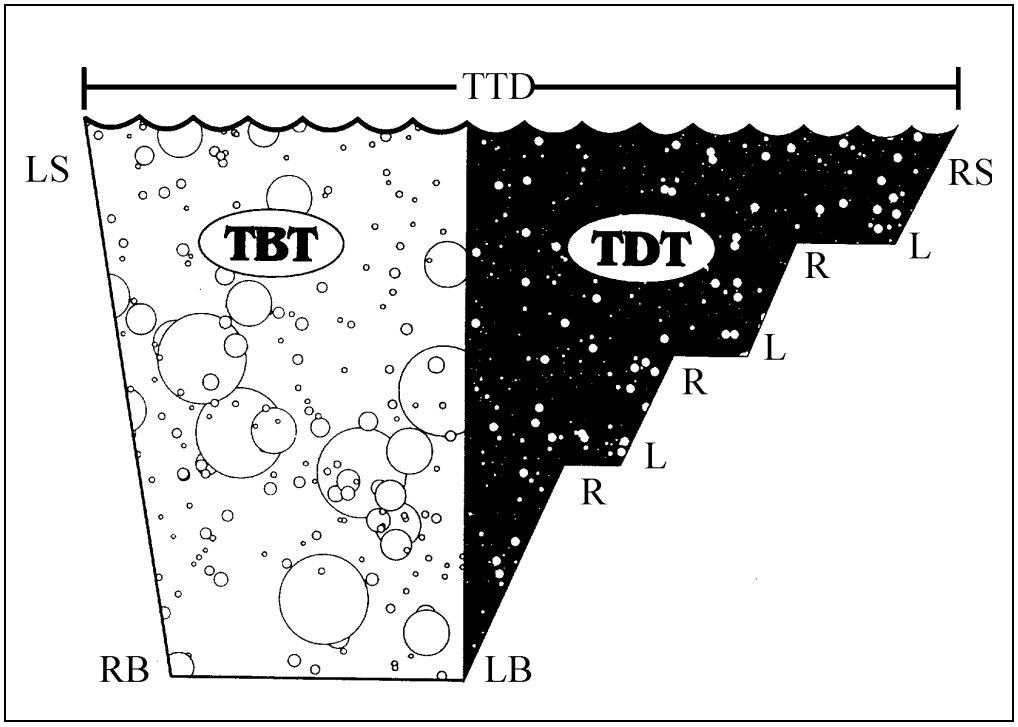


Figure 9-2. Graphic View of a Dive with Abbreviations.

9-5 TABLE SELECTION

9-5.1 Decompression Tables Available. The decompression tables available for U.S. Navy air diving operations are:

- Unlimited/No-Decompression Limits and Repetitive Group Designation Table for unlimited/no-decompression air dives
- Standard Air Decompression Table

- Surface Decompression Table Using Oxygen
- Surface Decompression Table Using Air
- Residual Nitrogen Timetables for Repetitive Air Diving
- Sea Level Equivalent Depth Table

These tables contain a series of decompression schedules or depth corrections that must be rigidly followed during an ascent from an air dive. Each table has specific conditions that justify its selection. These conditions are: depth and duration of the dive, altitude, availability of an oxygen breathing system within the recompression chamber, and environmental conditions (sea state, water temperature, etc.).

The Residual Nitrogen Timetable for Repetitive Air Dives provides information for planning repetitive dives.

The five air diving tables and the criteria for the selection and application of each are listed in Table 9-2. General instructions for using the tables and special instructions applicable to each table are discussed in paragraphs 9-6 and 9-7, respectively.

NOTE **Omitted decompression is a dangerous situation. Procedures for dealing with this situation are discussed in Chapter 21.**

9-5.2 Selection of Decompression Schedule. The decompression schedules of all the tables are usually given in 10-foot depth increments and 10-minute bottom time increments. Depth and bottom time combinations from dives, however, rarely match the decompression schedules exactly. To ensure that the selected decompression schedule is always conservative, always select the schedule depth equal to or next greater than the maximum depth of the dive and always select the schedule bottom time equal to or next longer than the bottom time of the dive.

For example, to use the Standard Air Decompression Table to select the correct schedule for a dive to 97 fsw for 31 minutes, decompression would be selected for 100 fsw and carried out per the 100 fsw for 40 minutes (100/40) schedule.

CAUTION **Never attempt to interpolate between decompression schedules.**

When planning for surface-supplied dives where the diver will be exceptionally cold or the work load is expected to be relatively strenuous, Surface Decompression should be considered. In such case, conduct decompression from the normal schedule in the water and then surface decompress using the chamber stop time(s) from the next longer schedule. When conducting dives using Standard Air Decompression Tables, select the next longer decompression schedule than the one that would normally be selected.

If the divers are exceptionally cold during the dive or if the work load is relatively strenuous, select the next longer decompression schedule than the one that would normally be selected.

Table 9-2. *Air Decompression Tables Selection Criteria.*

U.S. Navy Standard Air Decompression Table	In-water decompression using normal and exceptional exposure dive schedules. Repetitive dives; normal decompression schedules only.
Unlimited/No-Decompression Limits and Repetitive Group Designation Table for Unlimited/No-Decompression Air Dives	Decompression not required. Repetitive dives.
Residual Nitrogen Timetable for Repetitive Air Dives	Repetitive Group Designations after surface intervals greater than 10 minutes and less than 12 hours. Residual nitrogen times for repetitive air dives.
Surface Decompression Table Using Oxygen	Recompression chamber with oxygen breathing system is used for shorting of in-water decompression. Repetitive dives combine to single dive.
Surface Decompression Table Using Air	Recompression chamber without an oxygen breathing system is used for shorting of in-water decompression. Repetitive dives combine to single dive.
Sea Level Equivalent Depth Table	Altitude correction for use with tables listed above.

For example, the normal schedule for a dive to 90 fsw for 34 minutes would be the 90/40 schedule. If the divers are exceptionally cold or fatigued, they should decompress according to the 90/50 schedule. This procedure is used because the divers are generating heat and on-gassing at a normal rate while working at depth. Once decompression starts, however, the divers are at rest and begin to chill. Vasoconstriction of the blood vessels takes place and they do not off-gas at the normal rate. The additional decompression time increases the likelihood that the divers receive adequate decompression.

NOTE **Take into consideration the physical condition of the diver when determining what is strenuous.**

If the diver's depth cannot be maintained at a decompression stop, the Diving Supervisor may select the next deeper decompression table.

9-6 ASCENT PROCEDURES

9-6.1 **Rules During Ascent.** After selecting the applicable decompression schedule, it is imperative that it be followed as closely as possible. Unless a Diving Medical Officer recommends a deviation and the Commanding Officer concurs, decompression must be completed according to the schedule selected.

9-6.1.1 **Ascent Rate.** Always ascend at a rate of 30 fpm (::20 per 10 fsw). Minor variations in the rate of travel between 20 and 40 fsw/minute are acceptable. Any variation in the rate of ascent must be corrected in accordance with the procedures in paragraph 9-6.2. However, a delay of up to one minute in reaching the first decompression stop can be ignored.

9-6.1.2 **Decompression Stop Time.** Decompression stop times, as specified in the decompression schedule, begin as soon as the divers reach the stop depth. Upon

completion of the specified stop time, the divers ascend to the next stop or to the surface at the proper ascent rate. Ascent time is not included as part of stop time.

9-6.2 Variations in Rate of Ascent. The following rules for correcting variations in rate of ascent apply to Standard Air Decompression dives as well as Surface Decompression Table dives. (For ease of illustration, the following examples address Standard Air dives.)

9-6.2.1 **Delays in Arriving at the First Stop.**

- **Delay greater than 1 minute, deeper than 50 fsw.** Add the total delay time (rounded up to the next whole minute) to the bottom time, recompute a new decompression schedule, and decompress accordingly.

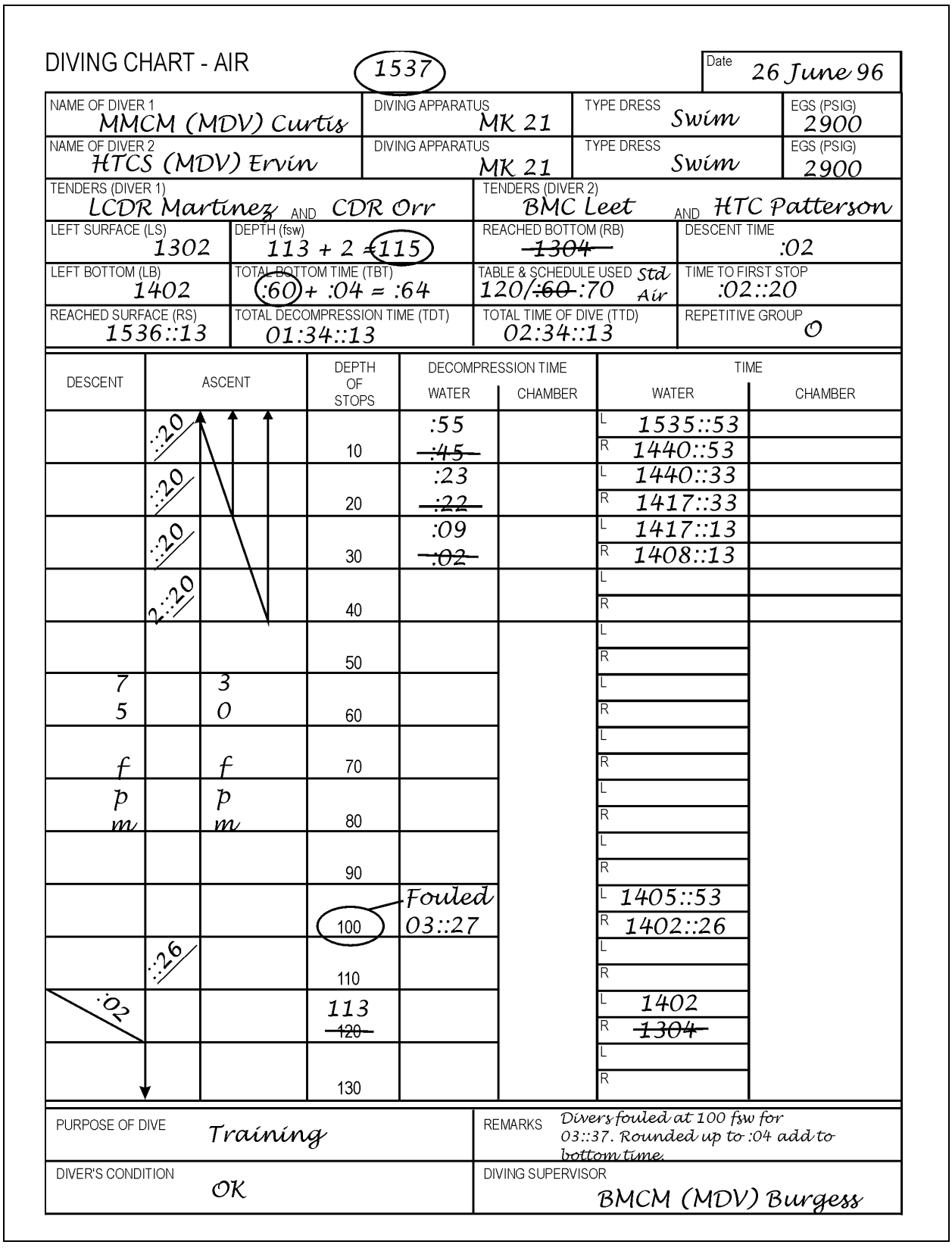
  Example: A dive was made to 113 fsw with a bottom time of 60 minutes. According to the 120/60 decompression schedule of the Standard Air Decompression Table, the first decompression stop is 30 fsw. During ascent, the divers were delayed at 100 fsw for: 03::27 and it actually took 6 minutes 13 seconds to reach the 30-foot decompression stop. Determine the new decompression schedule.

  Solution: If the divers had maintained an ascent rate of 30 fpm, it would have taken the divers 2 minutes 46 seconds to ascend from 113 fsw to 30 fsw. The difference between what it should have taken and what it actually took is 3 minutes 27 seconds. Increase the bottom time from 60 minutes to 64 minutes (3 minutes 27 seconds rounded up), recompute the decompression schedule using a 70-minute bottom time and continue decompression according to the new decompression schedule, 120/70. This dive is illustrated in Figure 9-3.

- **Delay greater than 1 minute, shallower than 50 fsw.** If the rate of ascent is less than 30 fpm, add the delay time to the diver's first decompression stop. If the delay is between stops, disregard the delay. The delay time is rounded up to the next whole minute.

  Example: A dive was made to 113 fsw with a bottom time of 60 minutes. According to the Standard Air Decompression Table, the first decompression stop is at 30 fsw. During ascent, the divers were delayed at 40 fsw and it actually took 6 minutes 20 seconds to reach the 30-foot stop. Determine the new decompression schedule.

  Solution: If the divers had maintained an ascent rate of 30 fpm, the correct ascent time should have been 2 minutes 46 seconds. Because it took 6 minutes 20 seconds to reach the 30-foot stop, there was a delay of 3 minutes 34 seconds (6 minutes 20 seconds minus 2 minutes 46 seconds). Therefore, increase the length of the 30-foot decompression stop by 3 minutes 34 seconds, rounded up to 4 minutes. Instead of 2 minutes, the divers must spend 6 minutes at 30 fsw. This dive is illustrated in Figure 9-4.



DIVING CHART - AIR

1537

Date: 26 June 96

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
MMCM (MDV) Curtis	MK 21	Swim	2900
NAME OF DIVER 2	**DIVING APPARATUS**	**TYPE DRESS**	**EGS (PSIG)**
HTCS (MDV) Ervin	MK 21	Swim	2900

TENDERS (DIVER 1)	TENDERS (DIVER 2)
LCDR Martinez AND CDR Orr	BMC Leet AND HTC Patterson

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
1302	113 + 2 = 115	~~1304~~	:02
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
1402	:60 + :04 = :64	120/~~:60~~ :70 Std Air	:02::20
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
1536::13	01:34::13	02:34::13	O

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	::20	10	:55 / ~~:45~~		L 1535::53 / R 1440::53	
	::20	20	:23 / ~~:22~~		L 1440::33 / R 1417::33	
	::20	30	:09 / ~~:02~~		L 1417::13 / R 1408::13	
	2::20	40			L / R	
		50			L / R	
7 5	3 0	60			L / R	
f	f	70			L / R	
p m	p m	80			L / R	
		90			L / R	
		100	Fouled 03::27		L 1405::53 / R 1402::26	
	::26	110			L / R	
:02		~~120~~ 113			L 1402 / R ~~1304~~	
		130			L / R	

PURPOSE OF DIVE	REMARKS
Training	Divers fouled at 100 fsw for 03::37. Rounded up to :04 add to bottom time.
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	BMCM (MDV) Burgess

Figure 9-3. Completed Air Diving Chart.

DIVING CHART - AIR 1721

Date 26 June 96

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
HTCM (MDV) King	MK 21	Swim	2900
NAME OF DIVER 2	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
CAPT. Knafelc	MK 21	Swim	2900

TENDERS (DIVER 1)	TENDERS (DIVER 2)
BM3 Alexander AND BM2 Howard	EMC Pizzini AND EM1 Perdomo

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
1500	113 + 2 ~~115~~	~~1502~~	:02
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
1600	:60	120/:60 Std Air	:02::46
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
1720::20	01:20::20	02:20::20	O

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	::20	10	:45		L 1720::00	
					R 1635::00	
	::20	20	:22		L 1634::40	
					R 1612::40	
	::20	30	:02 + :04 :06		L 1612::20	
					R 1606::20	
	2::26	40	Fouled 03::34		L 1606::00	
					R 1602::26	
		50			L	
					R	
7 5	3 0	60			L	
					R	
f	f	70			L	
					R	
p m	p m	80			L	
					R	
		90			L	
					R	
		100			L	
					R	
		110			L	
					R	
:02		113 ~~120~~			L 1600	
					R ~~1502~~	
		130			L	
					R	

PURPOSE OF DIVE	REMARKS
ReQual	Delay shallower than 50 fsw for 03::34. Rounded up to :04 add to first stop time.
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	BMCS (MDV) Westbrook

Figure 9-4. Completed Air Diving Chart.

9-6.2.2 **Travel Rate Exceeded.** On a Standard Air Dive, if the rate of ascent is greater than 30 fpm, STOP THE ASCENT, allow the watches to catch up, and then continue ascent. If the stop is arrived at early, start the stop time after the watches catch up.

9-7 UNLIMITED/NO-DECOMPRESSION LIMITS AND REPETITIVE GROUP DESIGNATION TABLE FOR UNLIMITED/NO-DECOMPRESSION AIR DIVES

The Unlimited/No-Decompression Table (Table 9-6) serves three purposes. First, the table identifies that on a dive with the depth 20 fsw and shallower, unlimited bottom time may be achieved. Second, it summarizes all the depth and bottom time combinations for which no decompression is required. Third, it provides the repetitive group designation for each unlimited/no-decompression dive. Even though decompression is not required, there is still an amount of nitrogen remaining in the diver's tissues for up to 12 hours following a dive. If they dive again within a 12-hour period, divers must consider this residual nitrogen when calculating decompression from the repetitive dive. Any dive deeper than 25 fsw that has a bottom time greater than the no-decompression limit given in this table is a decompression dive and must be conducted per the Standard Air Decompression Table.

Each depth listed in the Unlimited/No-Decompression Table has a corresponding no-decompression limit listed in minutes. This limit is the maximum bottom time that divers may spend at that depth without requiring decompression. Use the columns to the right of the no-decompression limits column to obtain the repetitive group designation. This designation must be assigned to a diver subsequent to every dive.

To find the repetitive group designation:

1. Enter the table at the depth equal to, or next greater than, the maximum depth of the dive.

2. Follow that row to the right to the bottom time equal to, or just greater than, the actual bottom time of the dive.

3. Follow the column up to the repetitive group designation.

9-7.1 **Example.** In planning a dive, the Dive Supervisor wants the divers to conduct a brief inspection of the work site, located at a depth of 152 fsw. Determine the maximum no-decompression limit and repetitive group designation.

9-7.2 **Solution.** The maximum bottom time that may be used without requiring decompression and the repetitive group designation after the dive can be found in either the Unlimited/No-Decompression Table or the Standard Air Decompression Table.

- **Using the Unlimited/No-Decompression Table**.

1. Locate the dive depth in the Depth column. Because there is no entry for 154 (152 +2) fsw, round the depth up to the next greater depth of 160 fsw.

2. Move vertically across the table to locate the no-decompression limit in the Unlimted/No-Decompression Limits column. The no-decompression limit is 5 minutes. To avoid having to make decompression stops, the divers must descend to 152 fsw, make the inspection and begin ascent within 5 minutes of leaving the surface.

3. To find the repetitive group designation, follow the 160-fsw entry to the right to the 5-minute bottom time entry and then follow it vertically to the top of the column. This shows the repetitive group designation to be D.

- **Using the Standard Air Decompression Table**.

1. Locate the schedule for the dive depth. Because there is no schedule for 154 (152 +2) fsw, round the depth up to the next greater depth of 160 fsw.

2. Follow the 5-minute bottom time row all the way horizontally to the right. There is a "0" listed in the decompression stops column and D is depicted in the Repetitive Group column.

Figure 9-5 is a diving chart for this dive.

9-8 U.S. NAVY STANDARD AIR DECOMPRESSION TABLE

This manual combines the Standard Air Decompression Schedules and Exceptional Exposure Air Schedules into one table (see Table 9-5). To clearly distinguish between the standard (normal) and exceptional exposure decompression schedules, the exceptional exposure schedules have been printed in red.

NOTE **The Commanding Officer must have CNO approval to conduct planned exceptional exposure dives.**

If the bottom time of a dive is less than the first bottom time listed for its depth, decompression is not required. The divers may ascend directly to the surface at a rate of 30 feet per minute (fpm). The repetitive group designation for a no-decompression dive is given in the Unlimited/No-Decompression Table. As noted in the Standard Air Decompression Table, there are no repetitive group designations for exceptional exposure dives. Repetitive dives are not permitted following an exceptional exposure dive.

9-8.1 **Example.** Divers complete a salvage dive to a depth of 140 fsw for 37 minutes. They were not unusually cold or fatigued during the dive. Determine the decompression schedule and the repetitive group designation at the end of the decompression.

DIVING CHART - AIR

0811

Date: 22 Nov 96

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
MMCM (MDV) Mallet	MK 21	Wet Suit	2750
NAME OF DIVER 2	**DIVING APPARATUS**	**TYPE DRESS**	**EGS (PSIG)**
HMC Chabot	MK 21	Wet Suit	2750

TENDERS (DIVER 1)	TENDERS (DIVER 2)
ENC Pettus AND BM1 McDaniels	HM2 Carlson AND BM2 Froelich

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
0800	152 + 2 ~~154~~	~~0803~~	:03
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
0805	:05	160/:05 No "D"	:05::04
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
0810::04	05::04	10::04	D

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	05::04	10			L / R	
		20			L / R	
		30			L / R	
		40			L / R	
		50			L / R	
75	30	60			L / R	
f	f	70			L / R	
pm	pm	80			L / R	
		90			L / R	
		100			L / R	
		110			L / R	
		120			L / R	
:03		152 ~~130~~			L 0805 / R ~~0803~~	

PURPOSE OF DIVE	REMARKS
Inspection Dive Site	OK to Repet
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	BMCM (MDV) Bettua

Figure 9-5. Completed Air Diving Chart.

9-8.2 Solution. Select the equal or next deeper depth and the equal or next longer bottom time (140 + 2 = 142 fsw). This would be the 150/40 schedule, repetitive group designator N (see Figure 9-6).

9-9 REPETITIVE DIVES

During the 12-hour period after an air dive, the quantity of residual nitrogen in divers' bodies will gradually be reduced to its normal level. If the divers are to make a second dive within this period (repetitive dive), they must consider their residual nitrogen level when planning for the dive.

