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Suitability of the USN MK 15 (VVAL18) Decompression Algorithm for Air Diving

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A computer algorithm was developed and approved for use breathing a fixed 0.7 ata partial pressure of oxygen in nitrogen gas in 1980 (The MK15 (VVAL18) RTA). The intent was to incorporate this algorithm into a diver carried underwater decompression computer (UDC). This same algorithm was also tested breathing air but approval for Fleet us on air was never sought because at the time there was no decompression computer suitable for its incorporation. The Navy has recently contracted to have a UDC built raising again the need to have the MK15 (VVAL18) RTA approved for use on air. This report provides an in depth analysis of the risk of decompression sickness (DCS) using the MK15 (VVAL18) RTA on air and compares that to the risk using the standard air tables. The DCS risk was computed from various dive profiles using a probabilistic decompression algorithm developed at the Naval Medical Research Institute (the NMRI LE1 PDA). The NMRI LE1 PDA had been calibrated on several thousand air and 0.7 ata constant PO_2 in N_2 dive profiles where the actual outcome (DCS or no DCS) was known and has been shown to give reasonable risk predictions and dives switching between air and constant 0.7 ata PO_2 breathing gases were analyzed. Analysis showed that the MK15 (VVAL18) RTA) produced risks not significantly higher and in most cases lower than current USN air procedures. It was recommended that the algorithm be submitted for approval for diving breathing air, constant 0.7 ata PO_2 in N_2, or switching between the two gases.

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(March 30, 1997)

BACKGROUND

Development of the MK15 Constant 0.7 ata PO2 in N2 Decompression Algorithm

In August of 1980 testing was completed by the Navy Experimental Diving Unit (NEDU) on a decompression algorithm designed specifically for the then new US Navy MK15 underwater breathing apparatus (UBA). The MK15 controls the oxygen partial pressure in the breathing gas to a constant level of 0.7 ata with a nitrogen diluent. Details of the algorithm itself are given elsewhere (1) as are the results of testing (2,3). All testing was conducted using real time computation of decompression schedules with chamber depth being continuously monitored by a computer which was programmed with the algorithm. Every 2 seconds an updated decompression schedule was computed based on the actual dive profile up to that point. The intent of real time testing was to gain approval of the algorithm itself rather than just a set of decompression schedules[1]. It was planned to eventually program the algorithm into a small diver carried underwater decompression monitor (UDM) capable of computing the decompression schedule in real time as the dive progresses. This algorithm will be referred to as the MK15 (VVAL18) RTA. *MK15* denotes the UBA for which the algorithm was initially designed, although it can be used to compute decompression schedules for any UBA which controls the inspired PO2 to 0.7 ata or higher using nitrogen as a diluent. *VVAL18* denotes the final set of algorithm parameters arrived at after completion of testing and *RTA* stands for real time algorithm.

Initial validation of the MK15(VVAL18)RTA concentrated solely on its use with a 0.7 ata constant PO2 in N2 breathing gas. Diving on air was not tested. Upon obtaining approval of the MK15(VVAL18) RTA it was used to compute a constant 0.7 ata PO2 in N2 decompression table for use with the MK15 UBA which was published in the 1981 revision of the U.S. Navy Diving Manual, Volume 2 (4) as the *US Navy Closed-Circuit Mixed-Gas UBA Decompression Table Using 0.7 ata Constant Partial Pressure Oxygen in Nitrogen.* Repetitive dive procedures were later developed (5) and published in the 1987 revision of Volume 2 U.S. Navy Diving Manual (6).

In 1985, two commercially available UDMs were programmed with the MK15(VVAL18)RTA for evaluation. Although the evaluation was completed successfully and the feasibility of programming the MK15(VVAL18)RTA into a UDM demonstrated (7), the UDM hardware available at that time was judged too large and cumbersome so no attempt was made to procure a UDM for Fleet use.