The procedures for conducting a repetitive dive are summarized in Figure 9-7. Upon completing the first dive, the divers are assigned a repetitive group designation from either the Standard Air Decompression Table or the Unlimited/No-Decompression Table. This designation relates directly to the residual nitrogen level upon surfacing. As nitrogen passes out of the diver's tissues and blood, their repetitive group designation changes. By using the Residual Nitrogen Timetable (Table 9-7), this designation may be determined at any time during the surface interval.

To determine the decompression schedule for a repetitive dive using either the unlimited/no-decompression, standard air, or surface decompression table:

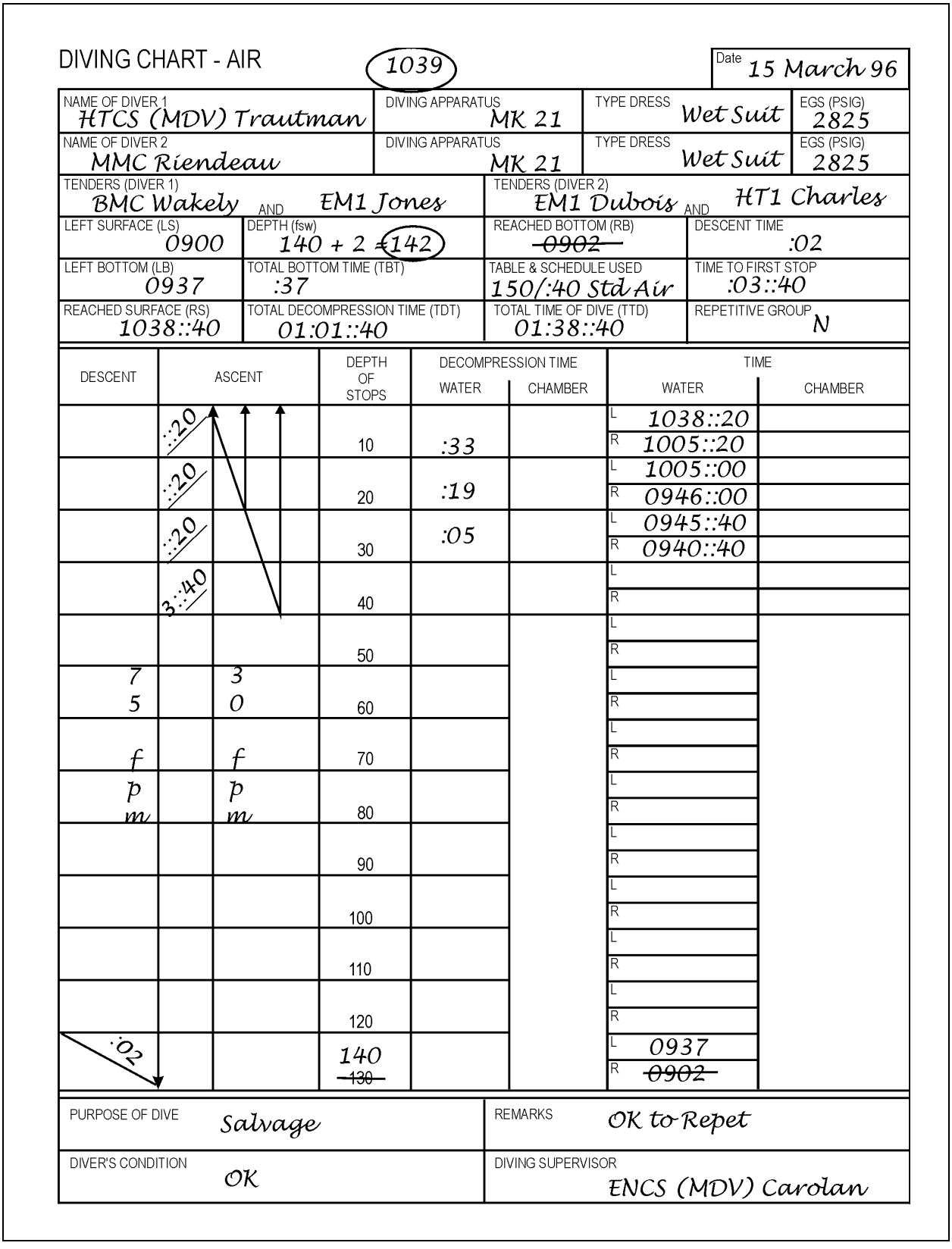
1. Determine the residual nitrogen level just prior to leaving the surface of the of the repetitive dive (based on the repetitive dive depth), using the Residual Nitrogen Timetable. This level is expressed as residual nitrogen time, in minutes.

2. Add this time to the actual bottom time of the repetitive dive to get the bottom time of the Equivalent Single Dive.

3. Conduct decompression from the repetitive dive using the depth and bottom time of the equivalent single dive to select the appropriate decompression schedule. Avoid equivalent single dives requiring the use of Exceptional Exposure decompression schedules.

Always use a systematic Repetitive Dive Worksheet, shown in Figure 9-8, when determining the decompression schedule for a repetitive dive. If still another dive follows the repetitive dive, insert the depth and bottom time of the first equivalent single dive in Part One of the second Repetitive Dive Worksheet.

9-9.1 Residual Nitrogen Timetable for Repetitive Air Dives. The quantity of residual nitrogen in a diver's body immediately after a dive is expressed by the repetitive group designation assigned from either the Standard Air Decompression Schedule or the Unlimited/No-Decompression Table. The upper portion of the Residual Nitrogen Timetable is composed of various intervals between 10 minutes and 12 hours. These are expressed in hours and minutes (2:21 = 2 hours, 21 minutes). Each interval has a minimum time (top limit) and a maximum time (bottom limit).



DIVING CHART - AIR

1039

Date 15 March 96

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
HTCS (MDV) Trautman	MK 21	Wet Suit	2825
NAME OF DIVER 2	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
MMC Riendeau	MK 21	Wet Suit	2825

TENDERS (DIVER 1)	TENDERS (DIVER 2)
BMC Wakely AND EM1 Jones	EM1 Dubois AND HT1 Charles

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
0900	140 + 2 = 142	~~0902~~	:02
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
0937	:37	150/:40 Std Air	:03::40
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
1038::40	01:01::40	01:38::40	N

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	:20	10	:33		L 1038::20	
					R 1005::20	
	:20	20	:19		L 1005::00	
					R 0946::00	
	:20	30	:05		L 0945::40	
					R 0940::40	
	3::40	40			L	
					R	
		50			L	
					R	
75 fpm	30 fpm	60			L	
					R	
		70			L	
					R	
		80			L	
					R	
		90			L	
					R	
		100			L	
					R	
		110			L	
					R	
		120			L	
					R	
:02		140 ~~130~~			L 0937	
					R ~~0902~~	

PURPOSE OF DIVE	REMARKS
Salvage	OK to Repet
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	ENCS (MDV) Carolan

Figure 9-6. Completed Air Diving Chart.

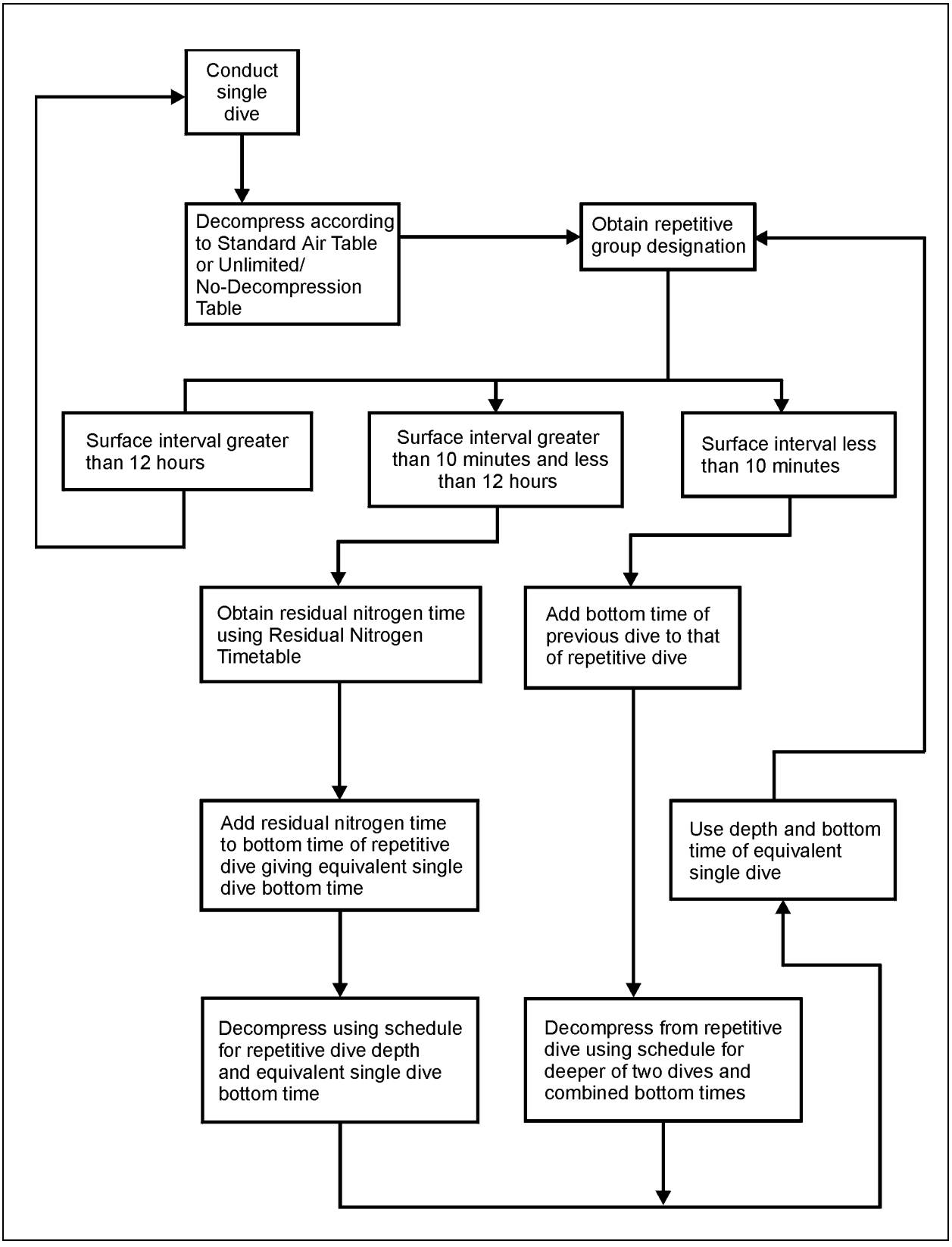


Figure 9-7. Repetitive Dive Flowchart.

REPETITIVE DIVE WORKSHEET

DATE

1. PREVIOUS DIVE

_____ minutes ☐ Standard Air Table ☐ Unlimited/No-Decompression Table

_____ + _____ = _____ feet ☐ Surface Table Using Oxygen ☐ Surface Table Using Air

_____ repetitive group letter designation

2. SURFACE INTERVAL

_____ hours _____ minutes on surface

_____ repetitive group from Item 1 above

_____ new repetitive group letter designation from Residual Nitrogen Timetable

3. RESIDUAL NITROGEN TIME

_____ + _____ = _____ feet, depth of repetitive dive

_____ new repetitive group letter designation from item 2 above

_____ minutes, residual nitrogen time from Residual Nitrogen Timetable or bottom time of previous Sur D dive

4. EQUIVALENT SINGLE DIVE TIME:

_____ minutes, residual nitrogen time from item 3 above or bottom time of previous Sur D dive

\+ _____ minutes, actual bottom time of repetitive dive

= _____ minutes, equivalent single dive time

5. DECOMPRESSION FOR REPETITIVE DIVE:

_____ + _____ = _____ feet, depth of repetitive dive

_____ minutes, equivalent single dive time from item 4 above

Decompression from (check one):

☐ Standard Air Table ☐ Unlimited/No-Decompression Table

☐ Surface Table Using Oxygen ☐ Surface Table Using Air

	Depth	Water	Chamber
Decompression Stops:	_____ feet	_____ minutes	_____ minutes
	_____ feet	_____ minutes	_____ minutes
	_____ feet	_____ minutes	_____ minutes
	_____ feet	_____ minutes	_____ minutes
	_____ feet	_____ minutes	_____ minutes

_____ schedule used (depth/time)

_____ repetitive group letter designation

Figure 9-8. Repetitive Dive Worksheet.

Residual nitrogen times corresponding to the depth of the repetitive dive are given in the body of the lower portion of the table. To determine the residual nitrogen time for a repetitive dive:

1. Locate the diver's repetitive group designation from the previous dive along the diagonal line above the table.

2. Read horizontally to the interval where the diver's surface interval lies. The time spent on the surface must be between or equal to the limits of the selected interval.

3. Read vertically down to the new repetitive group designation. This corresponds to the present quantity of residual nitrogen in the diver's body.

4. Continue down in this same column to the row representing the depth of the repetitive dive. The time given at the intersection is the residual nitrogen time, in minutes, to be applied to the bottom time of the repetitive dive.

9-9.1.1 **Example.** A repetitive dive is planned to 98 fsw for an estimated bottom time of 15 minutes. The previous dive was to a depth of 100 (100+1=101) fsw with a bottom time of 48 minutes. The diver's surface interval is 6 hours 26 minutes (6:26). Determine the proper decompression schedule.

1. Use the 110/50 schedule of the Standard Air Decompression Table to find the residual nitrogen time of the previous dive. Read across the 50-minute bottom time row to find the repetitive group designator of M.

2. Move to the Residual Nitrogen Timetable for Repetitive Air Dives.

3. Enter the table on the diagonal line at M.

4. Read horizontally across the line until reaching the surface interval coinciding with the diver's surface interval of 6 hours 26 minutes. The diver's surface interval falls within the limits of the 6:19/9:28 column.

5. Read vertically down the 6:19/9:28 column until reaching the depth coinciding with the repetitive dive depth of 100 fsw to find the residual nitrogen time of 7 minutes.

6. Add the 7 minutes of residual nitrogen time to the estimated bottom time of 15 minutes to obtain the single equivalent dive time of 22 minutes.

7. The diver will be decompressed on the 100/22 No-Decompression schedule.

Figure 9-9 depicts the dive profile for the first dive, Figure 9-10 shows the Repetitive Dive Worksheet, and Figure 9-11 shows the dive profile for the repetitive dive.

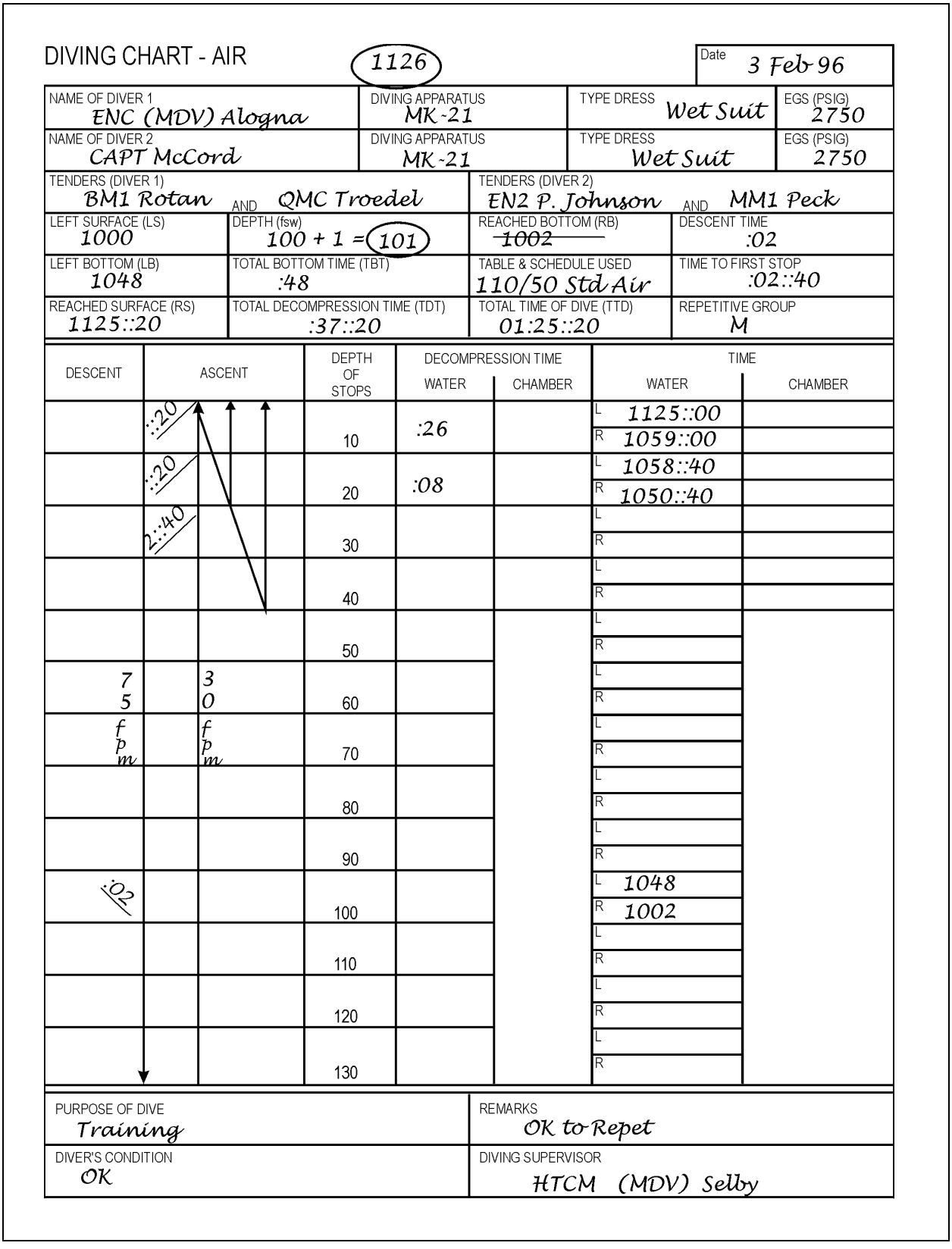


Figure 9-9. Dive Profile.

REPETITIVE DIVE WORKSHEET

DATE: 3 FEB 96

1. PREVIOUS DIVE

:48 minutes
100 + 2 = 102 feet
M repetitive group letter designation

[X] Standard Air Table
[ ] Surface Table Using Oxygen
[ ] Unlimited/No-Decompression Table
[ ] Surface Table Using Air

2. SURFACE INTERVAL

6 hours 26 minutes on surface
M repetitive group from item 1 above
B new repetitive group letter designation from Residual Nitrogen Timetable

3. RESIDUAL NITROGEN TIME

93 + 1 = 94 feet, depth of repetitive dive
B new repetitive group letter designation from item 2 above
:07 minutes, residual nitrogen time from Residual Nitrogen Timetable or bottom time of previous Sur D dive

4. EQUIVALENT SINGLE DIVE TIME:

:07 minutes, residual nitrogen time from item 3 above or bottom time of previous Sur D dive
\+ :15 minutes, actual bottom time of repetitive dive
= :22 minutes, equivalent single dive time

5. DECOMPRESSION FOR REPETITIVE DIVE:

93 + 1 = 94 feet, depth of repetitive dive
:22 minutes, equivalent single dive time from item 4 above

Decompression from (check one):

[ ] Standard Air Table
[ ] Surface Table Using Oxygen
[X] Unlimited/No-Decompression Table
[ ] Surface Table Using Air

	Depth	Water	Chamber
Decompression Stops:	_____ feet	_____ minutes	_____ minutes
	_____ feet	_____ minutes	_____ minutes
	_____ feet	_____ minutes	_____ minutes
	_____ feet	_____ minutes	_____ minutes
	_____ feet	_____ minutes	_____ minutes

100/22 schedule used (depth/time)
G repetitive group letter designation

Figure 9-10. Completed Repetitive Dive Worksheet.

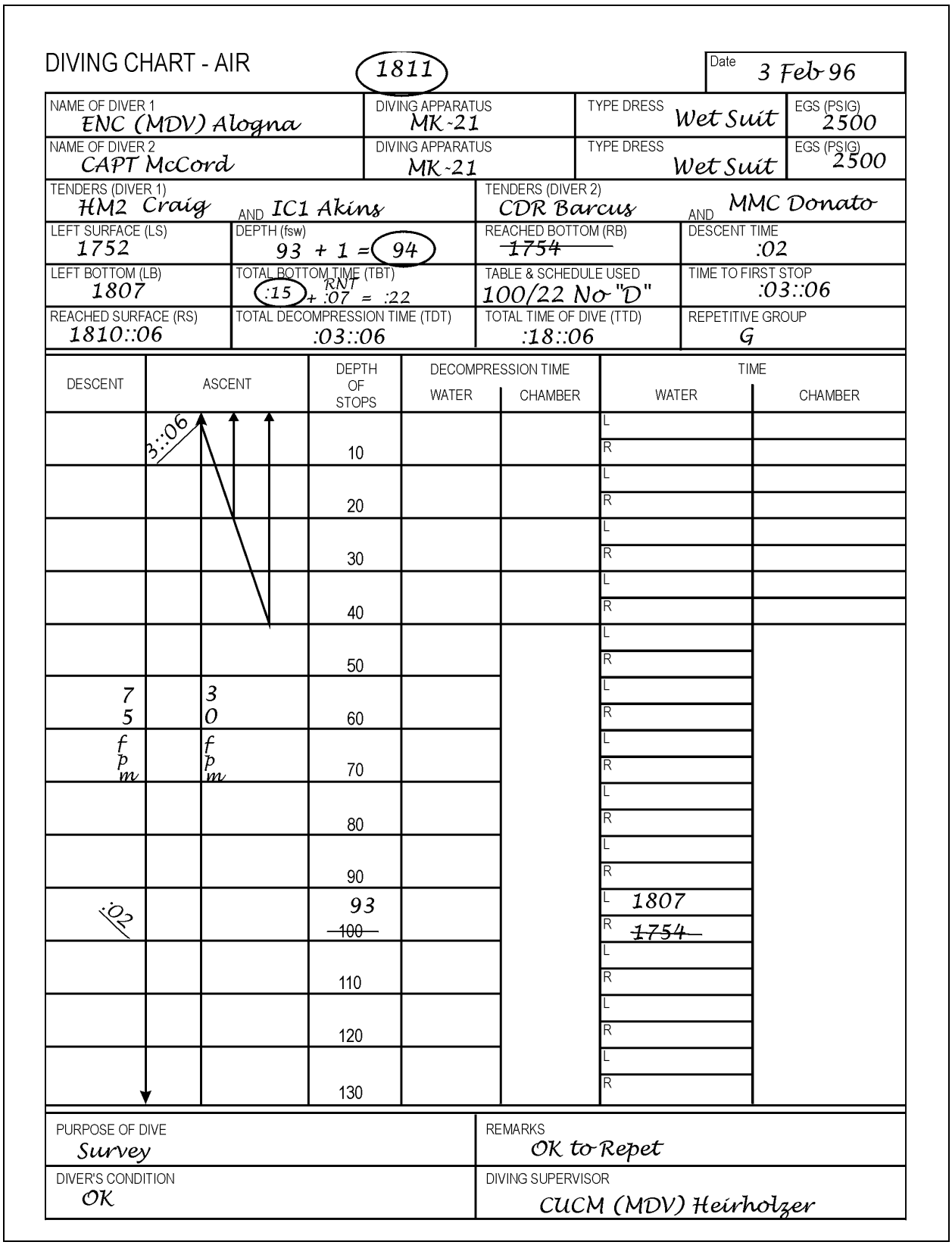


Figure 9-11. Dive Profile for Repetitive Dive.

9-9.1.2 **RNT Exception Rule.** An exception to this table occurs when the repetitive dive is made to the same or greater depth than that of the previous dive. This is referred to as the RNT Exception Rule. In such cases, the residual nitrogen time may be longer than the bottom time of the previous dive. A diver's body cannot contain more residual nitrogen than it was originally exposed to. To obtain the equivalent single dive time, simply add the bottom time of the previous dive to that of the repetitive dive. (All of the residual nitrogen passes out of a diver's body after 12 hours, so a dive conducted after a 12-hour surface interval is not a repetitive dive.)

9-10 SURFACE DECOMPRESSION

Surface decompression is a technique for fulfilling all or a portion of a diver's decompression obligation in a recompression chamber instead of in the water, significantly reducing the time that a diver must spend in the water. Also, breathing oxygen in the recompression chamber reduces the diver's total decompression time. Other variations will be handled in accordance with paragraph 9-6.2.

Surface decompression offers many advantages that enhance the divers' safety. Shorter exposure time in the water keeps divers from chilling to a dangerous level. Inside the recompression chamber, the divers can be maintained at a constant pressure, unaffected by surface conditions of the sea. Divers shall be observed constantly by either the inside tender or topside personnel, and monitored for decompression sickness and oxygen toxicity. Using an inside tender when two divers undergo surface decompression is at the discretion of the dive supervisor. If an inside tender is not used, both divers will carefully monitor each other in addition to being closely observed by topside personnel.

If an oxygen breathing system is installed in the recompression chamber, conduct surface decompression according to the Surface Decompression Table Using Oxygen (Table 9-6). If air is the only breathing medium available, use the Surface Decompression Table Using Air (Table 9-10).

Residual Nitrogen Timetables have not been developed for Surface Decompression Repetitive Dives. Repetitive surface decompression dives may be accomplished in accordance with paragraph 9-10.1.5.

9-10.1 Surface Decompression Table Using Oxygen. Using the Surface Decompression Table Using Oxygen (referred to as Sur D O_2) requires an approved double-lock recompression chamber with an oxygen breathing system as described in Chapter 22. With Sur D O_2, divers ascend at a constant rate of 30 fpm. The divers are decompressed to the first decompression stop (or to the surface if there are no water stops required) at an ascent rate of 30 fpm. The travel rate between stops and from 30 fsw to the surface is also 30 fpm (::20 per 10 fsw). Minor variations in the rate of travel between 20 and 40 fpm are acceptable.

Once the divers are on the surface, the tenders have three and a half (:03::30) minutes to remove the breathing apparatus and diving dress and assist the divers into the recompression chamber.

Pressurizing the recompression chamber with air to 40 fsw should take approximately 30 seconds (descent rate not to exceed 80 fpm). The total elapsed time from when the divers leave the 30-foot stop to when they reach the 40-foot recompression chamber stop **must not exceed 5 minutes** with the following exception: If no in-water stops are required, the time from reaching the surface to arrival at 40 feet in the chamber must not exceed 4 minutes. During descent in the recompression chamber, if a diver cannot clear and the chamber is at a depth of at least 20 fsw, stop, then breathe oxygen at 20 fsw for twice the 40 fsw chamber stop time. Ascend to 10 fsw and breathe oxygen again for twice the 40 fsw chamber stop time. Then ascend to the surface. This "safe way out" procedure is not intended to be used in place of normal Sur D O_2 procedures.

If the prescribed surface interval is exceeded and the divers are asymptomatic, treat them as if they have Type I decompression sickness (Treatment Table 5, Chapter 21). If the divers are symptomatic, they are treated as if they have Type II decompression sickness (Treatment Table 6, Chapter 21), even if they are only displaying Type I symptoms. Symptoms occurring during the chamber stops are treated as recurrences (Chapter 21).

Upon arrival at 40 fsw in the recompression chamber, the divers are placed on the Built-in Breathing System (BIBS) mask breathing pure oxygen. The designated 40-foot stop time commences once the divers are breathing oxygen. The divers breathe oxygen throughout the 40-foot stop, interrupting oxygen breathing after each 30 minutes with a 5-minute period of breathing chamber air (referred to as an "air break"). Count the air breaks as "dead time" and not part of the oxygen stop time. If the air break interval falls on time to travel, remove oxygen and commence traveling to the surface at 30 fpm. This procedure simplifies time keeping and should be used whenever using the Surface Decompression Table Using Oxygen. Remove the O_2 mask prior to leaving the 40 fsw stop for the surface.

9-10.1.1 **Example.** A dive is planned to approximately 160 fsw for 40 minutes. The dive is to be conducted using Sur D O_2 procedures. Figure 9-12 shows this dive profile.

In the event of oxygen system failure, it is important to be familiar with the appropriate air decompression schedules. If the oxygen system fails while the divers are in the water, the divers are shifted to the Standard Air Decompression Table or the Surface Decompression Table Using Air. During the chamber phase, use the procedures listed below in the event of oxygen system failure or CNS oxygen toxicity.

9-10.1.2 **Oxygen System Failure (40-fsw Chamber Stop).** Follow this procedure when there is an oxygen system failure at the 40 fsw chamber stop:

1. Complete remainder of 40-fsw stop on air.

DIVING CHART - AIR

1044

Date: 11 Dec 96

NAME OF DIVER 1: BMCM (MDV) Augustine	DIVING APPARATUS: MK-21	TYPE DRESS: Wet Suit	EGS (PSIG): 2800
NAME OF DIVER 2: HMCS Thrift	DIVING APPARATUS: MK-21	TYPE DRESS: Wet Suit	EGS (PSIG): 2800

TENDERS (DIVER 1): EMC Favara AND GM2 Dumke		TENDERS (DIVER 2): HT1 Lutz AND HTC Tochterman	
LEFT SURFACE (LS): 0900	DEPTH (fsw): 152 + 2 = 154	REACHED BOTTOM (RB): ~~0903~~	DESCENT TIME: :03
LEFT BOTTOM (LB): 0940	TOTAL BOTTOM TIME (TBT): :40	TABLE & SCHEDULE USED: 160/40 Sur 'D' 02	TIME TO FIRST STOP: :03::24
REACHED SURFACE (RS): 1001::04/1043::24	TOTAL DECOMPRESSION TIME (TDT): 01:03::24	TOTAL TIME OF DIVE (TTD): 01:43::24	REPETITIVE GROUP: N/A

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	::01 / :01::20 / :03::30 + ::30 = :04 (80 fpm)	10			L	
					R	
		20			L	
					R	
		30	:08		L 1000::04	
					R 0952::04	
	::20	40	:05	:30 02 :05 Air :02 02	L 0951::44	1042::04
					R 0946::44	1005::04
	::20	50	:03		L 0946::24	
					R 0943::24	
	3::24	60			L	
					R	
75 fpm	30 fpm	70			L	
					R	
		80			L	
					R	
		90			L	
					R	
		100			L	
					R	
		110			L	
					R	
		120			L	
					R	
		152 ~~130~~			L 0940	
					R ~~0903~~	

PURPOSE OF DIVE: Training	REMARKS: OK to Repet
DIVER'S CONDITION: OK	DIVING SUPERVISOR: BMCS (MDV) Gaillard

Figure 9-12. Dive Profile.

2. Ascend to 20 fsw. Repeat the 40-fsw chamber stop time.

3. Ascend to 10 fsw. Stay there for twice the 40-fsw chamber stop time.

9-10.1.3 **CNS Oxygen Toxicity (40-fsw Chamber Stop).** Follow this procedure when a diver displays symptoms of CNS O_2 toxicity at the 40 fsw chamber stop:

1. Remove the BIBS masks from the divers.

2. Wait for all symptoms to completely subside, then wait an additional 15 minutes.

3. Place the divers back on oxygen and resume the decompression at the point of interruption. The period the divers are not breathing oxygen is considered "dead time" and is not counted toward the total stop time. This procedure can be repeated as many times as the Dive Supervisor considers prudent until all the required time spent breathing oxygen at 40 fsw is met.

If the Dive Supervisor decides that the diver cannot tolerate oxygen:

1. Complete remainder of 40-fsw stop on air. Count all the time at 40 fsw toward stop time. If all time at 40 fsw already meets or exceeds the 40-fsw stop time, then ascend to 20 fsw.

2. Ascend to 20 fsw. Repeat the 40-fsw chamber stop time.

3. Ascend to 10 fsw. Stay there for twice the 40-fsw stop chamber time.

9-10.1.3.1 ***Example.*** Divers make a planned dive to 152 fsw for 40 minutes using the Surface Decompression Table Using Oxygen. From the appropriate schedule (160/40), there is a 3-minute water stop at 50 fsw, a 5-minute water stop at 40 fsw, an 8-minute water stop at 30 fsw, and a 32-minute chamber stop at 40 fsw breathing oxygen. After 12 minutes of breathing oxygen at the 40-foot chamber stop, a diver develops an oxygen toxicity symptom that completely subsides in 5 minutes.

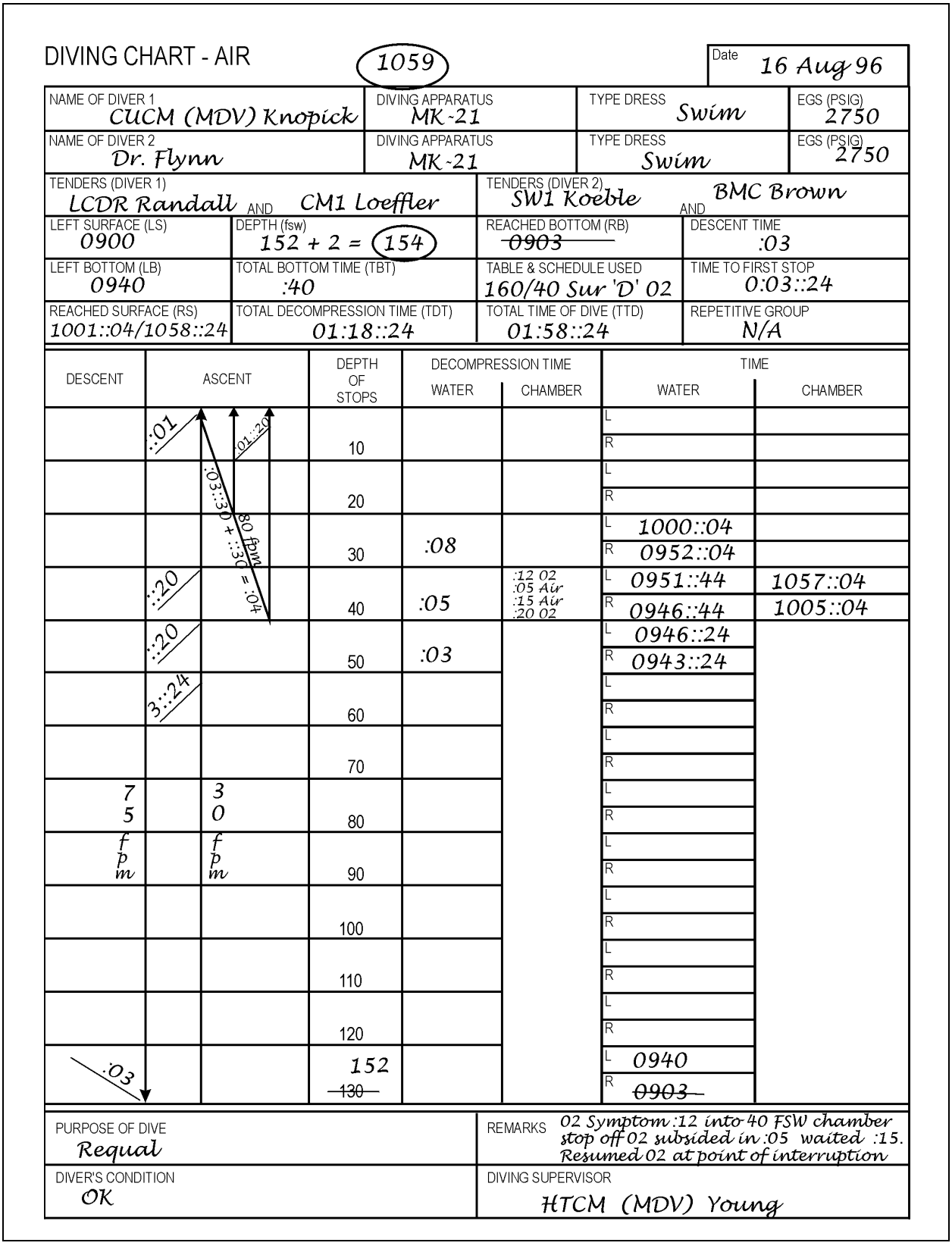
9-10.1.3.2 ***Solution.*** Following the procedures for handling an oxygen toxicity symptom, remove the BIBS from the diver. The diver breathes chamber air until all symptoms completely subside. After an additional 15 minutes, place the diver back on oxygen and continue the decompression schedule from the point of interruption. Figure 9-13 is a profile of this dive.

9-10.1.4 **Convulsions at the 40-fsw Chamber Stop.**

NOTE **If the first symptom of CNS O_2 toxicity at the 40-fsw stop is a convulsion, oxygen must not be restarted.**

Follow this procedure when a diver convulses at the 40-fsw chamber stop:

1. Remove the BIBS mask.



DIVING CHART - AIR

1059

Date: 16 Aug 96

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
CUCM (MDV) Knopick	MK-21	Swim	2750
NAME OF DIVER 2	**DIVING APPARATUS**	**TYPE DRESS**	**EGS (PSIG)**
Dr. Flynn	MK-21	Swim	2750

TENDERS (DIVER 1)	TENDERS (DIVER 2)
LCDR Randall AND CM1 Loeffler	SW1 Koeble AND BMC Brown

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
0900	152 + 2 = 154	~~0903~~	:03
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
0940	:40	160/40 Sur 'D' 02	0:03::24
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
1001::04/1058::24	01:18::24	01:58::24	N/A

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	::01 / :03::30 + ::30 = :04 (80 fpm) / :01::20	10			L R	
		20			L R	
		30	:08		L 1000::04 R 0952::04	
	::20	40	:05	:12 02 :05 Air :15 Air :20 02	L 0951::44 R 0946::44	1057::04 1005::04
	::20	50	:03		L 0946::24 R 0943::24	
	3::24	60			L R	
		70			L R	
75 fpm	30 fpm	80			L R	
		90			L R	
		100			L R	
		110			L R	
		120			L R	
	:03	152 ~~130~~			L 0940 R ~~0903~~	

PURPOSE OF DIVE	REMARKS
Requal	02 Symptom :12 into 40 FSW chamber stop off 02 subsided in :05 waited :15. Resumed 02 at point of interruption
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	HTCM (MDV) Young

Figure 9-13. Dive Profile.

2. Keep the chamber depth constant at 40 fsw. Wait for the convulsion to stop, ensuring the diver is breathing. The diver breathes air until regaining consciousness and all symptoms resolve.

3. Complete remainder of 40-fsw stop on air. Count all the time at 40 fsw toward stop time. If all time at 40 fsw already meets or exceeds the 40-fsw stop time, then ascend to 20 fsw.

4. Ascend to 20 fsw. Repeat the 40-fsw chamber stop time.

5. Ascend to 10 fsw. Stay there for twice the 40-fsw stop chamber time.

9-10.1.4.1 ***Example.*** Divers make a planned dive to 152 fsw for 44 minutes using the Surface Decompression Table Using Oxygen. From the appropriate schedule (160/45), there is a 3-minute water stop at 60 fsw, a 4-minute water stop at 50 fsw, an 8-minute water stop at 40 fsw, a 6-minute stop at 30 fsw, and a 38-minute chamber stop at 40 fsw breathing oxygen. After 12 minutes of breathing oxygen at the 40-foot chamber stop, a diver suffers a convulsion. The convulsion completely subsides in 5 minutes and the diver regains consciousness.

9-10.1.4.2 ***Solution.*** Following the procedures for handling an oxygen toxicity convulsion, remove the BIBS from the diver. The diver breathes chamber air until all symptoms completely subside and he regains consciousness.

1. Complete remainder of 40-fsw stop on air.

2. Ascend to 20 fsw. Repeat the 40-fsw chamber stop time.

3. Ascend to 10 fsw. Stay there for twice the 40-fsw chamber stop time.

Figure 9-14 is a profile of this dive.

9-10.1.5 **Repetitive Dives.** There are no repetitive diving tables or surface interval tables for surface decompression dives. If another surface decompression dive using oxygen is planned within a 12-hour period, select the appropriate decompression schedule by:

1. Adding the bottom times of all dives made in the previous 12 hours to get an adjusted bottom time, and

2. Using the maximum depth obtained in the previous 12 hours.

3. The equivalent single dive shall not exceed 170/40 for Sur D O_2 or 190/60 for Sur D Air.

9-10.1.5.1 ***Example.*** A dive is conducted to 165 fsw for 25 minutes, followed by a surface interval of 3 hours 42 minutes, and a repetitive dive to 133 fsw for 15 minutes. The Surface Decompression Table Using Oxygen is used for both dives. Determine the correct decompression schedules.

9-10.1.5.2 ***Solution.*** The correct decompression schedule is 170/25 for the first dive and 170/40 for the second dive. Even though the second dive was to a maximum depth of 138 fsw for 15 minutes, the divers must be decompressed for the maximum depth attained in the previous 12 hours, which was 170 fsw, and a total of all bottom times, which was 40 minutes. Figure 9-15, Figure 9-16, and Figure 9-17 chart this example.

Even if the second dive is to be a Standard Air dive, combine all bottom times in the previous 12 hours to get an adjusted bottom time and decompression schedule from the maximum depth attained in the previous 12 hours.

9-10.2 Surface Decompression Table Using Air. The Surface Decompression Table Using Air (referred to as Sur D Air) should be used for surface decompression following an air dive when a recompression chamber without an oxygen breathing system is all that is available.

The total ascent times of the Surface Decompression Table Using Air exceed those of the Standard Air Decompression Table; the only advantages surface decompression using air are getting the divers out of the water sooner and maintaining the divers in a controlled, closely observed environment during decompression.

When using the Sur D Air table, all ascents are made at 30 fpm. This includes the ascent rate from the last water stop. The time spent on the surface should not exceed 3½ minutes and the rate of descent to the first recompression chamber stop should not exceed 60 fpm. The total elapsed time for these three procedures must not exceed 5 minutes.