Development of the Air-N2O2 Decompression Computer Algorithm

In anticipation of adequate UDM hardware becoming available in the future, a further experimental study was undertaken to investigate the feasibility of using a decompression algorithm based on the MK15(VVAL18)RTA to compute decompression schedules for air as well as a constant 0.7 ata PO2 in N2 breathing gas, and allow switching between these gases during a dive. This algorithm will be referred to as the NEDU Air/N2O2 real time algorithm or NEDU A/N RTA. Testing was completed in August 1985 (8) and involved air dives, constant 0.7 ata PO2 in N2 dives and dives switching between the two gases. Single

[1] In this report a decompression schedule is defined as a set of depths and times which are required to be followed during an ascent. A decompression table is a set of decompression schedules usually for single depth dives using the same breathing gas and ordered by depth and time. The terms decompression profile and decompression schedule are used interchangeably.

A dive profile is the set of all depths and times for the entire dive and consists of all specified depths and times as well as all the decompression schedules required during ascents.

no-decompression, decompression, multiple repetitive, multi-level dives were tested along with dives where there were switches between breathing air and a constant PO2 gas. While the final version of the NEDU A/N RTA proved relatively successful at computing single air depth dives, it's performance was judged unsatisfactory when applied to air repetitive dives. As a result a new air decompression table was not proposed for approval. Rather it was decided to wait until an algorithm could be developed which could be used for computation of all operational nitrogen-oxygen (air and 0.7 ata PO2 in N2) decompression schedules, including surface decompression and repetitive dives.

In 1988, the then U.S. Navy Supervisor of Salvage, Captain C. Bartholomew, endorsed the idea of the Naval Medical Research Institute (NMRI) proceeding with the development of a decompression algorithm which could be used to compute a new air decompression table as well as be used for real time decompression in a UDM. From March through June 1991 NMRI conducted some 139 man-dives which then led to a larger validation series of 591 man-dives at NEDU from July 1991 through Feb 1992. This effort was built on previous work at NMRI developing a probabilistic approach to computing decompression schedules (9,10,11). The difference between the probabilistic approach and the conventional approach is discussed below. The result of this testing was the NMRI LE1 probabilistic decompression algorithm (LE1 PDA) which incorporated the kinetic portion of the MK15(VVAL18)RTA. The LE1 PDA was an improvement over the MK15(VVAL18)RTA and was equally successful at computing single depth and repetitive dives on air although some no-decompression limits and decompression schedules seemed overly conservative. The LE1 PDA was used to compute a set of air and constant 0.7 ata PO2 in N2 decompression tables , the so called NMRI '93 Tables (12-16). These were forwarded to the Supervisor of Salvage at the Naval Sea Systems Command (NAVSEA) for approval in 1993 but, because of reduced air no-decompression limits in the 30-50 fsw range and other issues relating to Fleet applicability, these tables have not yet been issued for Fleet use. While the LE1 PDA decompression schedules were judged safer than existing air schedules, Fleet operators suggested that operational experience showed some of the shortened no-decompression limits and longer decompression schedules to be overly conservative and that this might adversely impact mission performance. It was decided not to issue these tables for operational use until Fleet operator concerns on mission impact could be addressed

Special Warfare SDV Mission Decompression Procedures

While Fleet experience with the USN air decompression table in current use suggested there was no pressing need for their revision, the Special Warfare Community routinely performs dives using Swimmer Delivery Vehicles (SDV) for which the current USN operational decompression procedures are not designed. These are long multi-level dives where 30 min or so may be spent at depths down to 80-100 fsw doing a lockout from the SDV hanger attached to a submarine followed by a several hour transit during which multiple upward and downward excursions may be performed. The dive is completed by spending another 30 min or so at depths down to 80-100 fsw to lock back into the hanger. In order to provide a procedure for computing decompression schedules for these types of multi-level dives, the Combat Swimmer Multi-level Dive (CSMD) procedure was developed in 1983 (17) for diving on air. This procedure, with a slight modification in format, is the decompression procedure currently used during operational SDV missions. The CSMD requires that the decompression profile be manually modified as the mission progresses and cannot adequately address all possible dive scenarios. A Dive Planner program based on the NMRI LE1 PDA, called *Plan V4*, was developed by NMRI to run on an IBM type personal computer (18). It can only be used once all divers are in the chambers on board the submarine to compute the final decompression after completion of the mission, provided that the depth/time profile and breathing gas are precisely known. *Plan V4* cannot be used during the actual conduct of the mission. Therefore, it is of no use in addressing unanticipated events such as unplanned downward excursions.