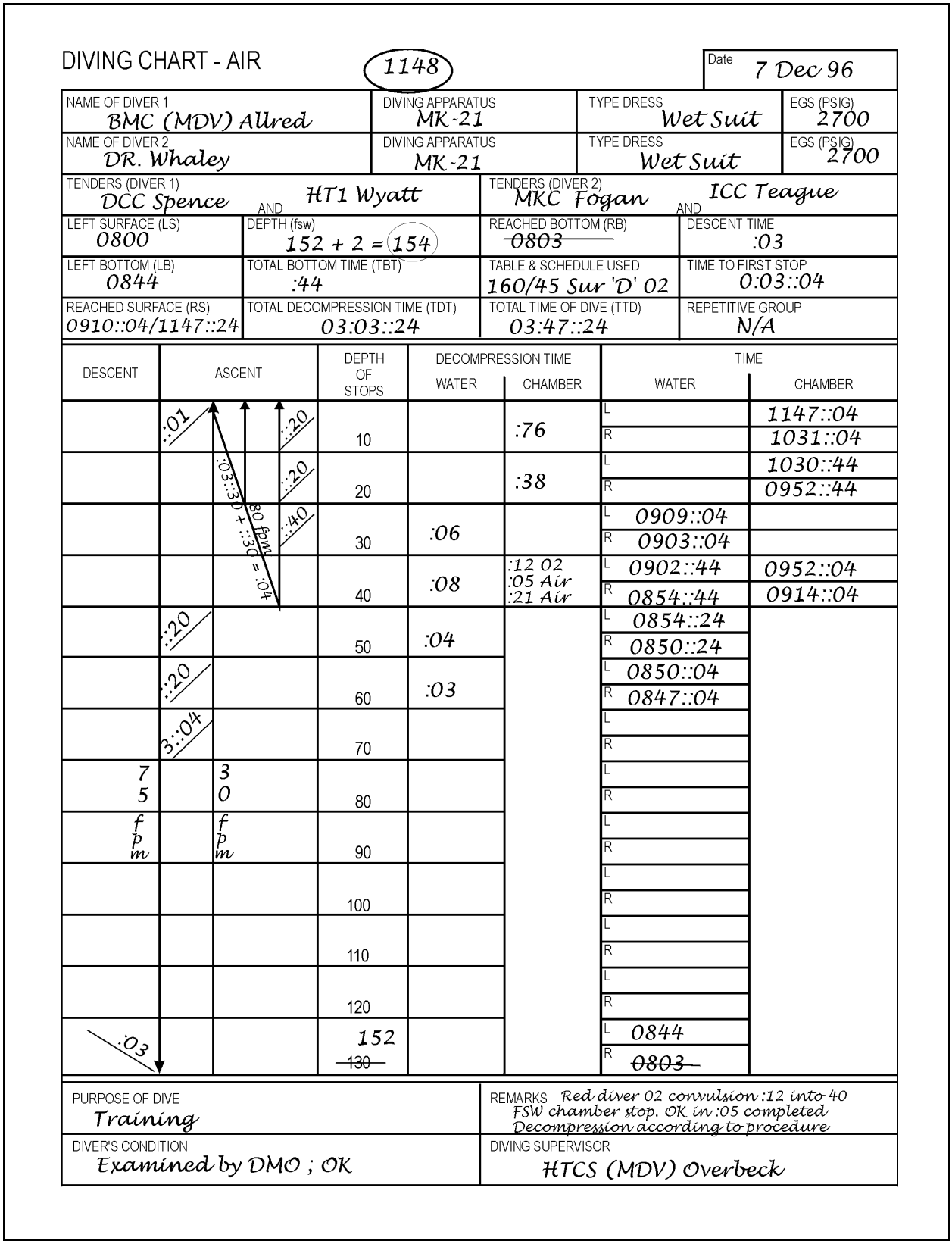
If the prescribed surface interval is exceeded and the divers are asymptomatic, they are treated as if they had Type I Decompression Sickness (Treatment Table 5 or 1A, Chapter 21). If the divers are symptomatic, they are treated as if they had Type II Decompression Sickness (Treatment Table 6 or 2A, Chapter 21), even if they are only displaying Type I symptoms. Symptoms occurring during the chamber stops are treated as recurrences (Chapter 21).

9-10.2.1 **Example.** A dive is conducted to 123 fsw for 48 minutes using the Surface Decompression Table Using Air. Determine the correct decompression schedule.

9-10.2.2 **Solution.** The correct decompression schedule for a dive conducted to 123 fsw for 48 minutes is the 130/50 schedule. The decompression chart is shown in Figure 9-18.

9-10.2.3 **Repetitive Dives.** If a second surface decompression air dive is planned within a 12-hour period, the same rule applies as for making a second Sur D O_2 dive (paragraph 9-10.1.5).

9-10.2.3.1 ***Example.*** A repetitive Sur D Air dive is planned for 138 fsw for 20 minutes. The previous dive was to 167 fsw for 30 minutes. The surface interval was 4 hours 27 minutes. Determine the correct decompression schedules.



DIVING CHART - AIR

1148

Date: 7 Dec 96

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
BMC (MDV) Allred	MK-21	Wet Suit	2700
NAME OF DIVER 2	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
DR. Whaley	MK-21	Wet Suit	2700

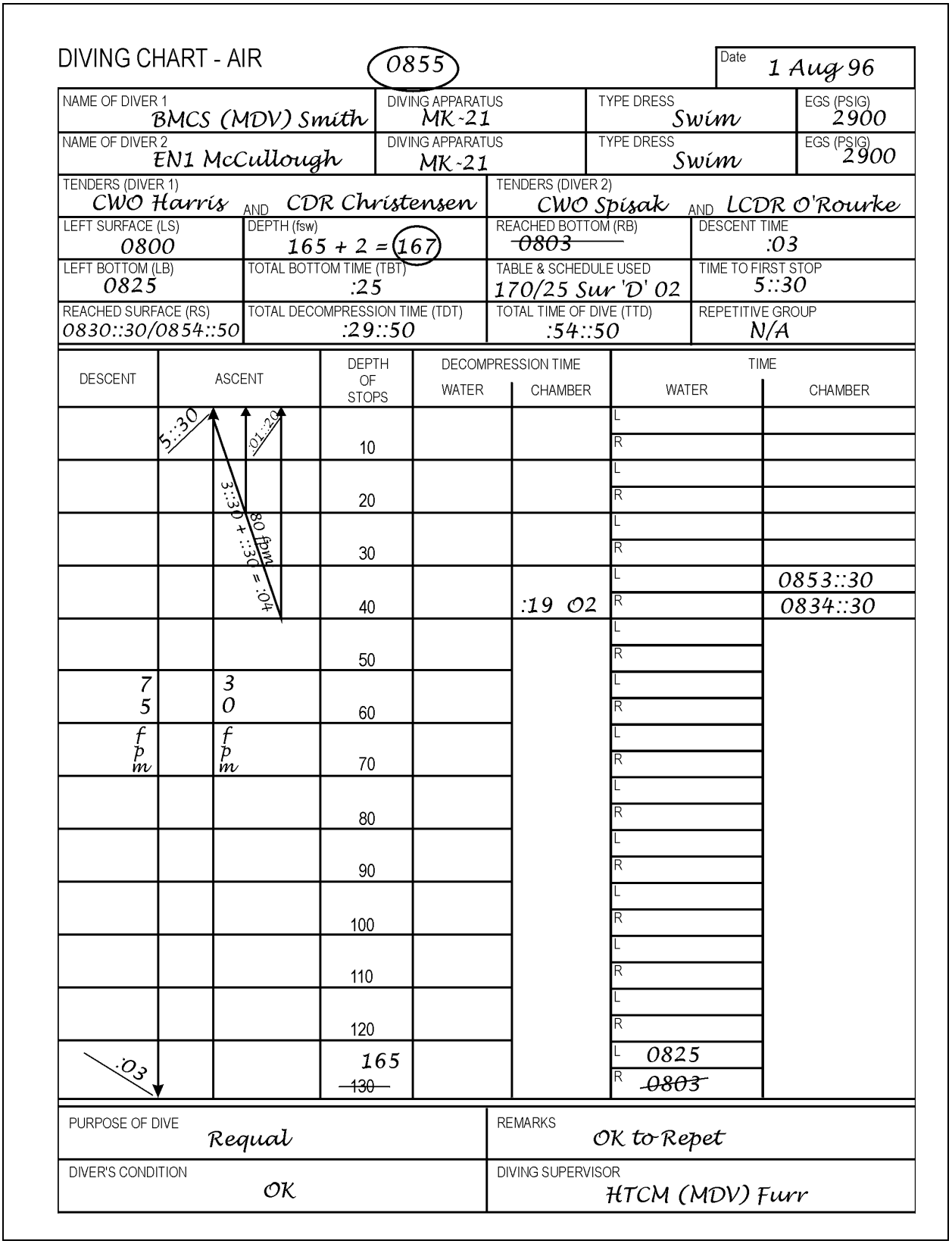
TENDERS (DIVER 1)		TENDERS (DIVER 2)	
DCC Spence AND	HT1 Wyatt	MKC Fogan AND	ICC Teague

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
0800	152 + 2 = 154	~~0803~~	:03
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
0844	:44	160/45 Sur 'D' 02	0:03::04
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
0910::04/1147::24	03:03::24	03:47::24	N/A

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	:01 / :20	10		:76	L	1147::04
					R	1031::04
	:03::30 + ::30 = :04 (80 fpm) / :20	20		:38	L	1030::44
					R	0952::44
	:40	30	:06		L 0909::04	
					R 0903::04	
		40	:08	:12 02 :05 Air :21 Air	L 0902::44	0952::04
					R 0854::44	0914::04
	:20	50	:04		L 0854::24	
					R 0850::24	
	:20	60	:03		L 0850::04	
					R 0847::04	
	3::04	70			L	
					R	
75 fpm	30 fpm	80			L	
					R	
		90			L	
					R	
		100			L	
					R	
		110			L	
					R	
		120			L	
					R	
:03		152 ~~130~~			L 0844	
					R ~~0803~~	

PURPOSE OF DIVE	REMARKS
Training	Red diver 02 convulsion :12 into 40 FSW chamber stop. OK in :05 completed Decompression according to procedure
DIVER'S CONDITION	**DIVING SUPERVISOR**
Examined by DMO ; OK	HTCS (MDV) Overbeck

Figure 9-14. Dive Profile.



DIVING CHART - AIR

0855

Date: 1 Aug 96

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
BMCS (MDV) Smith	MK-21	Swim	2900
NAME OF DIVER 2	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
EN1 McCullough	MK-21	Swim	2900

TENDERS (DIVER 1)	TENDERS (DIVER 2)
CWO Harris AND CDR Christensen	CWO Spisak AND LCDR O'Rourke

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
0800	165 + 2 = 167	~~0803~~	:03
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
0825	:25	170/25 Sur 'D' 02	5::30
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
0830::30/0854::50	:29::50	:54::50	N/A

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	5::30 / :01::20 / 3::30 @ 80 fpm + ::30 = :04	10			L / R	
		20			L / R	
		30			L / R	
		40		:19 O2	L / R	0853::30 / 0834::30
		50			L / R	
75 fpm	30 fpm	60			L / R	
		70			L / R	
		80			L / R	
		90			L / R	
		100			L / R	
		110			L / R	
		120			L / R	
:03		165 ~~130~~			L 0825 / R ~~0803~~	

PURPOSE OF DIVE	REMARKS
Requal	OK to Repet
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	HTCM (MDV) Furr

Figure 9-15. Dive Profile.

REPETITIVE DIVE WORKSHEET

DATE: 1 AUG 96

1. PREVIOUS DIVE

:25 minutes
165+02=167 feet
_____ repetitive group letter designation

☐ Standard Air Table
☒ Surface Table Using Oxygen
☐ Surface Table Using Air
☐ Unlimited/No-Decompression Table

2. SURFACE INTERVAL

03 hours 42 minutes on surface
_____ repetitive group from item 1 above
_____ new repetitive group letter designation from Residual Nitrogen Timetable

3. RESIDUAL NITROGEN TIME

133 + 2 = 135 feet, depth of repetitive dive
_____ new repetitive group letter designation from item 2 above
:25 minutes, residual nitrogen time from Residual Nitrogen Timetable or bottom time of previous Sur D dive

4. EQUIVALENT SINGLE DIVE TIME:

:25 minutes, residual nitrogen time from item 3 above or bottom time of previous Sur D dive
\+ :15 minutes, actual bottom time of repetitive dive
= :40 minutes, equivalent single dive time

5. DECOMPRESSION FOR REPETITIVE DIVE:

133 + 2 = 135 feet, depth of repetitive dive previous dive was 165 + 2 = 167
:40 minutes, equivalent single dive time from item 4 above

Decompression from (check one):

☐ Standard Air Table
☒ Surface Table Using Oxygen
☐ Unlimited/No-Decompression Table
☐ Surface Table Using Air

Decompression Stops:	Depth	Water	Chamber
	30 feet	:06 minutes	_____ minutes
	40 feet	:08 minutes	::36 minutes
	50 feet	:04 minutes	_____ minutes
	60 feet	:04 minutes	_____ minutes
	_____ feet	_____ minutes	_____ minutes

170/40 schedule used (depth/time)
_____ repetitive group letter designation

(diver "maxed out" on Sur 'D' 0)

Figure 9-16. Completed Repetitive Dive Worksheet.

DIVING CHART - AIR

1405

Date: 1 Aug 96

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
BMCS (MDV) Smith	MK-21	Swim	2900
NAME OF DIVER 2	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
BM1 Starring	MK-21	Swim	2900

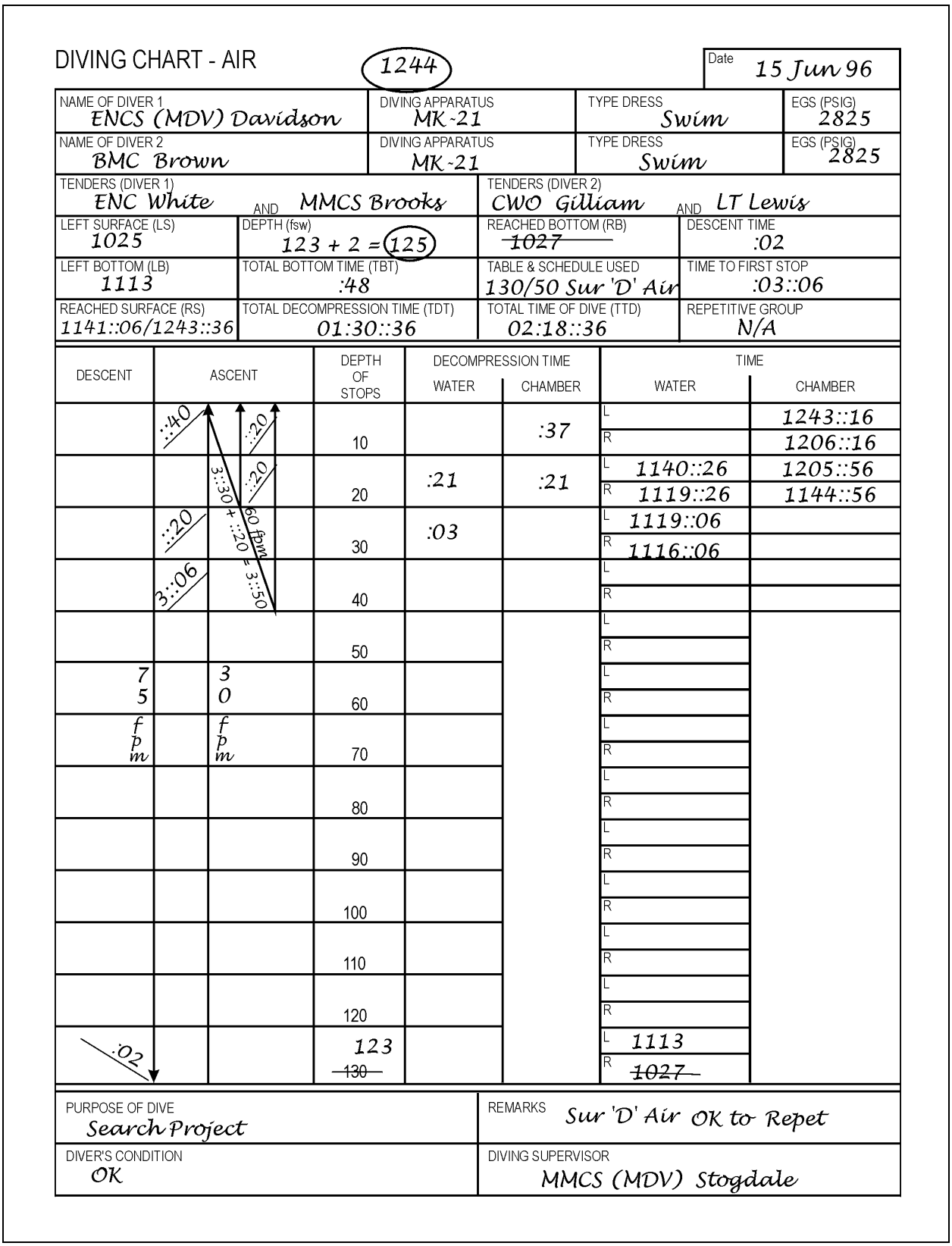
TENDERS (DIVER 1)	TENDERS (DIVER 2)
CAPT. Rewick AND LCDR Veazie	CWO Schnieder AND CDR. Coster

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
1237	133 + 2 = (135)	~~1239~~	:02
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
1252	(:15) + :25 = :40	170/40 Sur 'D' 02	:02::26
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
1318::26/1404::46	01:12::46	01:27::46	N/A

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	::01 / 01::20 / 3::30 + ::30 = :04 @ 80 fpm	10			L R	
		20			L R	
		30	:06		L 1317::26 R 1311::26	
	::20	40	:08	:30 02 :05 Air :06 02	L 1311::06 R 1303::06	1403::26 1322::26
	::20	50	:04		L 1302::46 R 1258::46	
	::20	60	:04		L 1258::26 R 1254::26	
	2::26	70			L R	
75 fpm		80			L R	
		90			L R	
		100			L R	
		110			L R	
		120			L R	
:02		133 ~~130~~			L 1252 R ~~1239~~	

PURPOSE OF DIVE	REMARKS
Training	Do Not Repet Maxed Out Sur 'D' 02
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	SWCS (MDV) Isui

Figure 9-17. Dive Profile.



DIVING CHART - AIR

1244

Date: 15 Jun 96

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
ENCS (MDV) Davidson	MK-21	Swim	2825
NAME OF DIVER 2	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
BMC Brown	MK-21	Swim	2825

TENDERS (DIVER 1)	TENDERS (DIVER 2)
ENC White AND MMCS Brooks	CWO Gilliam AND LT Lewis

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
1025	123 + 2 = 125	~~1027~~	:02
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
1113	:48	130/50 Sur 'D' Air	:03::06
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
1141::06/1243::36	01:30::36	02:18::36	N/A

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	::40	10		:37	L	1243::16
	::20				R	1206::16
	3::30 + ::20 = 3::50	20	:21	:21	L 1140::26	1205::56
	::20				R 1119::26	1144::56
	::20	30	:03		L 1119::06	
	60 fpm				R 1116::06	
	3::06	40			L	
					R	
		50			L	
					R	
75 fpm	30 fpm	60			L	
					R	
		70			L	
					R	
		80			L	
					R	
		90			L	
					R	
		100			L	
					R	
		110			L	
					R	
		120			L	
					R	
:02		123 ~~130~~			L 1113	
					R ~~1027~~	

PURPOSE OF DIVE	REMARKS
Search Project	Sur 'D' Air OK to Repet
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	MMCS (MDV) Stogdale

Figure 9-18. Dive Profile.

9-10.2.3.2 ***Solution.*** The correct schedule for the first dive is 180/30. The correct schedule for the second dive is 180/50. As explained in the Sur D O_2 procedure, the correct procedure is to decompress the divers on a schedule for the maximum depth attained and the total of bottom times of all dives made in the previous 12 hours. Figure 9-19 illustrate the first dive, the repetitive dive worksheet is shown in Figure 9-20 and the repetitive dive for the example above is shown in Figure 9-21.

9-11 EXCEPTIONAL EXPOSURE DIVES

Exceptional exposure dives are those dives in which the risk of decompression sickness, oxygen toxicity, and/or exposure to the elements is substantially greater than on normal working dives. Decompression schedules for exceptional exposure dives are contained in the Standard Air Decompression Table. These exceptional exposure schedules are intended to be used only in emergencies, such as diver entrapment. Exceptional exposure dives should not be planned in advance except under the most unusual operational circumstances. The Commanding Officer must carefully assess the need for planned exceptional exposure diving and prior CNO approval for such diving is required. Selected exceptional exposure dives have been proven safe in controlled conditions and are authorized at the Naval Diving and Salvage Training Center during certain phases of diver training.

9-11.1 Surface Decompression Procedures for Exceptional Exposure Dives. The long decompressions times associated with exceptional exposure dives impose unusual demands on a diver's endurance. There is also limited assurance that the dive will be completed without decompression sickness. These two risks can be reduced by using surface decompression techniques rather than completing decompression entirely in the water.

9-11.1.1 **If oxygen is available at the 30 fsw stop in the water:**

1. Complete the entire 30 fsw in water stop on oxygen, interrupting oxygen breathing after each 30 minutes with a 5 minute air break. The air breaks count as part of the stop time.

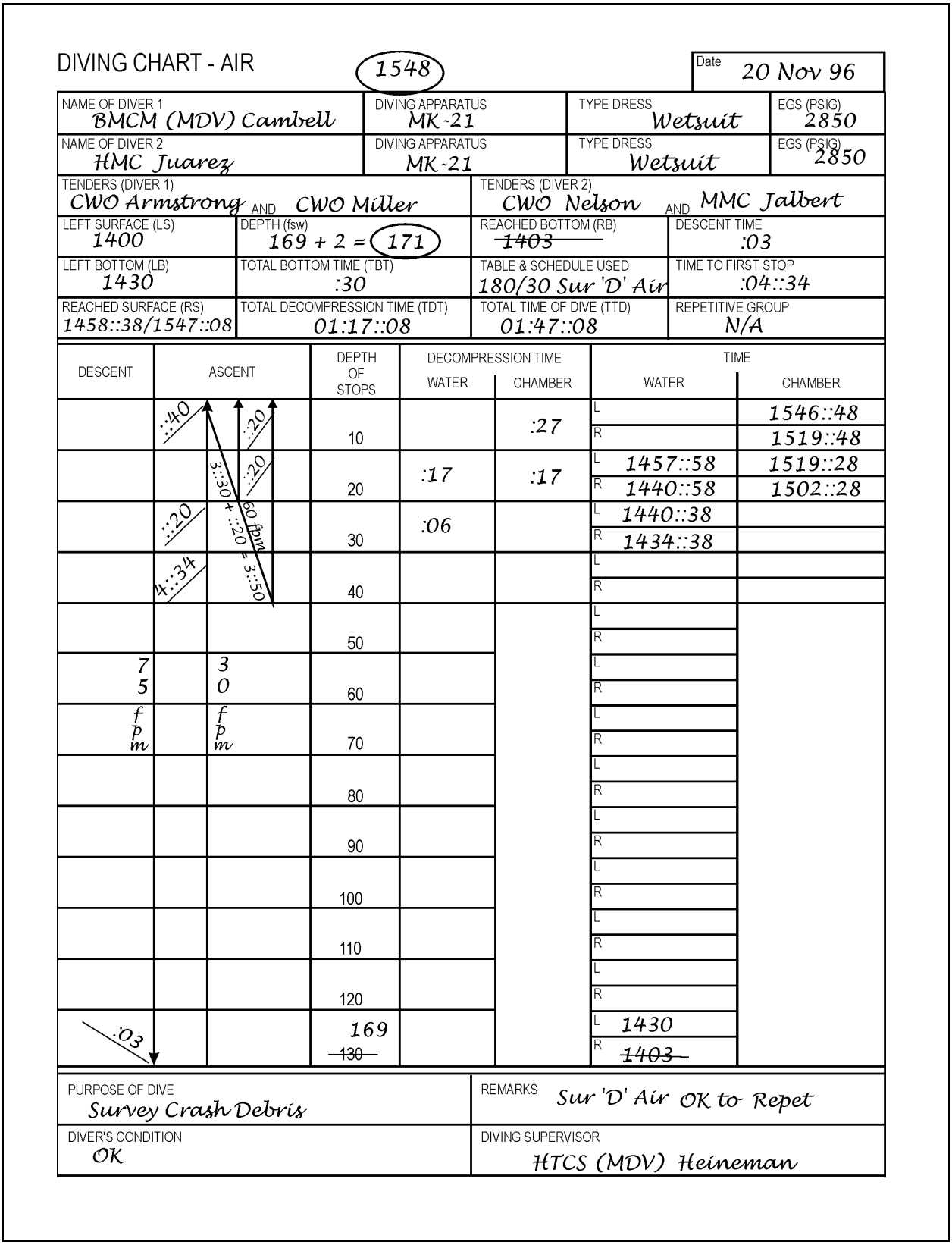
2. Ascend to the surface at 30 fpm. Minor variations in the rate of travel between 20 and 40 fpm are acceptable.

3. Once on the surface, the tenders have three and a half (:03::30) minutes to remove the breathing apparatus and diving dress and assist the divers into the recompression chamber.

4. Pressurize the recompression chamber with air to 30 fsw at a travel rate of 60 fpm.

5. Upon arrival at 30 fsw in the recompression chamber, the divers are placed on the Built-in Breathing System (BIBS) mask breathing 100 % oxygen.

6. The 30 foot stop time commences once the divers are breathing oxygen. Repeat the 30 fsw in-water stop time.



DIVING CHART - AIR

1548

Date: 20 Nov 96

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
BMCM (MDV) Cambell	MK-21	Wetsuit	2850
NAME OF DIVER 2	**DIVING APPARATUS**	**TYPE DRESS**	**EGS (PSIG)**
HMC Juarez	MK-21	Wetsuit	2850

TENDERS (DIVER 1)	TENDERS (DIVER 2)
CWO Armstrong AND CWO Miller	CWO Nelson AND MMC Jalbert

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
1400	169 + 2 = 171	~~1403~~	:03
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
1430	:30	180/30 Sur 'D' Air	:04::34
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
1458::38/1547::08	01:17::08	01:47::08	N/A

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	::40	10		:27	L	1546::48
	::20				R	1519::48
	3::30 + ::20 = 3::50	20	:17	:17	L 1457::58	1519::28
	::20				R 1440::58	1502::28
	60 fpm	30	:06		L 1440::38	
	4::34				R 1434::38	
		40			L	
					R	
		50			L	
					R	
75 fpm	30 fpm	60			L	
					R	
		70			L	
					R	
		80			L	
					R	
		90			L	
					R	
		100			L	
					R	
		110			L	
					R	
		120			L	
					R	
:03		169 ~~130~~			L 1430	
					R ~~1403~~	

PURPOSE OF DIVE	REMARKS
Survey Crash Debris	Sur 'D' Air OK to Repet
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	HTCS (MDV) Heineman

Figure 9-19. Dive Profile.

REPETITIVE DIVE WORKSHEET

DATE: 20 NOV 96

1. PREVIOUS DIVE

:30 minutes
169 + 2 = 171 feet
N/A repetitive group letter designation

☐ Standard Air Table
☐ Surface Table Using Oxygen
☐ Unlimited/No-Decompression Table
☒ Surface Table Using Air

2. SURFACE INTERVAL

04 hours 27 minutes on surface
N/A repetitive group from item 1 above
N/A new repetitive group letter designation from Residual Nitrogen Timetable

3. RESIDUAL NITROGEN TIME

139 + 2 = 141 feet, depth of repetitive dive
N/A new repetitive group letter designation from item 2 above
:30 minutes, residual nitrogen time from Residual Nitrogen Timetable or bottom time of previous Sur D dive

4. EQUIVALENT SINGLE DIVE TIME:

:30 minutes, residual nitrogen time from item 3 above or bottom time of previous Sur D dive
\+ :20 minutes, actual bottom time of repetitive dive
= :50 minutes, equivalent single dive time

5. DECOMPRESSION FOR REPETITIVE DIVE:

139 + 2 = 141 feet, depth of repetitive dive previous dive was 171 feet
:50 minutes, equivalent single dive time from item 4 above

Decompression from (check one):

☐ Standard Air Table
☐ Surface Table Using Oxygen
☐ Unlimited/No-Decompression Table
☒ Surface Table Using Air

	Depth	Water	Chamber
Decompression Stops:	10 feet	---- minutes	:65 minutes
	20 feet	:30 minutes	:30 minutes
	30 feet	:19 minutes	_____ minutes
	40 feet	:09 minutes	_____ minutes
	50 feet	:02 minutes	_____ minutes

180/50 schedule used (depth/time)
_____ repetitive group letter designation

Figure 9-20. Completed Repetitive Dive Worksheet.

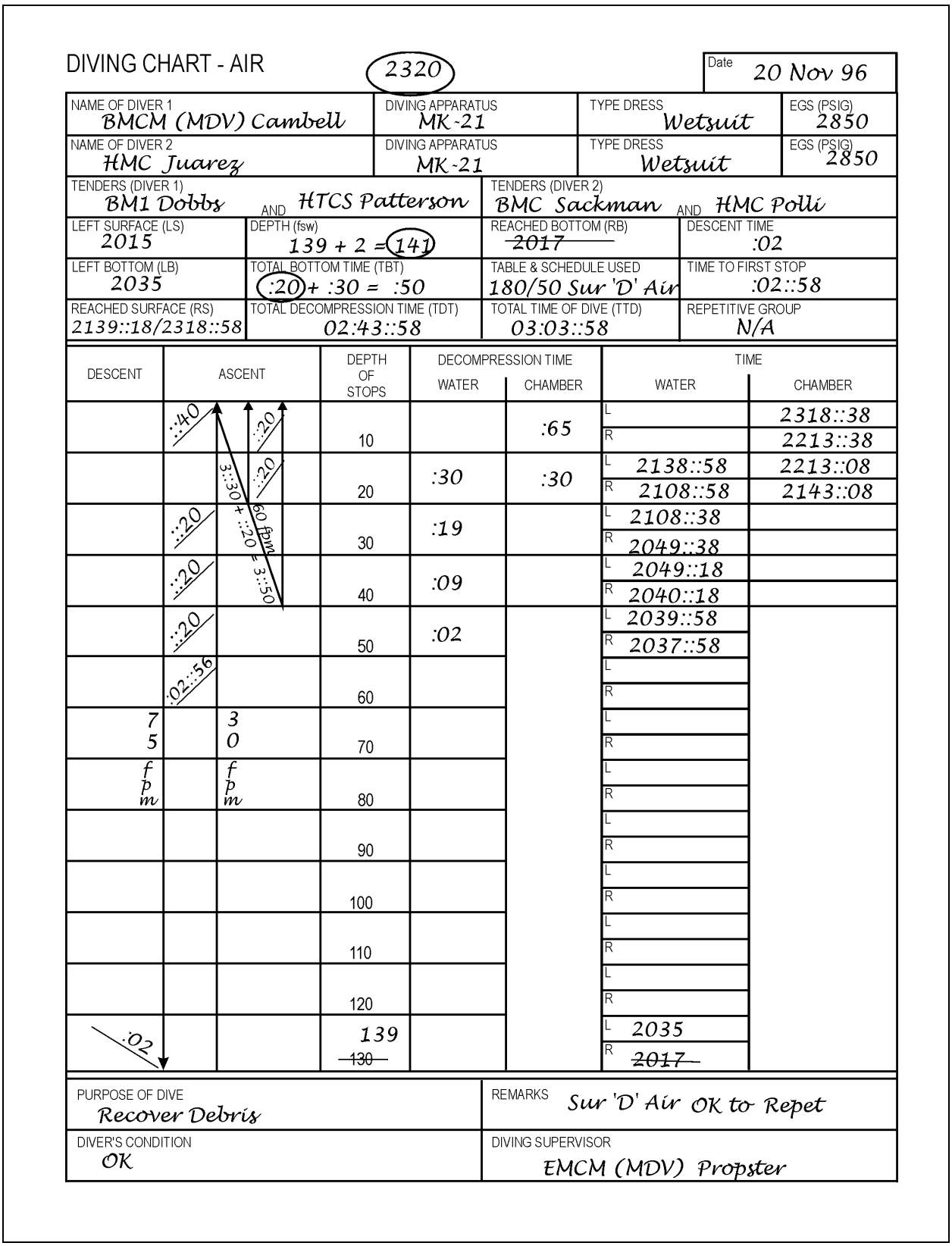


Figure 9-21. Dive Profile.

7. The divers breathe oxygen throughout the 30-foot stop, interrupting oxygen breathing after each 30 minutes with a 5 minute air break. The air breaks count as part of the stop time.

8. Ascend to 20 fsw at 30 fpm. Complete the 20 fsw in-water stop time. The divers breathe oxygen throughout the 20-foot stop, interrupting oxygen breathing after each 30 minutes with a 5 minute air break. The air breaks count as part of the stop time.

9. Ascend to 10 fsw at 30 fpm. Complete the 10 fsw in-water stop time. The divers breathe oxygen throughout the 10-foot stop, interrupting oxygen breathing after each 30 minutes with a 5 minute air break. The air breaks count as part of the stop time.

10. Ascent to the surface at 30 fpm.

9-11.1.2 **If no oxygen is available at the 30 fsw stop in the water:**

1. Complete the entire 20 fsw in the water.

2. Ascend to the surface at 30 fpm. Minor variations in the rate of travel between 20 and 40 fpm are acceptable.

3. Once on the surface, the tenders have three and a half (:03::30) minutes to remove the breathing apparatus and diving dress and assist the divers into the recompression chamber.

4. Pressurize the recompression chamber with air to 20 fsw at a travel rate of 60 fpm.

5. Upon arrival at 20 fsw in the recompression chamber, the divers are placed on the Built-in Breathing System (BIBS) mask breathing 100 % oxygen.

6. The 20 foot stop time commences once the divers are breathing oxygen. Repeat the 20 fsw in-water stop time.

7. The divers breathe oxygen throughout the 20-foot stop, interrupting oxygen breathing after each 30 minutes with a 5 minute air break. The air breaks count as part of the stop time.

8. Ascend to 10 fsw at 30 fpm. Complete the 10 fsw in-water stop time. The divers breathe oxygen throughout the 10-foot stop, interrupting oxygen breathing after each 30 minutes with a 5 minute air break. The air breaks count as part of the stop time.

9. Ascent to the surface at 30 fpm.

9-11.2 Oxygen System Failure (Chamber Stop). If the oxygen systems fails during a chamber stop, complete the remaining decompression time on air.

9-12 DIVING AT HIGH ALTITUDES

Because of the reduced atmospheric pressure, dives conducted at altitude require more decompression than identical dives conducted at sea level. Standard air decompression tables, therefore, cannot be used as written. Some organizations calculate specific decompression tables for use at each altitude. An alternative approach is to correct the altitude dive to obtain an equivalent sea level dive, then determine the decompression requirement using standard tables. This procedure is commonly known as the "Cross Correction" technique and always yields a sea level dive that is deeper than the actual dive at altitude. A deeper sea level equivalent dive provides the extra decompression needed to offset effects of diving at altitude.

9-12.1 Altitude Correction Procedure. To apply the "Cross Correction" technique, two corrections must be made for altitude diving. First, the actual dive depth must be corrected to determine the sea level equivalent depth. Second, the decompression stops in the sea level equivalent depth table must be corrected for use at altitude. Strictly speaking, ascent rate should also be corrected, but this third correction can safely be ignored.

9-12.1.1 **Correction of Depth of Dive.** Depth of a sea level equivalent dive is determined by multiplying the depth of the dive at altitude by a ratio of atmospheric pressure at sea level to atmospheric pressure at altitude. Using millibars (mb) as a unit for expressing atmospheric pressure at altitude equivalent depth is then:

$$\text{Equivalent Depth (fsw)} = \text{Altitude Depth (fsw)} \times \frac{\text{Pressure at Sea Level (mb)}}{\text{Pressure at Altitude (mb)}}$$

Example: A diver makes a dive to 60 fsw at an altitude of 5000 ft. The atmospheric pressure measured at 5000 ft is 843 millibars (0.832 ATA). Atmospheric pressure at sea level is assumed to be 1013 millibars (1.000 ATA). Sea level equivalent depth is then:

$$\text{Equivalent Depth (fsw)} = 60 \text{ fsw} \times \frac{1013 \text{ mb}}{843 \text{ mb}} = 72.1 \text{ fsw}$$

9-12.1.2 **Correction for Decompression Stop Depths.** Depth of the corrected stop at altitude is calculated by multiplying depth of a sea level equivalent stop by a ratio of atmospheric pressure at altitude to atmospheric pressure at sea level. [Note: this ratio is inverse to the ratio in the formula above.

$$\text{Altitude Stop Depth (fsw)} = \text{Sea Level Stop Depth (fsw)} \times \frac{\text{Pressure at Altitude (mb)}}{\text{Pressure at Sea Level (mb)}}$$

Example: A diver makes a dive at an altitude of 5000 ft. An equivalent sea level dive requires a decompression stop at 20 fsw. Stop depth used at altitude is then:

$$\text{Altitude Stop Depth (fsw)} = 20 \text{ fsw} \times \frac{843 \text{ mb}}{1013 \text{ mb}} = 16.6 \text{ fsw}$$

To simplify calculations, Table 9-3 gives corrected sea level equivalent depths and equivalent stops depths for dives from 10-190 ft and for altitudes from 1,000 to 10,000 ft in 1000 ft increments.

WARNING **Table 9-3 cannot be used with constant ppO_2 diving equipment, such as the MK 16.**

9-12.2 Need for Correction. No correction is required for dives conducted at altitudes between sea level and 300 ft. The additional risk associated with these dives is minimal. At altitudes between 300 and 1000 feet, correction is required for dives deeper than 145 fsw (actual depth). At altitudes above 1000 ft., correction is required for all dives.

9-12.3 Depth Measurement at Altitude. The preferred method for measuring depth at altitude is a mechanical or electronic gauge that can be re-zeroed at the dive site. Once re-zeroed, no further correction of the reading is required.

When using a recompression chamber for decompression, zero the chamber depth gauges before conducting surface decompression.

Most mechanical depth gauges carried by divers have a sealed one atmosphere reference and cannot be adjusted for altitude, thus they will read low throughout a dive at altitude. A correction factor of 1 fsw for every 1000 ft of altitude should be added to the reading of a sealed reference gauge before entering Table 9-3.

Pneumofathometers can be used at altitude. Add the pneumofathometer correction factor (Table 9-1) to the depth reading before entering Table 9-3. The pneumofathometer correction factors are unchanged at altitude.

A sounding line or fathometer may be used to measure the depth if a suitable depth gauge is not available. These devices measure the linear distance below the surface of the water, not the water pressure. Though fresh water is less dense than sea water, all dives will be assumed to be conducted in sea water, thus no corrections will be made based on water salinity. Enter Table 9-3 directly with the depth indicated on the line or fathometer.

9-12.4 Equilibration at Altitude. Upon ascent to altitude, two things happen. The body off-gases excess nitrogen to come into equilibrium with the lower partial pressure of nitrogen in the atmosphere. It also begins a series of complicated adjustments to the lower partial pressure of oxygen. The first process is called equilibration; the second is called acclimatization. Twelve hours at altitude is required for equilibration. A longer period is required for full acclimatization.

Table 9-3. *Sea Level Equivalent Depth (fsw).*

Actual Depth	Altitude (feet)									
(fsw)	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
10	10	15	15	15	15	15	15	15	15	15
15	15	20	20	20	20	20	20	25	25	25
20	20	25	25	25	25	25	30	30	30	30
25	25	30	30	30	35	35	35	35	35	40
30	30	35	35	35	40	40	40	50	50	50
35	35	40	40	50	50	50	50	50	50	60
40	40	50	50	50	50	50	60	60	60	60
45	45	50	60	60	60	60	60	70	70	70
50	50	60	60	60	70	70	70	70	70	80
55	55	60	70	70	70	70	80	80	80	80
60	60	70	70	70	80	80	80	90	90	90
65	65	70	80	80	80	90	90	90	100	100
70	70	80	80	90	90	90	100	100	100	110
75	75	90	90	90	100	100	100	110	110	110
80	80	90	90	100	100	100	110	110	120	120
85	85	100	100	100	110	110	120	120	120	130
90	90	100	110	110	110	120	120	130	130	140
95	95	110	110	110	120	120	130	130	140	140
100	100	110	120	120	130	130	130	140	140	150
105	105	120	120	130	130	140	140	150	150	160
110	110	120	130	130	140	140	150	150	160	160
115	115	130	130	140	140	150	150	160	170	170
120	120	130	140	140	150	150	160	170	170	180
125	125	140	140	150	160	160	170	170	180	190
130	130	140	150	160	160	170	170	180	190	190
135	135	150	160	160	170	170	180	190	190	200
140	140	160	160	170	170	180	190	190	200	210
145	145	160	170	170	180	190	190	200	210	
150	160	170	170	180	190	190	200	210		
155	170	170	180	180	190	200	210			
160	170	180	180	190	200	200				
165	180	180	190	200	200					
170	180	190	190	200						
175	190	190	200							
180	190	200	210							
185	200	200								
190	200									
Table Water	**Equivalent Stop Depths (fsw)**									
10	10	9	9	9	8	8	8	7	7	7
20	19	19	18	17	17	16	15	15	14	14
30	29	28	27	26	25	24	23	22	21	21
40	39	37	36	35	33	32	31	30	29	28
50	48	47	45	43	42	40	39	37	36	34
60	58	56	54	52	50	48	46	45	43	41

Note: ——— = Exceptional Exposure Limit

.

If a diver begins a dive at altitude within 12 hours of arrival, the residual nitrogen left over from sea level must be taken into account. In effect, the initial dive at altitude can be considered a repetitive dive, with the first dive being the ascent from sea level to altitude. Table 9-4 gives the repetitive group associated with an initial ascent to altitude. Using this group and the time at altitude before diving, enter the Residual Nitrogen Timetable for Repetitive Air Dives (Table 9-7) to determine a new repetitive group designator associated with that period of equilibration. Determine sea level equivalent depth for your planned dive using Table 9-3. From your new repetitive group and sea level equivalent depth, determine the residual nitrogen time associated with the dive. Add this time to the actual bottom time of the dive.

Example: A diver ascends rapidly to 6000 feet in a helicopter and begins a dive to 100 fsw 90 minutes later. How much residual nitrogen time should be added to the dive?

From Table 9-4, repetitive group upon arrival at 6000 feet is Group E. During 90 minutes at altitude, the diver will desaturate to Group D. From Table 9-3, sea level equivalent depth for a 100 fsw dive is 130 fsw. From Table 9-7, residual nitrogen time for a 130 fsw dive in Group D is 11 minutes. The diver should add 11 minutes to bottom time.

Table 9-4 can also be used when a diver who is fully equilibrated at one altitude ascends to and dives at a higher altitude. Enter Table 9-4 with the difference between the two altitudes to determine an initial repetitive group.

Example: Divers equilibrated at a base camp altitude of 6000 feet, fly by helicopter to the dive site at 10,000 feet. The difference between the altitudes is 4000 feet. From Table 9-4, the initial repetitive group to be used at 10,000 feet is Group C.

WARNING **Altitudes above 10,000 feet can impose serious stress on the body resulting in significant medical problems while the acclimatization process takes place. Ascents to these altitudes must be slow to allow acclimatization to occur and prophylactic drugs may be required. These exposures should always be planned in consultation with a Diving Medical Officer. Commands conducting diving operations above 10,000 feet may obtain the appropriate decompression procedures from NAVSEA 00C.**

9-12.5 Diving At Altitude Worksheet.

Figure 9-22 is a worksheet for altitude diving. To determine Sea Level Equivalent Depth (SLED) and corrected decompression stops for an altitude dive, follow these steps:

9-12.5.1 Corrections for Depth of Dive at Altitude and In-Water Stops.

Line 1. Determine dive site altitude by referring to a map. From Table 9-3, enter the altitude in feet that is equal to, or next greater than the altitude at the dive site.

Line 2. Enter the actual depth of the dive in feet of seawater.

Table 9-4. *Repetitive Groups Associated with Initial Ascent to Altitude.*

Altitude (feet)	Repetitive Group
1000	A
2000	B
3000	B
4000	C
5000	D
6000	E
7000	E
8000	F
9000	G
10000	H

NOTE **Refer to paragraph 9-12.3 to correct divers' depth guage readings to actual depths at altitude.**

Line 3. Read Table 9-3 vertically down the Actual Depth column. Select a depth that is equal to or next greater than the actual depth. Reading horizontally, select the Sea Level Equivalent Depth corresponding to an altitude equal or next greater than that of your dive site.

9-12.5.2 **Corrections for Equilibration.**

Line 4. Enter the Repetitive Group upon arrival at altitude from Table 9-4 for the altitude listed on Line 1.

Line 5. Record time in hours and minutes spent equilibrating at altitude prior to the dive. If time at altitude is greater than 12 hours, proceed to step 7 and enter zero.

Line 6. Using Table 9-7, determine the Repetitive Group at the end of the pre-dive equilibration interval.