It has been recognized for some time that a diver carried UDM would relieve SDV operators of the burden of having to manually compute decompression schedules during missions and would also be able to compute decompression schedules for dive profiles of any complexity. At the present time there are several commercially available UDMs designed for the recreational SCUBA diver breathing air. Many of the algorithms used in these UDMs are proprietary and have received no formal testing. The algorithms are designed for single depth dives or repetitive dives and many manufacturers caution against using these

units outside of no-decompression limits. Certainly these algorithms were not designed for the long duration, multiple level dives as done by the Special Warfare community. There are currently no commercially available UDMs for a fixed 0.7 ata PO2 in N2 breathing gas.

The US Navy has amassed a considerable experience specifically looking at the types of dive profiles used by Special Warfare divers. The MK15(VVAL18)RTA was specifically designed for these types of dives breathing a constant 0.7 ata PO2 in N2 gas. The LE1 PDA, which incorporates some of the essential features of the MK15(VVAL18)RTA, was configured to run in real time on a Digital Equipment MicroVax 3400 computer during manned validation trials. It was shown to be useful at computing real time decompression schedules breathing either air, a constant 0.7 ata PO2 in N2, or dives where switches are made between the two gases. With a eye towards specifically addressing the needs of the Special Warfare community, in 1991, the LE1 PDA was made available to commercial UDM manufacturers to see if it could be programmed into existing hardware. It was eventually concluded that the LE1 PDA was too mathematically intensive to be run in the microprocessors currently being used in commercial units, these having significantly less computing power than many older personal computers. In order to run on these types of microprocessors, a prohibitively expensive development effort would be required. Therefore, the effort to program the LE1 PDA into existing UDMs was suspended until such time as industry had developed processors powerful enough to execute it without an extensive software modification.

Use of the MK15(VVAL18)RTA on Air

The MK15(VVAL18)RTA is mathematically much simpler than the LE1 PDA. It has been approved for constant 0.7 ata PO2 in N2 diving and it has already been demonstrated that it could be programmed into existing UDM hardware (5). A Special Operations Command Task was established through NEDU to investigate the possibility of using the LE1 PDA to "validate" the MK15(VVAL18)RTA for air diving. Once this was done, the MK15(VVAL18)RTA could then be used in an "off the shelf " UDM for Special Warfare missions using air or a constant 0.7 ata PO2 in N2 breathing gas. In addition this task specified that the algorithm flowcharts and equations be made available to the manufacturer specified by the U.S. Navy and that any assistance needed to program this algorithm into specified hardware be made available. In December of 1996 five units built by Cochran Consulting (Richardson, Texas) programmed with the MK15(VVAL18)RTA were delivered to NEDU for human factors and hardware evaluation. Appendix A contains the algorithm as submitted to Cochran Consulting for programming into these units.

During Special Warfare missions, a UDM must be able to compute decompression profiles for both air and a constant 0.7 ata PO2 in N2 breathing gas and switch to air when the diver is at the surface. This is because divers breathing a 0.7 ata PO2 in N2 gas will breathe air before and after diving as well as during surface intervals. Also, some missions may be done using only air as a breathing gas. In addition there may be times when switches may be made between SDV boat air and the constant PO2 gas supplied by the divers underwater breathing apparatus. Although developing UDM hardware capable of switching decompression modes in conjunction with breathing gas switches at depth is not part of the current effort, having a decompression algorithm available capable of supporting such hardware will minimize development time in the future.