Line 7. Using Table 9-7, determine the Residual Nitrogen Time for the new repetitive group designation from line 6 and the Sea Level Equivalent Depth from line 3.

Line 8. Enter the planned bottom time.

Line 9. Add the bottom time and the residual nitrogen time to obtain the equivalent Single Dive Time.

Line 10. Select the Decompression Table to be used.

Line 11. Enter the Schedule from the Decompression Table using the Sea Level Equivalent Depth from line 3 and equivalent Single Dive Time from line 9.

DIVING AT ALTITUDE WORKSHEET

DATE

Actual Dive Site Altitude _____ feet

1. Altitude from Table 9-3. _____ feet

2. Actual Depth of Dive (corrected per section 9-12.3) _____ fsw

3. Sea Level Equivalent Depth from Table 9-3 _____ SLED

4. Repetitive Group from Table 9-4 _____

5. Time at Altitude _____ hrs _____ min

6. New Repetitive Group Designation from Table 9-7 _____

7. Residual Nitrogen Time _____ min

8. Planned Bottom Time + _____ min

9. Equivalent Single Dive Time = _____ min

10. Decompression Table

☐ Standard Air Table ☐ Unlimited/No-Decompression Table

☐ Surface Table Using Oxygen ☐ Surface Table Using Air

11. Table/Schedule _____/_____

12. Decompression Schedule

Sea Level Stop Depth	Altitude Stop Depth	Stop Time (Water/Chamber)
10 fsw	_____ fsw	_____/_____ min
20 fsw	_____ fsw	_____/_____ min
30 fsw	_____ fsw	_____/_____ min
40 fsw	_____ fsw	_____/_____ min*
50 fsw	_____ fsw	_____ min
60 fsw	_____ fsw	_____ min

13. Repetitive Group Letter Designation _____

*Chamber stop on SUR D O_2 will be at 40 fsw.

Figure 9-22. Worksheet for Diving at Altitude.

Line 12. Using the lower section of Table 9-3, read down the Table Water Stops column on the left to the decompression stop(s) given in the Sea Level Equivalent Depth Table/Schedule. Read horizontally to the altitude column. Record the corresponding altitude stop depths on the worksheet.

NOTE **For surface decompression dives on oxygen, the chamber stops are not adjusted for altitude. Enter the same depths as at sea level. Keeping chamber stop depths the same as sea level provides an extra decompression benefit for the diver on oxygen. For surface decompression on air, stops must be adjusted. (See the example below and Figure 9-23.)**

Line 13. Record the Repetitive Group Designator at the end of the dive.

NOTE **Follow all decompression table procedures for ascent and descent**

Example: Five hours after arriving at an altitude of 7750 feet, divers make a 60 min air dive to a gauge depth of 75 fsw. Depth is measured with a pneumofathometer having a non-adjustable gauge with a fixed reference pressure of one atmosphere. The Surface Decompression Table Using Oxygen will be used for decompression. What is the proper decompression schedule?

The altitude is first rounded up to 8000 feet. A depth correction of +8 fsw must be added to the maximum depth recorded on the fixed reference gauge. A pneumofathometer correction factor of + 1 fsw must also be added. The divers' actual depth is 84 fsw. Table 9-3 is entered at an actual depth of 85 fsw. The Sea Level Equivalent Depth for 8000 feet of altitude is 120 fsw. The repetitive group upon arrival at altitude is Group F. This decays to Group B during the five hours at altitude pre-dive. The residual nitrogen time for Group B at 120 fsw is 6 minutes. The Equivalent Single Dive Time therefore is 66 minutes. The appropriate decompression schedule from the Surface Decompression Table Using Oxygen is 120 fsw for 70 minutes. By the schedule, a 4-minute stop at 30 fsw in the water and a 39-minute stop at 40 fsw in the chamber are required. The water stop is taken at a depth of 22 fsw. The chamber stop is taken at a depth of 40 fsw.

Figure 9-23 shows the filled-out Diving at Altitude Worksheet for this dive. Figure 9-24 shows the filled-out Diving Chart.

9-12.6 Repetitive Dives. Repetitive dives may be conducted at altitude. The procedure is identical to that a sea level, with the exception that the sea level equivalent dive depth is always used to replace the actual dive depth. Figure 9-25 (on page 9-48) is a Repetitive Dive at Altitude Worksheet.

Example: Fourteen hours after ascending to an altitude of 7750 feet, divers make a 82 fsw 60 min MK 21 dive using the Standard Air Table. Depth is measured with a pneumofathometer having a depth gauge adjustable for altitude. After two hours and 10 min on the surface, they make a second dive to 79 fsw for 30 min and decompress on the Surface Decompression Table Using Oxygen. What is the proper decompression schedule for the second dive?

The altitude is first rounded up to 8000 feet. For the first dive, a depth correction of +1 fsw must be added to the 82 fsw pneumofathometer reading. The divers

DIVING AT ALTITUDE WORKSHEET

DATE: 10 Jan 99

Actual Dive Site Altitude: 7,750 feet

1. Altitude from Table 9-3. 8,000 feet
2. Actual Depth of Dive (corrected per section 9-12.3) 75 + 8 + 1 = 84 fsw
3. Sea Level Equivalent Depth from Table 9-3 120 SLED
4. Repetitive Group from Table 9-4 F
5. Time at Altitude 5 hrs — min
6. New Repetitive Group Designation from Table 9-7 B
7. Residual Nitrogen Time 6 min
8. Planned Bottom Time + 60 min
9. Equivalent Single Dive Time = 66 min
10. Decompression Table
    - ☐ Standard Air Table
    - ☒ Sur D Table Using Oxygen
    - ☐ Unlimited/No-Decompression Table
    - ☐ Sur D Table Using Air
11. Table/Schedule 120 / 70
12. Decompression Schedule

Sea Level Stop Depth	Altitude Stop Depth	Stop Time (Water/Chamber)
10 fsw	____ fsw	/ min
20 fsw	____ fsw	/ min
30 fsw	22 fsw	4 / min
40 fsw	____ fsw	/39 min*
50 fsw	____ fsw	____ min
60 fsw	____ fsw	____ min

13. Repetitive Group Letter Designation ____

*Chamber stop on SUR D O_2 will be at 40 fsw.

Figure 9-23. Completed Worksheet for Diving at Altitude

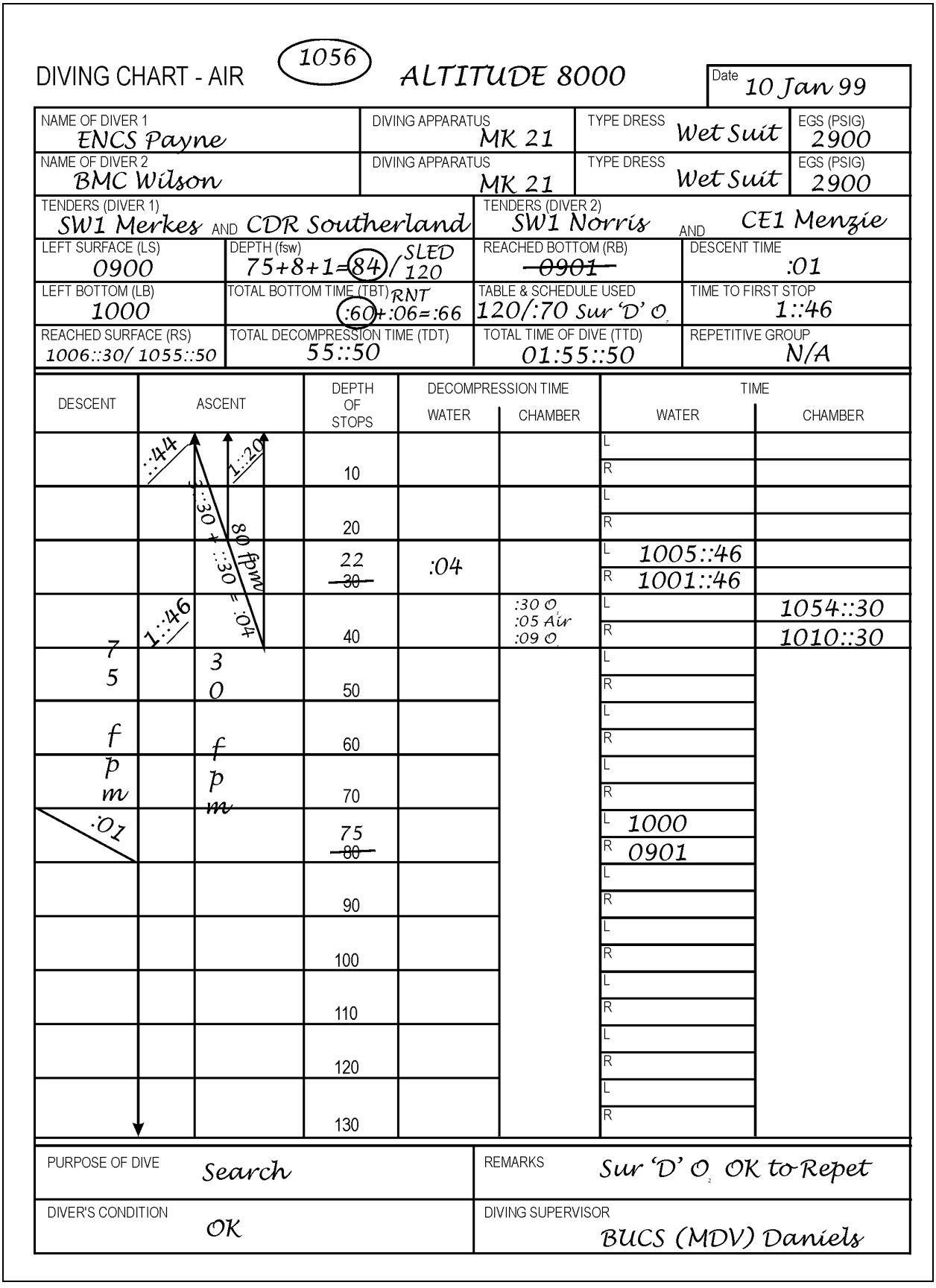


Figure 9-24. Completed Chart for Dive at Altitude.

REPETITIVE DIVE AT ALTITUDE WORKSHEET

DATE

1. PREVIOUS DIVE

_____ minutes ☐ Standard Air Table ☐ Unlimited/No-Decompression Table

_____ SLED ☐ Sur D Table Using Oxygen ☐ Sur D Table Using Air

_____ repetitive group letter designation

2. SURFACE INTERVAL

_____ hours _____ minutes on surface

_____ repetitive group from Item 1 above

_____ new repetitive group letter designation from Residual Nitrogen Timetable

3. RESIDUAL NITROGEN TIME FOR REPETITIVE DIVE

Altitude from Table 9-3 _____ feet

Actual Depth of Dive (corrected per section 9-12.3) _____ fsw

Sea Level Equivalent Depth of repetitive dive from Table 9-3 _____ SLED

_____ new repetitive group letter designation from item 2 above

_____ minutes, residual nitrogen time from Residual Nitrogen Timetable or bottom time of previous Sur D dive

4. EQUIVALENT SINGLE DIVE TIME:

_____ minutes, residual nitrogen time from item 3 above or bottom time of previous Sur D dive

\+ _____ minutes, actual bottom time of repetitive dive

= _____ minutes, equivalent single dive time

5. DECOMPRESSION FOR REPETITIVE DIVE:

_____ SLED of repetitive dive

_____ minutes, equivalent single dive time from item 4 above

Decompression from (check one):

☐ Standard Air Table ☐ Unlimited/No-Decompression Table

☐ Sur D Table Using Oxygen ☐ Sur D Table Using Air

_____ schedule used (depth/time)

Sea Level Stop Depth:	Altitude Stop Depth	Water Stop Time	Chamber Stop Time
10 fsw	_____ fsw	_____ minutes	_____ minutes
20 fsw	_____ fsw	_____ minutes	_____ minutes
30 fsw	_____ fsw	_____ minutes	_____ minutes
40 fsw	_____ fsw	_____ minutes	_____ minutes*
50 fsw	_____ fsw	_____ minutes	_____ minutes
60 fsw	_____ fsw	_____ minutes	_____ minutes

_____ repetitive group letter designation

*Chamber stop on SUR D O_2 will be at 40 fsw.

Figure 9-25. Worksheet for Repetitive Dive at Altitude.

actual depth on the first dive is 83 fsw. Table 9-3 is entered at an actual depth of 85 fsw. The Sea Level Equivalent Depth for the first dive is 120 fsw. The repetitive group designation upon completion of the 60 min dive is Group O. This decays to Group H during the 2 hour 10 min surface interval.

The actual depth of the second dive is 80 fsw (79 fsw plus a 1 fsw penumofathometer correction). Table 9-3 is entered at an actual depth of 80 fsw. The Sea Level Equivalent Depth for the second dive is 110 fsw. The residual nitrogen time for Group H at 110 fsw is 27 min. The equivalent single dive time therefore is 57 min. The appropriate decompression schedule from the Surface Decompression Table Using Oxygen is 110 fsw for 60 min. A 26 min stop at 40 fsw in the chamber is required by the schedule. This stop is taken at a chamber depth of 40 fsw.

Figure 9-26 shows the filled-out Repetitive Dive at Altitude Worksheet for these two dives. Figure 9-27 and Figure 9-28 shows the filled out Diving Charts for the first and second dives.

9-13 ASCENT TO ALTITUDE AFTER DIVING/FLYING AFTER DIVING.

Leaving the dive site may require temporary ascent to a higher altitude. For example, divers may drive over a mountain pass at higher altitude or leave the dive site by air. Ascent to altitude after diving increases the risk of decompression sickness because of the additional reduction in atmospheric pressure. The higher the altitude, the greater the risk. (Pressurized commercial airline flights are addressed in Note 3 of Table 9-5.)

Table 9-5 gives the surface interval (hours:minutes) required before making a further ascent to altitude. The surface interval depends on the planned increase in altitude and the highest repetitive group designator obtained in the previous 24-hour period. Enter the table with the highest repetitive group designator obtained in the previous 24-hour period. Read the required surface interval from the column for the planned change in altitude.

Example: A diver surfaces from a 60 fsw for 60 minutes no-decompression dive at sea level in Repetitive Group J. After a suface interval of 6 hours 10 minutes, the diver makes a second dive to 30 fsw for 20 minutes placing him in Repetitive Group C. He plans to fly home in a commercial aircraft in which the cabin pressure is controlled at 8000 feet. What is the required surface interval before flying?

The planned increase in altitude is 8000 feet. Because the diver has made two dives in the previous 24-hour period, you must use the highest Repetitive Group Designator of the two dives. Enter Table 9-5 at 8000 feet and read down to Repetitive Group J. The diver must wait 17 hours and 35 minutes after completion of the second dive before flying.

Example: Upon completion of a dive at an altitude of 4000 feet, the diver plans to ascend to 7500 feet in order to cross a mountain pass. The diver's repetitive group upon surfacing is Group G. What is the required surface interval before crossing the pass?

REPETITIVE DIVE AT ALTITUDE WORKSHEET

DATE 10 Jan 99

1. PREVIOUS DIVE

:60 minutes — [X] Standard Air Table — [ ] Unlimited/No-Decompression Table

120 SLED — [ ] Surface Table Using Oxygen — [ ] Surface Table Using Air

O repetitive group letter designation

2. SURFACE INTERVAL

2 hours 10 minutes on surface

O repetitive group from Item 1 above

H new repetitive group letter designation from Residual Nitrogen Timetable

3. RESIDUAL NITROGEN TIME FOR REPETITIVE DIVE

Altitude from Table 9-3 — 8000 feet

Actual Depth of Dive (corrected per section 9-12.3) — 79+1=80 fsw

Sea Level Equivalent Depth of repetitive dive from Table 9-3 — 110 SLED

H new repetitive group letter designation from item 2 above

:27 minutes, ~~residual nitrogen time from Residual Nitrogen Timetable~~ or bottom time of previous Sur D dive

4. EQUIVALENT SINGLE DIVE TIME:

:27 minutes, ~~residual nitrogen time from item 3 above~~ or bottom time of previous Sur D dive

\+ :30 minutes, actual bottom time of repetitive dive

= :57 minutes, equivalent single dive time

5. DECOMPRESSION FOR REPETITIVE DIVE:

110 SLED of repetitive dive

:57 minutes, equivalent single dive time from item 4 above

Decompression from (check one):

[ ] Standard Air Table — [ ] Unlimited/No-Decompression Table

[X] Sur D Table Using Oxygen — [ ] Sur D Table Using Air

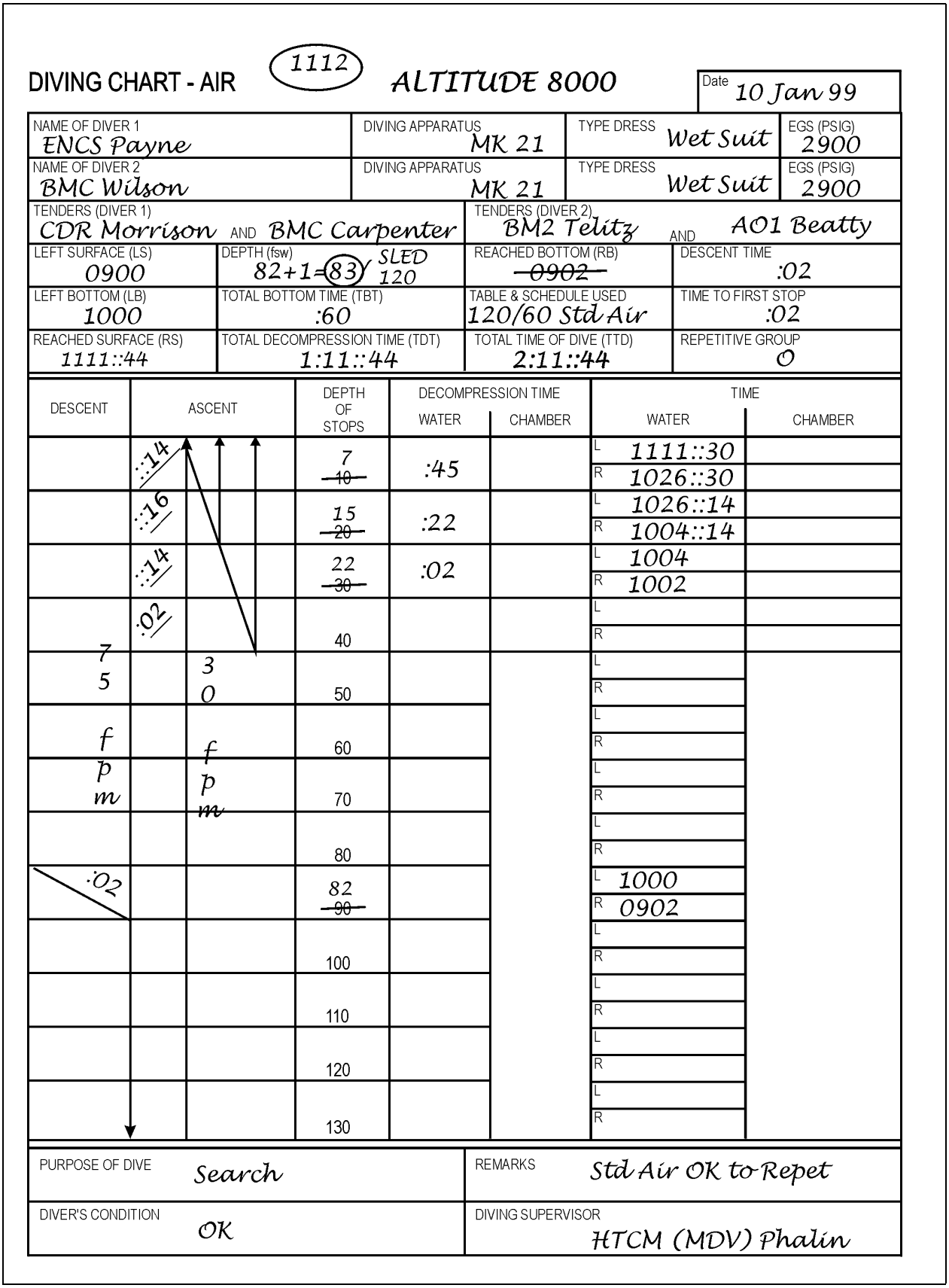
110/60 schedule used (depth/time)

Sea Level Stop Depth:	Altitude Stop Depth	Water Stop Time	Chamber Stop Time
10 fsw	_____ fsw	_____ minutes	_____ minutes
20 fsw	_____ fsw	_____ minutes	_____ minutes
30 fsw	_____ fsw	_____ minutes	_____ minutes
40 fsw	_____ fsw	_____ minutes	26 minutes*
50 fsw	_____ fsw	_____ minutes	_____ minutes
60 fsw	_____ fsw	_____ minutes	_____ minutes

N/A repetitive group letter designation

*Chamber stop on SUR D O_2 will be at 40 fsw.

Figure 9-26. Completed Worksheet for Repetitive Dive at Altitude.



DIVING CHART - AIR 1112 ALTITUDE 8000 Date 10 Jan 99

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
ENCS Payne	MK 21	Wet Suit	2900
NAME OF DIVER 2	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
BMC Wilson	MK 21	Wet Suit	2900

TENDERS (DIVER 1)	TENDERS (DIVER 2)
CDR Morrison AND BMC Carpenter	BM2 Telitz AND AO1 Beatty

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
0900	82+1=~~83~~ SLED 120	~~0902~~	:02
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
1000	:60	120/60 Std Air	:02
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
1111::44	1:11::44	2:11::44	O

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	::14	7 ~~10~~	:45		L 1111::30	
					R 1026::30	
	::16	15 ~~20~~	:22		L 1026::14	
					R 1004::14	
	::14	22 ~~30~~	:02		L 1004	
					R 1002	
	:02	40			L	
					R	
75 fpm	30 fpm	50			L	
					R	
		60			L	
					R	
		70			L	
					R	
		80			L	
					R	
:02		82 ~~90~~			L 1000	
					R 0902	
		100			L	
					R	
		110			L	
					R	
		120			L	
					R	
		130			L	
					R	

PURPOSE OF DIVE	REMARKS
Search	Std Air OK to Repet
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	HTCM (MDV) Phalin

Figure 9-27. Completed Chart for Dive at Altitude.