Since the MK15(VVAL18)RTA has only been approved for diving on a constant 0.7 ata PO2 in N2 breathing gas, it is necessary, at a minimum, to evaluate its performance on air dives and obtain approval for its use when breathing air. Also, it would be useful if at the same time, its performance could be evaluated on dives where switches are made between air and a constant 0.7 ata PO2 in N2 breathing gas during a dive (gas switch dives). It must be determined if existing data is sufficient such that a mathematical evaluation can be conducted which could form the basis of a recommendation for approval or if additional man-testing is required. Crucial to these goals is the use of the LE1 PDA as will be described.

This report describes the mathematical evaluation of the MK15(VVAL18) RTA algorithm on air and gas switch dives using existing data. In addition a revision designated as MK15 (VVAL18-1) RTA, which has several improvements, including longer shallow air no-decompression limits, is also evaluated. This report also addresses whether or not additional manned testing is required and makes specific recommendation regarding algorithm approval.

Probabilistic vs Deterministic Decompression Computation Methods.

All decompression tables and procedures currently in use by the US Navy were computed using some sort of mathematical model. The details of these various models are given in various NEDU reports (3,5,17,19,20-22) and it is beyond the scope of this paper to go into their details. What is important for the comparisons made in this paper is that all current Fleet procedures were computed using deterministic mathematical models. Simply put, a set of ascent rules were developed which, if violated during decompression, would result in an unsafe decompression profile, but the degree of 'unsafety' was not specified. Using this computational method, there was only one way to conduct a decompression without violating the ascent criteria. Profiles which differed from these "safe" profiles could be compared in terms of stop depths and stop times but there was no formal way to compare the safety of the two profiles. When doing such comparisons, it was assumed that if the stop depth distribution was not much different, then profiles with longer total stop times were "safer" or more conservative and the ones with the shorter total stop times time were "less safe" or less conservative.

Probabilistic models are designed to compute the probability (or risk) of decompression sickness (DCS) occurring from a particular decompression profile. These models can then systematically vary the decompression stop depths and times to obtain a final decompression schedule to a specified probability of DCS occurring, the target risk, while minimizing the total decompression time (TDT, time from beginning ascent to reaching the surface taking all decompression stops, also called total ascent time). The abbreviation PDCS will be used to denote the probability of DCS occurrence. In addition these models can be used to compute the PDCS value for any profile, no matter how the decompression schedule was computed.

Using a probabilistic model to analyze profiles allows comparison of risks between two dissimilar profiles. Not only will these probabilistic models tell which decompression profile is the riskier one (the one with the larger computed PDCS) but will tell how much of a difference in risk there is.

Risk Analysis Using the NMRI LE1 PDA

The NMRI LE1 PDA is a crucial part of the analysis of the performance of both the MK15(VVAL18)RTA and the MK15(VVAL18-1) RTA which is the subject of this report. Since the LE1 PDA is a probabilistic model it can be used to compute decompression schedules to a specified target risk or, as a risk estimator, to compute the PDCS of a decompression schedule form any source. As noted above, the LE1 PDA has not yet proved useful at computing decompression tables acceptable to the Fleet. It must be stressed, however, that this was not because of safety issues. Rather is had to do with the mechanics of the method by which the LE1 PDA lengthens decompression time in order to obtain a schedule as close to the target risk as possible (18). Currently, this results in profiles with no-decompression limits which have been judged over-conservative at depths shallower than 50 fsw. In spite of this, when used as a risk estimator to compute the risk of DCS occurring, the LE1 PDA remains the most powerful tool yet devised for evaluating and comparing various decompression schedules. Needless to say, the accuracy of it's risk predictions (predictive ability) must be substantiated.

The LE1 PDA was one of several candidate decompression models whose performance was initially evaluated using a Calibration Data Base of 2383 air and N2O2 breathing gas manned dives where the DCS outcomes were known (23,27). Many of these dives are given in Appendix H (see below). The result of this analysis was that the LE1 PDA proved superior to the other models in predicting the observed outcomes (DCS or no DCS) of the dive profiles in the Calibration Data Base.