DIVING CHART - AIR 1426 ALTITUDE 8000 Date 10 Jan 99

NAME OF DIVER 1	DIVING APPARATUS	TYPE DRESS	EGS (PSIG)
ENCS Payne	MK 21	Wet Suit	2825
NAME OF DIVER 2	**DIVING APPARATUS**	**TYPE DRESS**	**EGS (PSIG)**
BMC Wilson	MK 21	Wet Suit	2825

TENDERS (DIVER 1)	TENDERS (DIVER 2)
BU1 Doyle AND UT2 Stacy	SW2 Brooks AND BU2 McElroy

LEFT SURFACE (LS)	DEPTH (fsw)	REACHED BOTTOM (RB)	DESCENT TIME
1322	79+1=80 / SLED 110	~~1324~~	:02
LEFT BOTTOM (LB)	**TOTAL BOTTOM TIME (TBT)**	**TABLE & SCHEDULE USED**	**TIME TO FIRST STOP**
1352	RNT :30+:27=:57	110/60 Sur 'D' O_2	:02::38
REACHED SURFACE (RS)	**TOTAL DECOMPRESSION TIME (TDT)**	**TOTAL TIME OF DIVE (TTD)**	**REPETITIVE GROUP**
1354::38/1425::58	:33::58	1:03:58	N/A

DESCENT	ASCENT	DEPTH OF STOPS	DECOMPRESSION TIME WATER	DECOMPRESSION TIME CHAMBER	TIME WATER	TIME CHAMBER
	:02::38 / :01::20 / :03+::30=:04 80 fpw	10			L / R	
		20			L / R	
		30			L / R	
		40		:26	L / R	1424::38 / 1358::38
75 fpm	30 fpm	50			L / R	
		60			L / R	
		70			L / R	
:O_2		79 ~~80~~			L 1352 / R 1324	
		90			L / R	
		100			L / R	
		110			L / R	
		120			L / R	
		130			L / R	

PURPOSE OF DIVE	REMARKS
Search	Sur 'D' O_2 OK to Repet
DIVER'S CONDITION	**DIVING SUPERVISOR**
OK	MDV Deen

Figure 9-28. Completed Chart for Repetitive Dive at Altitude.

Table 9-5. *Required Surface Interval Before Ascent to Altitude After Diving.*

Repetitive Group Designator	Increase in Altitude									
	1000	**2000**	**3000**	**4000**	**5000**	**6000**	**7000**	**8000**	**9000**	**10000**
A	0:00	0:00	0:00	0:00	0:00	0:00	0:00	**0:00**	0:00	0:00
B	0:00	0:00	0:00	0:00	0:00	0:00	0:00	**0:00**	0:00	2:11
C	0:00	0:00	0:00	0:00	0:00	0:00	0:00	**0:00**	3:06	8:26
D	0:00	0:00	0:00	0:00	0:00	0:00	0:09	**3:28**	7:33	12:52
E	0:00	0:00	0:00	0:00	0:00	0:51	3:35	**6:54**	10:59	16:18
F	0:00	0:00	0:00	0:00	1:12	3:40	6:23	**9:43**	13:47	19:07
G	0:00	0:00	0:00	1:23	3:34	6:02	8:46	**12:05**	16:10	21:29
H	0:00	0:00	1:31	3:26	5:37	8:05	10:49	**14:09**	18:13	23:33
I	0:00	1:32	3:20	5:15	7:26	9:54	12:38	**15:58**	20:02	24:00
J	1:32	3:09	4:57	6:52	9:04	11:32	14:16	**17:35**	21:39	24:00
K	3:00	4:37	6:25	8:20	10:32	13:00	15:44	**19:03**	23:07	24:00
L	4:21	5:57	7:46	9:41	11:52	14:20	17:04	**20:23**	24:00	24:00
M	5:35	7:11	9:00	10:55	13:06	15:34	18:18	**21:37**	24:00	24:00
N	6:43	8:20	10:08	12:03	14:14	16:42	19:26	**22:46**	24:00	24:00
O	7:47	9:24	11:12	13:07	15:18	17:46	20:30	**23:49**	24:00	24:00
Z	8:17	9:54	11:42	13:37	15:49	18:17	21:01	**24:00**	24:00	24:00
Exceptional Exposure	Wait 48 hours before flying									

NOTE 1 When using Table 9-5, use the highest repetitive group designator obtained in the previous 24-hour period.

NOTE 2 Table 9-5 may only be used when the maximum altitude achieved is 10,000 feet or less. For ascents above 10,000 feet, consult NAVSEA 00C for guidance.

NOTE 3 The cabin pressure in commercial aircraft is maintained at a constant value regardless of the actual altitude of the flight. Though cabin pressure varies somewhat with aircraft type, the nominal value is 8,000 feet. For commercial flights, use a final altitude of 8000 feet to compute the required surface interval before flying.

NOTE 4 No surface interval is required before taking a commercial flight if the dive site is at 8000 feet or higher. In this case, flying results in an increase in atmospheric pressure rather than a decrease.

NOTE 5 No repetitive group is given for air dives with surface decompression on oxygen or air. For these surface decompression dives, enter the standard air table with the sea level equivalent depth and bottom time of the dive to obtain the appropriate repetitive group designator to be used.

NOTE 6 For ascent to altitude following a non-staturation helium-oxygen dive, wait 12 hours if the dive was a no-decompression dive. Wait 24 hours if the dive was a decompression dive.

The planned increase in altitude is 3500 feet. Enter Table 9-5 at 4000 feet and read down to Repetitive Group G. The diver must delay 1 hour and 23 minutes before crossing the pass.

Example: Upon completion of a dive at 2000 feet, the diver plans to fly home in an unpressurized aircraft at 5000 feet. The diver's repetitive group designator upon surfacing is Group K. What is the required surface interval before flying?

The planned increase in altitude is 3000 feet. Enter Table 9-5 at 3000 feet and read down to Repetitive Group K. The diver must delay 6 hours and 25 minutes before taking the flight.

Table 9-6. *Unlimited/No-Decompression Limits and Repetitive Group Designation Table for Unlimited/No-Decompression Air Dives.*

Depth (feet)	Depth (meters)	No-Decompression Limits (min)	Group Designation A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10	3.0	unlimited	60	120	210	300	797	*									
15	4.6	unlimited	35	70	110	160	225	350	452	*							
20	6.1	unlimited	25	50	75	100	135	180	240	325	390	917	*				
25	7.6	595	20	35	55	75	100	125	160	195	245	315	361	540	595		
30	9.1	405	15	30	45	60	75	95	120	145	170	205	250	310	344	405	
35	10.7	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	12.2	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	
50	15.2	100		10	15	25	30	40	50	60	70	80	90	100			
60	18.2	60		10	15	20	25	30	40	50	55	60					
70	21.3	50		5	10	15	20	30	35	40	45	50					
80	24.4	40		5	10	15	20	25	30	35	40						
90	27.4	30		5	10	12	15	20	25	30							
100	30.5	25		5	7	10	15	20	22	25							
110	33.5	20			5	10	13	15	20								
120	36.6	15			5	10	12	15									
130	39.6	10			5	8	10										
140	42.7	10			5	7	10										
150	45.7	5			5												
160	48.8	5				5											
170	51.8	5				5											
180	54.8	5				5											
190	59.9	5				5											

***** Highest repetitive group that can be achieved at this depth regardless of bottom time.

Table 9-7. *Residual Nitrogen Timetable for Repetitive Air Dives.*

Locate the diver's repetitive group designation from his previous dive along the diagonal line above the table. Read horizontally to the interval in which the diver's surface interval lies.

Next read vertically downward to the new repetitive group designation. Continue downward in this same column to the row which represents the depth of the repetitive dive. The time given at the intersection is residual nitrogen time, in minutes, to be applied to the repetitive dive.

* Dives following surface intervals of more than 12 hours are not repetitive dives. Use actual bottom times in the Standard Air Decompression Tables to compute decompression for such dives.

** If no Residual Nitogen Time is given, then the repetitive group does not change.

Repetitive group at the beginning of the surface interval

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Z
A	0:10 12:00*															
B	0:10 3:20	3:21 12:00*														
C	0:10 1:39	1:40 4:49	4:50 12:00*													
D	0:10 1:09	1:10 2:38	2:39 5:48	5:49 12:00*												
E	0:10 0:54	0:55 1:57	1:58 3:24	3:25 6:34	6:35 12:00*											
F	0:10 0:45	0:46 1:29	1:30 2:28	2:29 3:57	3:58 7:05	7:06 12:00*										
G	0:10 0:40	0:41 1:15	1:16 1:59	2:00 2:58	2:59 4:25	4:26 7:35	7:36 12:00*									
H	0:10 0:36	0:37 1:06	1:07 1:41	1:42 2:23	2:24 3:20	3:21 4:49	4:50 7:59	8:00 12:00*								
I	0:10 0:33	0:34 0:59	1:00 1:29	1:30 2:02	2:03 2:44	2:45 3:43	3:44 5:12	5:13 8:21	8:22 12:00*							
J	0:10 0:31	0:32 0:54	0:55 1:19	1:20 1:47	1:48 2:20	2:21 3:04	3:05 4:02	4:03 5:40	5:41 8:50	8:51 12:00*						
K	0:10 0:28	0:29 0:49	0:50 1:11	1:12 1:35	1:36 2:03	2:04 2:38	2:39 3:21	3:22 4:19	4:20 5:48	5:49 8:58	8:59 12:00*					
L	0:10 0:26	0:27 0:45	0:46 1:04	1:05 1:25	1:26 1:49	1:50 2:19	2:20 2:53	2:54 3:36	3:37 4:35	4:36 6:02	6:03 9:12	9:13 12:00*				
M	0:10 0:25	0:26 0:42	0:43 0:59	1:00 1:18	1:19 1:35	1:36 2:05	2:06 2:34	2:35 3:08	3:09 3:52	3:53 4:49	4:50 6:18	6:19 9:28	9:29 12:00*			
N	0:10 0:24	0:25 0:39	0:40 0:54	0:55 1:11	1:12 1:30	1:31 1:53	1:54 2:18	2:19 2:47	2:48 3:22	3:23 4:04	4:05 5:03	5:04 6:32	6:33 9:43	9:44 12:00*		
O	0:10 0:23	0:24 0:36	0:37 0:51	0:52 1:07	1:08 1:24	1:25 1:43	1:44 2:04	2:05 2:29	2:30 2:59	3:00 3:33	3:34 4:17	4:18 5:16	5:17 6:44	6:45 9:54	9:55 12:00*	
Z	0:10 0:22	0:23 0:34	0:35 0:48	0:49 1:02	1:03 1:18	1:19 1:36	1:37 1:55	1:56 2:17	2:18 2:42	2:43 3:10	3:11 3:45	3:46 4:29	4:30 5:27	5:28 6:56	6:57 10:05	10:06 12:00*

Residual Nitrogen Times (Minutes)

Repetitive Dive Depth feet/meters	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
	New Repetitive Group Designation															
10 3.0	**	**	**	**	**	**	**	**	**	**	**	797	279	159	88	39
20 6.1	**	**	**	**	**	**	917	399	279	208	159	120	88	62	39	18
30 9.1	†	†	†	349	279	229	190	159	132	109	88	70	54	39	25	12
40 12.2	257	241	213	187	161	138	116	101	87	73	61	49	37	25	17	7
50 15.2	169	160	142	124	111	99	87	76	66	56	47	38	29	21	13	6
60 18.2	122	117	107	97	88	79	70	61	52	44	36	30	24	17	11	5
70 21.3	100	96	87	80	72	64	57	50	43	37	31	26	20	15	9	4
80 24.4	84	80	73	68	61	54	48	43	38	32	28	23	18	13	8	4
90 27.4	73	70	64	58	53	47	43	38	33	29	24	20	16	11	7	3
100 30.5	64	62	57	52	48	43	38	34	30	26	22	18	14	10	7	3
110 33.5	57	55	51	47	42	38	34	31	27	24	20	16	13	10	6	3
120 36.6	52	50	46	43	39	35	32	28	25	21	18	15	12	9	6	3
130 39.6	46	44	40	38	35	31	28	25	22	19	16	13	11	8	6	3
140 42.7	42	40	38	35	32	29	26	23	20	18	15	12	10	7	5	2
150 45.7	40	38	35	32	30	27	24	22	19	17	14	12	9	7	5	2
160 48.8	37	36	33	31	28	26	23	20	18	16	13	11	9	6	4	2
170 51.8	35	34	31	29	26	24	22	19	17	15	12	10	8	6	4	2
180 54.8	32	31	29	27	25	22	20	18	16	14	11	10	8	6	4	2
190 59.9	31	30	28	26	24	21	19	17	15	13	10	10	8	6	4	2

† Read vertically downward to the 40/12.2 (feet/meter) repetitive dive depth. Use the corresponding residual nitrogen times (minutes) to compute the equivalent single dive time. Decompress using the 40/12.2 (feet/meter) standard air decompression table.

Table 9-8. *U.S. Navy Standard Air Decompression Table.*

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Total decompression time (min:sec)	Repetitive group
40 12.1	200						0	1:20	*
	210	1:00					2	3:20	N
	230	1:00					7	8:20	N
	250	1:00					11	12:20	O
	270	1:00					15	16:20	O
	300	1:00					19	20:20	Z
	Exceptional Exposure								
	360	1:00					23	24:20	**
	480	1:00					41	42:20	**
	720	1:00					69	70:20	**
50 15.2	100						0	1:40	*
	110	1:20					3	4:40	L
	120	1:20					5	6:40	M
	140	1:20					10	11:40	M
	160	1:20					21	22:40	N
	180	1:20					29	30:40	O
	200	1:20					35	36:40	O
	220	1:20					40	41:40	Z
	240	1:20					47	48:40	Z
60 18.2	60						0	2:00	*
	70	1:40					2	4:00	K
	80	1:40					7	9:00	L
	100	1:40					14	16:00	M
	120	1:40					26	28:00	N
	140	1:40					39	41:00	O
	160	1:40					48	50:00	Z
	180	1:40					56	58:00	Z
	200	1:20				1	69	72:00	Z
	Exceptional Exposure								
	240	1:20				2	79	83:00	**
	360	1:20				20	119	141:00	**
	480	1:20				44	148	194:00	**
	720	1:20				78	187	267:00	**
70 21.3	50						0	2:20	*
	60	2:00					8	10:20	K
	70	2:00					14	16:20	L
	80	2:00					18	20:20	M
	90	2:00					23	25:20	N
	100	2:00					33	35:20	N
	110	1:40				2	41	45:20	O
	120	1:40				4	47	53:20	O
	130	1:40				6	52	60:20	O
	140	1:40				8	56	66:20	Z
	150	1:40				9	61	72:20	Z
	160	1:40				13	72	87:20	Z
	170	1:40				19	79	100:20	Z

* See No Decompression Table for repetitive groups

** Repetitive dives may not follow exceptional exposure dives

Table 9-8. *U.S. Navy Standard Air Decompression Table (Continued).*

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Total decompression time (min:sec)	Repetitive group
80 24.3	40						0	2:40	*
	50	2:20					10	12:40	K
	60	2:20					17	19:40	L
	70	2:20					23	25:40	M
	80	2:00				2	31	35:40	N
	90	2:00				7	39	48:40	N
	100	2:00				11	46	59:40	O
	110	2:00				13	53	68:40	O
	120	2:00				17	56	75:40	Z
	130	2:00				19	63	83:40	Z
	140	2:00				26	69	97:40	Z
	150	2:00				32	77	111:40	Z
	Exceptional Exposure								
	180	2:00				35	85	122:40	**
	240	1:40			6	52	120	180:40	**
	360	1:40			29	90	160	281:40	**
	480	1:40			59	107	187	355:40	**
	720	1:20		17	108	142	187	456:40	**
90 28.7	30						0	3:00	*
	40	2:40					7	10:00	J
	50	2:40					18	21:00	L
	60	2:40					25	28:00	M
	70	2:20				7	30	40:00	N
	80	2:20				13	40	56:00	N
	90	2:20				18	48	69:00	O
	100	2:20				21	54	78:00	Z
	110	2:20				24	61	88:00	Z
	120	2:20				32	68	103:00	Z
	130	2:00			5	36	74	118:00	Z
100 30.4	25						0	3:20	*
	30	3:00					3	6:20	I
	40	3:00					15	18:20	K
	50	2:40				2	24	29:20	L
	60	2:40				9	28	40:20	N
	70	2:40				17	39	59:20	O
	80	2:40				23	48	74:20	O
	90	2:20			3	23	57	86:20	Z
	100	2:20			7	23	66	99:20	Z
	110	2:20			10	34	72	119:20	Z
	120	2:20			12	41	78	134:20	Z
	Exceptional Exposure								
	180	2:00		1	29	53	118	204:20	**
	240	2:00		14	42	84	142	285:20	**
	360	1:40	2	42	73	111	187	418:20	**
	480	1:40	21	61	91	142	187	505:20	**
	720	1:40	55	106	122	142	187	615:20	**

* See No Decompression Table for repetitive groups

** Repetitive dives may not follow exceptional exposure dives

Table 9-8. *U.S. Navy Standard Air Decompression Table (Continued).*

110 / 33.1

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Total decompression time (min:sec)	Repetitive group
	20						0	3:40	*
	25	3:20					3	6:40	H
	30	3:20					7	10:40	J
	40	3:00				2	21	26:40	L
	50	3:00				8	26	37:40	M
	60	3:00				18	36	57:40	N
	70	2:40			1	23	48	75:40	O
	80	2:40			7	23	57	90:40	Z
	90	2:40			12	30	64	109:40	Z
	100	2:40			15	37	72	127:40	Z

120 / 36.5

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 70 21.3	60 18.2	50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Total decompression time (min:sec)	Repetitive group
	15								0	4:00	*
	20	3:40							2	6:00	H
	25	3:40							6	10:00	I
	30	3:40							14	18:00	J
	40	3:20						5	25	34:00	L
	50	3:20						15	31	50:00	N
	60	3:00					2	22	45	73:00	O
	70	3:00					9	23	55	91:00	O
	80	3:00					15	27	63	109:00	Z
	90	3:00					19	37	74	134:00	Z
	100	3:00					23	45	80	152:00	Z
	Exceptional Exposure										
	120	2:40				10	19	47	98	178:00	**
	180	2:20			5	27	37	76	137	286:00	**
	240	2:20			23	35	60	97	179	398:00	**
	360	2:00		18	45	64	93	142	187	553:00	**
	480	1:40	3	41	64	93	122	142	187	656:00	**
	720	1:40	32	74	100	114	122	142	187	775:00	**

130 / 39.6

	10								0	4:20	*
	15	4:00							1	5:20	F
	20	4:00							4	8:20	H
	25	4:00							10	14:20	J
	30	3:40						3	18	25:20	M
	40	3:40						10	25	39:20	N
	50	3:20					3	21	37	65:20	O
	60	3:20					9	23	52	88:20	Z
	70	3:20					16	24	61	105:20	Z
	80	3:00				3	19	35	72	133:20	Z
	90	3:00				8	19	45	80	156:20	Z

* See No Decompression Table for repetitive groups
** Repetitive dives may not follow exceptional exposure dives

Table 9-8. *U.S. Navy Standard Air Decompression Table (Continued).*

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 90 27.4	80 24.3	70 21.3	60 18.2	50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Total decompression time (min:sec)	Repetitive group
140 42.6	10										0	4:40	*
	15	4:20									2	6:40	G
	20	4:20									6	10:40	I
	25	4:00								2	14	20:40	J
	30	4:00								5	21	30:40	K
	40	3:40							2	16	26	48:40	N
	50	3:40							6	24	44	78:40	O
	60	3:40							16	23	56	99:40	Z
	70	3:20						4	19	32	68	127:40	Z
	80	3:20						10	23	41	79	157:40	Z
	Exceptional Exposure												
	90	3:00					2	14	18	42	88	168:40	**
	120	3:00					12	14	36	56	120	242:40	**
	180	2:40				10	26	32	54	94	168	388:40	**
	240	2:20			8	28	34	50	78	124	187	513:40	**
	360	2:00		9	32	42	64	84	122	142	187	686:40	**
	480	2:00		31	44	59	100	114	122	142	187	803:40	**
	720	1:40	16	56	88	97	100	114	122	142	187	926:40	**
150 45.7	5										0	5:00	C
	10	4:40									1	6:00	E
	15	4:40									3	8:00	G
	20	4:20								2	7	14:00	H
	25	4:20								4	17	26:00	K
	30	4:20								8	24	37:00	L
	40	4:00							5	19	33	62:00	N
	50	4:00							12	23	51	91:00	O
	60	3:40						3	19	26	62	115:00	Z
	70	3:40						11	19	39	75	149:00	Z
	80	3:20					1	17	19	50	84	176:00	Z
160 48.7	5										0	5:20	D
	10	5:00									1	6:20	F
	15	4:40								1	4	10:20	H
	20	4:40								3	11	19:20	J
	25	4:40								7	20	32:20	K
	30	4:20							2	11	25	43:20	M
	40	4:20							7	23	39	74:20	N
	50	4:00						2	16	23	55	101:20	Z
	60	4:00						9	19	33	69	135:20	Z
	Exceptional Exposure												
	70	3:40					1	17	22	44	80	169:20	**

* See No Decompression Table for repetitive groups
** Repetitive dives may not follow exceptional exposure dives

Table 9-8. *U.S. Navy Standard Air Decompression Table (Continued).*

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 110 33.5	100 30.4	90 27.4	80 24.3	70 21.3	60 18.2	50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Total decompression time (min:sec)	Repetitive group
170 51.8	5												0	5:40	D
	10	5:20											2	7:40	F
	15	5:00										2	5	12:40	H
	20	5:00										4	15	24:40	J
	25	4:40									2	7	23	37:40	L
	30	4:40									4	13	26	48:40	M
	40	4:20								1	10	23	45	84:40	O
	50	4:20								5	18	23	61	112:40	Z
	60	4:00							2	15	22	37	74	155:40	Z
	Exceptional Exposure														
	70	4:00							8	17	19	51	86	186:40	**
	90	3:40						12	12	14	34	52	120	249:40	**
	120	3:00				2	10	12	18	32	42	82	156	359:40	**
	180	2:40			4	10	22	28	34	50	78	120	187	538:40	**
	240	2:40			18	24	30	42	50	70	116	142	187	684:40	**
	360	2:20		22	34	40	52	60	98	114	122	142	187	876:40	**
	480	2:00	14	40	42	56	91	97	100	114	122	142	187	1010:40	**
180 54.8	5												0	6:00	D
	10	5:40											3	9:00	F
	15	5:20										3	6	15:00	I
	20	5:00									1	5	17	29:00	J
	25	5:00									3	10	24	43:00	L
	30	5:00									6	17	27	56:00	N
	40	4:40								3	14	23	50	96:00	O
	50	4:20							2	9	19	30	65	131:00	Z
	60	4:20							5	16	19	44	81	171:00	Z
190 57.9	5	5:40											0	6:20	D
	10	5:40										1	3	10:20	G
	15	5:40										6	7	17:20	I
	20	5:20									2	6	20	34:20	K
	25	:5:20									5	11	25	47:20	M
	30	5:00								1	8	19	32	66:20	N
	40	5:00								8	14	23	55	106:20	O
	Exceptional Exposure														
	50	4:40							4	13	22	33	72	150:20	**
	60	4:40							10	17	19	50	84	186:20	**

* See No Decompression Table for repetitive groups
** Repetitive dives may not follow exceptional exposure dives

Table 9-8. U.S. Navy Standard Air Decompression Table (Continued).

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 130 39.6	120 36.5	110 33.5	100 30.4	90 27.4	80 24.3	70 21.3	60 18.2	50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Total decompression time (min:sec)
200	Exceptional Exposure															
60.9	5	6:20													1	7:40
	10	6:00												1	4	11:40
	15	5:40											1	4	10	21:40
	20	5:40											3	7	27	43:40
	25	5:40											7	14	25	52:40
	30	5:20										2	9	22	37	76:40
	40	5:00									2	8	17	23	59	115:40
	50	5:00									6	16	22	39	75	164:40
	60	4:40								2	13	17	24	51	89	202:40
	90	3:40					1	10	10	12	12	30	38	74	134	327:40
	120	3:20				6	10	10	10	24	28	40	64	98	180	476:40
	180	2:40		1	10	10	18	24	24	42	48	70	106	142	187	688:40
	240	2:40		6	20	24	24	36	42	54	68	114	122	142	187	845::40
	360	2:20	12	22	36	40	44	56	82	98	100	114	122	142	187	1061:40
210	Exceptional Exposure															
64.0	5	6:40													1	8:00
	10	6:20												2	4	13:00
	15	6:00											1	5	13	26:00
	20	6:00											4	10	23	44:00
	25	5:40										2	7	17	27	60:00
	30	5:40										4	9	24	41	85:00
	40	5:20									4	9	19	26	63	128:00
	50	5:20								1	9	17	19	45	80	178:00
220	Exceptional Exposure															
67.0	5	7:00													1	8:20
	10	6:40												2	5	14:20
	15	6:20											2	5	16	30:20
	20	6:00										1	3	11	24	46:20
	25	6:00										3	8	19	33	70:20
	30	5:40									1	7	10	23	47	95:20
	40	5:40									6	12	22	29	68	144:20
	50	5:20								3	12	17	18	51	86	194:20
230	Exceptional Exposure															
70.1	5	7:20													2	9:40
	10	6:20											1	2	6	16:40
	15	6:20											3	6	18	34:40
	20	6:20										2	5	12	26	52:40
	25	6:20										4	8	22	37	78:40
	30	6:00									2	8	12	23	51	103:40
	40	5:40								1	7	15	22	34	74	160:40
	50	5:40								5	14	16	24	51	89	206:40

Table 9-8. *U.S. Navy Standard Air Decompression Table (Continued).*

240 fsw / 73.1 msw

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 130 / 39.6	120 / 36.5	110 / 33.5	100 / 30.4	90 / 27.4	80 / 24.3	70 / 21.3	60 / 18.2	50 / 15.2	40 / 12.1	30 / 9.1	20 / 6.0	10 / 3.0	Total decompression time (min:sec)
Exceptional Exposure	5	7:40													2	10:00
	10	7:00											1	3	6	18:00
	15	7:00											4	6	21	39:00
	20	6:40										3	6	15	25	57:00
	25	6:20									1	4	9	24	40	86:00
	30	6:20									4	8	15	22	56	113:00
	40	6:00								3	7	17	22	39	75	171:00
	50	5:40							1	8	15	16	29	51	94	222:00

250 fsw / 76.2 msw

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 200 / 60.9	190 / 57.9	180 / 54.8	170 / 51.8	160 / 48.7	150 / 45.7	140 / 42.6	130 / 39.6	120 / 36.5	110 / 33.5	100 / 30.4	90 / 27.4	80 / 24.3	70 / 21.3	60 / 18.2	50 / 15.2	40 / 12.1	30 / 9.1	20 / 6.0	10 / 3.0	Total decompression time (min:sec)
Exceptional Exposure	5	7:40																			1	2	11:20
	10	7:20																		1	4	7	20:20
	15	7:00																	1	4	7	22	42:20
	20	7:00																	4	7	17	27	63:20
	25	6:40																2	7	10	24	45	96:20
	30	6:40																6	7	17	23	59	120:20
	40	6:20															5	9	17	19	45	79	182:20
	60	5:20												4	10	10	10	12	22	36	64	164	302:20
	90	4:20								8	10	10	10	10	10	28	28	44	68	98	186	518:20
	120	3:40							5	10	10	10	16	24	24	36	48	64	94	142	187	688:20
	180	3:00					4	8	8	10	22	24	24	32	42	44	60	84	114	122	142	187	935:20
	240	3:00					9	14	21	22	22	40	40	42	56	76	98	100	114	122	142	187	1113:20

260 fsw / 79.2 msw

Exceptional Exposure	5	8:00																		1	2	11:40
	10	7:40																	2	4	9	23:40
	15	7:20																2	4	10	22	46:40
	20	7:00															1	4	7	20	31	71:40
	25	7:00															3	8	11	23	50	103:40
	30	6:40														2	6	8	19	26	61	130:40
	40	6:20													1	6	11	16	19	49	84	194:40

270 fsw / 82.3 msw

Exceptional Exposure	5	8:20																		1	3	13:00
	10	8:00																	2	5	11	27:00
	15	7:40																3	4	11	24	51:00
	20	7:20															2	3	9	21	35	79:00
	25	7:00														2	3	8	13	23	53	111:00
	30	7:00														3	6	12	22	27	64	143:00
	40	6:40													5	6	11	17	22	51	88	209:00

Table 9-8. *U.S. Navy Standard Air Decompression Table (Continued).*

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 200 60.9	190 57.9	180 54.8	170 51.8	160 48.7	150 45.7	140 42.6	130 39.6	120 36.5	110 33.5	100 30.4	90 27.4	80 24.3	70 21.3	60 18.2	50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Total decompression time (min:sec)
280 85.3	Exceptional Exposure																						
	5	8:40																			2	2	13:20
	10	8:00																	1	2	5	13	30:20
	15	7:40																1	3	4	11	26	54:20
	20	7:40																3	4	8	23	39	86:20
	25	7:20															2	5	7	16	23	56	118:20
	30	7:00														1	3	7	13	22	30	70	155:20
	40	6:40													1	6	6	13	17	27	51	93	223:20
290 88.4	Exceptional Exposure																						
	5	9:00																			2	3	14:40
	10	8:20																	1	3	5	16	34:40
	15	8:00																1	3	6	12	26	57:40
	20	8:00																3	7	9	23	43	94:40
	25	7:40															3	5	8	17	23	60	125:40
	30	7:20														1	5	6	16	22	36	72	167:40
	40	7:00													3	5	7	15	16	32	51	95	233:40

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters) 200 60.9	190 57.9	180 54.8	170 51.8	160 48.7	150 45.7	140 42.6	130 39.6	120 36.5	110 33.5	100 30.4	90 27.4	80 24.3	70 21.3	60 18.2	50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Total decompression time (min:sec)
300 91.4	Exceptional Exposure																						
	5	9:20																			3	3	16:00
	10	8:40																	1	3	6	17	37:00
	15	8:20																2	3	6	15	26	62:00
	20	8:00															2	3	7	10	23	47	102:00
	25	7:40														1	3	6	8	19	26	61	134:00
	30	7:40														2	5	7	17	22	39	75	177:00
	40	7:20													4	6	9	15	17	34	51	90	‘236:00
	60	6:00									4	10	10	10	10	10	14	28	32	50	90	187	465:00
	90	4:40					‘3	8	8	10	10	10	10	16	24	24	34	48	64	90	142	187	698:00
	120	4:00			4	8	8	8	8	10	14	24	24	24	34	42	58	66	102	122	142	187	895:00
	180	3:30	6	8	8	8	14	20	21	21	28	40	40	48	56	82	98	100	114	122	142	187	1173:00

Table 9-9. Surface Decompression Table Using Oxygen.

Depth feet/meters	Bottom time (min)	Time to first stop or surface (min:sec)	Time (min) breathing air at water stops (feet/meters) 60 18.2	50 15.2	40 12.1	30 9.1	Surface Interval	Time at 40-foot chamber stop (min) on oxygen	Surface	Total decompression time (min:sec)
70 21.3	50	2:20								2:20
	90	2:20						15		22:40
	120	2:20						23		30:40
	150	2:20						31		43:40
	180	2:20						39		51:40
80 24.3	40	2:40								2:40
	70	2:40						14		22:00
	85	2:40						20		28:00
	100	2:40						26		34:00
	115	2:40						31		44:00
	130	2:40						37		50:00
	150	2:40						44		57:00
90 27.4	30	3:00								3:00
	60	3:00						14		22:20
	70	3:00						20		28:20
	80	3:00						25		33:20
	90	3:00						30		38:20
	100	3:00						34		47:20
	110	3:00						39		52:20
	120	3:00						43		56:20
	130	3:00						48		61:20
100 30.4	25	3:20								3:20
	50	3:20						14		22:40
	60	3:20						20		28:40
	70	3:20						26		34:40
	80	3:20						32		45:40
	90	3:20						38		51:40
	100	3:20						44		57:40
	110	3:20						49		62:40
	120	2:20				3		53		69:20
110 33.5	20	3:40								3:40
	40	3:40						12		21:00
	50	3:40						19		28:00
	60	3:40						26		35:00
	70	3:40						33		47:00
	80	2:40				1		40		55:00
	90	2:40				2		46		62:00
	100	2:40				5		51		70:00
	110	2:40				12		54		80:00

TOTAL TIME FROM LAST WATER STOP TO FIRST CHAMBER STOP NOT TO EXCEED 5 MINUTES

1-MINUTE 20 SECONDS ASCENT FROM 40 FEET IN CHAMBER TO SURFACE WHILE BREATHING OXYGEN

Table 9-9. Surface Decompression Table Using Oxygen (Continued).

Depth feet/meters	Bottom time (min)	Time to first stop or surface (min:sec)	Time (min) breathing air at water stops (feet/meters) 60 18.2	50 15.2	40 12.1	30 9.1	Surface Interval	Time at 40-foot chamber stop (min) on oxygen	Surface	Total decompression time (min:sec)
120 36.5	15	4:00					TOTAL TIME FROM LAST WATER STOP TO FIRST CHAMBER STOP NOT TO EXCEED 5 MINUTES		1-MINUTE 20 SECONDS ASCENT FROM 40 FEET IN CHAMBER TO SURFACE WHILE BREATHING OXYGEN	4:00
	30	4:00						9		18:20
	40	4:00						16		25:20
	50	4:00						24		33:20
	60	3:00				2		32		48:20
	70	3:00				4		39		57:20
	80	3:00				5		46		65:20
	90	3:00			3	7		51		75:20
	100	3:00			6	15		54		89:20
130 39.6	10	4:20								4:20
	30	4:20						12		21:40
	40	4:20						21		30:40
	50	3:20				3		29		41:40
	60	3:20				5		37		56:40
	70	3:20				7		45		66:40
	80	3:00			6	7		51		78:40
	90	3:00			10	12		56		92:40
140 42.6	10	4:40								4:40
	25	4:40						11		21:00
	30	4:40						15		25:00
	35	4:40						20		30:00
	40	3:40				2		24		36:00
	45	3:40				4		29		43:00
	50	3:40				6		33		54:00
	55	3:40				7		38		60:00
	60	3:40				8		43		66:00
	65	3:20			3	7		48		73:00
	70	3:00		2	7	7		51		82:00
150 45.7	5	5:00								5:00
	25	5:00						13		23:20
	30	5:00						18		28:20
	35	4:00				4		23		37:20
	40	3:40			3	6		27		46:20
	45	3:40			5	7		33		60:20
	50	3:20		2	5	8		38		68:20
	55	3:00	2	5	9	4		44		79:20

Table 9-9. Surface Decompression Table Using Oxygen (Continued).

Depth feet/meters	Bottom time (min)	Time to first stop or surface (min:sec)	Time (min) breathing air at water stops (feet/meters) 60 18.2	50 15.2	40 12.1	30 9.1	Surface Interval	Time at 40-foot chamber stop (min) on oxygen	Surface	Total decompression time (min:sec)
160 48.7	5	5:20								5:20
	20	5:20						11		21:40
	25	5:20						16		26:40
	30	4:20				2		21		33:40
	35	4:00			4	6		26		46:40
	40	3:40		3	5	8		32		63:40
	45	3:20	3	4	8	6		38		74:40
170 51.8	5	5:40								5:40
	20	5:40						13		24:00
	25	5:40						19		30:00
	30	4:20			3	5		23		42:00
	35	4:00		4	4	7		29		55:00
	40	3:40	4	4	8	6		36		74:00

TOTAL TIME FROM LAST WATER STOP TO FIRST CHAMBER STOP NOT TO EXCEED 5 MINUTES

1-MINUTE 20 SECONDS ASCENT FROM 40 FEET IN CHAMBER TO SURFACE WHILE BREATHING OXYGEN

Table 9-10. *Surface Decompression Table Using Air.*

Depth feet/meters	Bottom time (min)	Time to first stop or surface (min:sec)	Time (min) at water stops (feet/meters) 30 9.1	20 6.0	10 3.0	Surface Interval	Chamber stops (air) (min) (feet/meters) 20 6.0	10 3.0	Total decompression time (min:sec)
40 12.1	230	1:00			3			7	15:20
	250	1:00			3			11	19:20
	270	1:00			3			15	23:20
	300	1:00			3			19	27:20
50 15.2	120	1:20			3			5	13:40
	140	1:20			3			10	18:40
	160	1:20			3			21	29:40
	180	1:20			3			29	37:40
	200	1:20			3			35	43:40
	220	1:20			3			40	48:40
	240	1:20			3			47	55:40
60 18.2	80	1:40			3			7	16:00
	100	1:40			3			14	23:00
	120	1:40			3			26	35:00
	140	1:40			3			39	48:00
	160	1:40			3			48	57:00
	180	1:40			3			56	65:00
	200	1:20		3			3	69	81:30
70 21.3	60	2:00			3			8	17:20
	70	2:00			3			14	23:20
	80	2:00			3			18	27:20
	90	2:00			3			23	32:20
	100	2:00			3			33	42:20
	110	1:40		3			3	41	53:50
	120	1:40		3			4	47	60:50
	130	1:40		3			6	52	67:50
	140	1:40		3			8	56	73:50
	150	1:40		3			9	61	79:50
	160	1:40		3			13	72	94:50
	170	1:40		3			19	79	107:50
80 24.3	50	2:20			3			10	19:40
	60	2:20			3			17	26:40
	70	2:20			3			23	32:40
	80	2:00		3			3	31	44:10
	90	2:00		3			7	39	56:10
	100	2:00		3			11	46	67:10
	110	2:00		3			13	53	76:10
	120	2:00		3			17	56	83:10
	130	2:00		3			19	63	92:10
	140	2:00		26			26	69	128:10
	150	2:00		32			32	77	148:10

Table 9-10. Surface Decompression Table Using Air (Continued).

Depth feet/meters	Bottom time (min)	Time to first stop or surface (min:sec)	Time (min) at water stops (feet/meters) 30 9.1	20 6.0	10 3.0	Surface Interval	Chamber stops (air) (min) (feet/meters) 20 6.0	10 3.0	Total decompression time (min:sec)
90 27.4	40	2:40			3			7	17:00
	50	2:40			3			18	28:00
	60	2:40			3			25	35:00
	70	2:20		3			7	30	47:30
	80	2:20		13			13	40	73:30
	90	2:20		18			18	48	91:30
	100	2:20		21			21	54	103:30
	110	2:20		24			24	61	116:30
	120	2:20		32			32	68	139:30
	130	2:00	5	36			36	74	158:30
100 30.4	40	3:00			3			15	25:20
	50	2:40		3			3	24	37:50
	60	2:40		3			9	28	47:50
	70	2:40		3			17	39	66:50
	80	2:40		23			23	48	101:50
	90	2:20	3	23			23	57	113:50
	100	2:20	7	23			23	66	126:50
	110	2:20	10	34			34	72	157:50
	120	2:20	12	41			41	78	179:50
110 33.5	30	3:20			3			7	17:40
	40	3:00		3			3	21	35:10
	50	3:00		3			8	26	45:10
	60	3:00		18			18	36	80:10
	70	2:40	1	23			23	48	103:10
	80	2:40	7	23			23	57	118:10
	90	2:40	12	30			30	64	144:10
	100	2:40	15	37			37	72	169:10
120 35.5	25	3:40			3			6	17:00
	30	3:40			3			14	25:00
	40	3:20		3			5	25	41:30
	50	3:20		15			15	31	69:30
	60	3:00	2	22			22	45	99:30
	70	3:00	9	23			23	55	118:30
	80	3:00	15	27			27	63	140:30
	90	3:00	19	37			37	74	175:30
	100	3:00	23	45			45	80	201:30

Table 9-10. Surface Decompression Table Using Air (Continued).

Depth feet/meters	Bottom time (min)	Time to first stop or surface (min:sec)	Time (min) at water stops (feet/meters) 50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Surface Interval	Chamber stops (air) (min) (feet/meters) 20 6.0	10 3.0	Total decompression time (min:sec)
130 39.6	25	4:00					3			10	21:20
	30	3:40				3			3	18	32:50
	40	3:40				10			10	25	53:50
	50	3:20			3	21			21	37	90:50
	60	3:20			9	23			23	52	115:50
	70	3:20			16	24			24	61	133:50
	80	3:00		3	19	35			35	72	172:50
	90	3:00		8	19	45			45	80	205:50
140 42.6	20	4:20					3			6	17:40
	25	4:00				3			3	14	29:10
	30	4:00				5			5	21	40:10
	40	3:40			2	16			16	26	69:10
	50	3:40			6	24			24	44	107:10
	60	3:40			16	23			23	56	127:10
	70	3:20		4	19	32			32	68	164:10
	80	3:20		10	23	41			41	79	203:10
150 45.7	20	4:20				3			3	7	22:30
	25	4:20				4			4	17	34:30
	30	4:20				8			8	24	49:30
	40	4:00			5	19			19	33	85:30
	50	4:00			12	23			23	51	118:30
	60	3:40		3	19	26			26	62	145:30
	70	3:40		11	19	39			39	75	192:30
	80	3:20	1	17	19	50			50	84	230:30
160 48.7	20	4:40				3			3	11	26:50
	25	4:40				7			7	20	43:50
	30	4:20			2	11			11	25	58:50
	40	4:20			7	23			23	39	101:50
	50	4:00		2	16	23			23	55	128:50
	60	4:00		9	19	33			33	69	172:50
	70	3:40	1	17	22	44			44	80	217:50
170 51.8	15	5:00				3			3	5	21:10
	20	5:00				4			4	15	33:10
	25	4:40			2	7			7	23	49:10
	30	4:40			4	13			13	26	66:10
	40	4:20		1	10	23			23	45	112:10
	50	4:20		5	18	23			23	61	140:10
	60	4:00	2	15	22	37			37	74	197:10
	70	4:00	8	17	19	51			51	86	242:10

Table 9-10. Surface Decompression Table Using Air (Continued).

Depth feet/meters	Bottom time (min)	Time to first stop or surface (min:sec)	Time (min) at water stops (feet/meters) 50 15.2	40 12.1	30 9.1	20 6.0	10 3.0	Surface Interval	Chamber stops (air) (min) (feet/meters) 20 6.0	10 3.0	Total decompression time (min:sec)
180 54.8	15	5:20				3			3	6	22:30
	20	5:00			1	5			5	17	38:30
	25	5:00			3	10			10	24	57:30
	30	5:00			6	17			17	27	77:30
	40	4:40		3	14	23			23	50	123:30
	50	4:20	2	9	19	30			30	65	165:30
	60	4:20	5	16	19	44			44	81	219:30
190 57.9	15	5:40				4			4	7	25:50
	20	5:20			2	6			6	20	44:50
	25	5:20			5	11			11	25	62:50
	30	5:00		1	8	19			19	32	89:50
	40	5:00		8	14	23			23	55	133:50
	50	4:40	4	13	22	33			33	72	187:50
	60	4:40	10	17	19	50			50	84	240:50