The predictive ability of the LE1 PDA depends on the values of the adjustable parameters. These parameter values are optimized by using an iterative computer algorithm which adjusts them to provide the best "fit" of the algorithm to a Calibration Data Base. After an initial set of parameter values were determined using the Calibration Data Base (27), the aforementioned prospective manned dive trial was conducted by NMRI and NEDU from March 1991 through Feb 1992. This dive series involved over 700 individual exposures using air and 0.7 ata PO2 in N2 breathing gases (24). This dive trial showed that the LE1 PDA was capable of computing reasonable estimates of DCS occurrence over a wide range of dive types where decompression schedules were computed using several different methods . When these validation dive

profiles and their outcomes were added to the existing data base, the resultant set of updated parameters differed only slightly from those computed using the original data base. This means that the predictive value of the LE1 PDA had already been largely achieved before the prospective dive trial.

Just how well the LE1 PDA can estimate the risk of DCS can be judged from the data presented in Tables H-1 and H-2, Appendix H[2]. Here are listed the dive profiles used in the manned studies specifically conducted to validate the MK15(VVAL18)RTA, the NEDU A/N RTA and the LE1 PDA along with the numbers of dives and DCS cases. In the PDCS column is the risk of DCS for each profile as computed by the LE1 PDA. Computer files containing these dive profiles are on Diskette 2, folder *ValDives*. In only 4 cases did the PDCS as computed by the LE1 PDA fall outside of the 95% binomial confidence limits computed using the actual numbers of dives and DCS cases for each profile. In 2 cases the PDCS was underpredicted, and in 2 cases it was over predicted. For the other 126 entries in the table the LE1 PDA risk fell within the binomial confidence limits as computed. Given that of 130 different profiles there are only 4 "outliers" (58 man dives out of 2251) the LE1 PDA seems to do a reasonable job of predicting the risk of DCS resulting from any dive where a nitrogen-oxygen breathing mix is used no matter how the profile was computed. This gives us powerful tool for comparing various decompression procedures and a way of quantitating their safety.

One shortcoming of the LE1 PDA is that and the shallow no-decompression limits it predicts seem to be conservative. For example, the LE1 PDA predicted that 8 cases of DCS should have occurred on the 69 air saturation dives in the 20 fsw to 25.5 fsw in the NMRI Calibration Data Base (23) while only 1 DCS and 4 niggles[3] actually occurred. In spite of this shortcomings, the LE1 PDA can still be used to compare even these types of profiles, the direction of the risk change (increased or decreased) will be accurate, although the quantitative difference in risk may not be.

In this analysis the LE1 PDA is used as the "gold standard" for determining the PDCS for various decompression profiles, and as the basis for a quantitative comparison of PDCS between various profiles. Areas where quantitative risk estimates may not be accurate will be pointed out and discussed as applicable.

METHODS

The analysis described in this report is focused on analyzing the performance of the MK15(VVAL18) RTA and it's variant the MK15(VVAL18-1) RTA. One type of analysis involves comparing single depth dive decompression schedules as computed by these algorithms with the decompression schedules from the tables currently approved for Fleet use. Another analysis looks at decompressions during repetitive dives, multi-level dives, and dives where there were switches made between air and a constant 0.7 ata PO2 in N2 breathing gas. In these cases comparisons are made with decompression schedules computed by repetitive and multi-level dive procedures currently in Fleet use as well as decompression schedules computed using the NMRI LE1 PDA. In all of the dive profiles used in the analyses described in this report the ascent and descent rates were standardized at 60 fsw/min, unless specifically stated otherwise.

Profiles Used for Comparison

Single Depth Dive Decompression Schedules

The standard for air diving comparisons is the existing *US Navy Standard Air Decompression Table* (25) last revised in 1955, designated as USN'55. For this comparison a complete set of air decompression schedules using the same depth and bottom time combinations as USN'55 were computed using both the MK15(VVAL18)RTA and the MK15(VVAL18-1)RTA and these are shown in Appendices B-1 and B-2. Schedules were only computed for depths down to of 200 fsw since greater depths are outside of the range

[2] All dives where the facility is noted as NEDU were done before the final manned validation of the LE1 PDA. Computer files of the actual dive profiles as recorded in real time were available for all of these except for those shown as Report 11-80.1 (these are Dive Series 1 profiles from NEDU Report 11-80 (2)). All but the 11-80.1 profiles were included in the above mentioned Calibration Data Base. The dives with the Facility specified as NMRI were the ones conducted at NMRI and NEDU for the prospective trial which was done from Mar 1991 through Feb 1992 as noted in the text (24).

[3] A niggle is a mild symptom, usually fleeting muscle or joint aches, which while related to a decompression, were not of sufficient severity or duration to require treatment.

in which the Special Warfare diver will operate. Depth/time combinations below the limit line in these tables are currently considered exceptional exposure.

The standard for constant 0.7 ata PO2 in N2 decompression schedule comparisons is the existing *US Navy Closed-Circuit Mixed-Gas UBA Decompression Table Using 0.7 ata Constant Partial Pressure Oxygen in Nitrogen* (26) whose validation was completed in 1980, designated as P07'80. This table was computed by the MK15(VVAL18)RTA and is shown in Appendix C-1. In addition a complete set of decompression schedules computed by the MK15(VVAL18-1)RTA using the same depth/bottom time combinations as found in the P07'80 Table was computed and is found in Appendix C-2. Again, depth/time combinations below the limit line are currently considered exceptional exposure.

In addition to the published Fleet tables, comparison was made to the air and constant 0.7 ata PO2 in N2 decompression tables computed by NMRI in 1993, designated as Air'93 and P07'93 respectively (12-16). Only the *Current State A* schedules were used which assume that the diver had no repetitive dive obligation from a previous dive before the current dive. Because the NMRI tables did not include all of the same depth/time combinations as the USN'55 or P07'80 tables some adjustments were made. In cases where an exact match was not found, a decompression schedule was constructed using the stop depths and times for the next longer bottom time schedule for the depth of interest. For example, the USN'55 Table has a schedule for a 140 fsw for 50 min bottom time but this depth/time combination does not appear in the Air'93 Table, the closest schedule being 140 fsw for 55 min. In this case a schedule was constructed where after a bottom time of 50 min was spent at 140 fsw, the decompression stops as found in the Air'93 140 fsw/55 min schedule were followed.

Repetitive, Multi-Level Dive, and Gas Switch Decompression Schedules

There are an infinite number of combinations which could be used to construct repetitive and multi-level dives for comparison. To keep things manageable it was decided to restrict the analysis to profiles based on the repetitive and multi-level dive profiles used in the manned dives series conducted specifically to validate the original MK15(VVAL18)RTA (2,3), the NEDU A/N RTA (8), and the LE1 PDA (24). These are shown in Appendix H as noted above. One advantage of using these profiles is that there is excellent documentation of the numbers and type of DCS cases which occurred using them.

These profiles are summarized in Table 1 and consist of all but the single depth air and constant PO2 dives (dive Types II and VI) presented in Appendix H (see Appendix H **Notes** for explanation of Profile Description). The dive profiles in Table 1 use the same "skeleton" profiles as those in Appendix H except all the ascent and descent rates have been standardized to 60 fsw/min. A skeleton profile specifies only the depths and interval times desired without specifying any decompression stops which may be required during ascents. These decompression stops are computed by the various models so that any differences in the total dives times will be due only to the differences in the decompression stop times. Each of the four methods of computing the decompression schedules (headings of the 4 right hand columns in Table 1) was used to compute required stops for all ascents.

The Type IX profiles are single depth dives where air was breathed at depth but a switch to a constant 0.7 ata PO2 in N2 breathing gas was made at the first decompression stop and breathed for the remainder of the decompression. The algorithm took this gas switch into account and computed a schedule with a much shorter decompression time than if air had been breathed throughout.

Where a bottom time is noted as *ND*, the model computed the maximum time at that depth which would allow direct ascent to the surface, the no-decompression time. In constructing the profiles in Table 1 using existing Fleet procedures, where a no-decompression time was required, the no-decompression time as computed by the MK15(VVAL18-1)RTA was used as the *ND* bottom time. In these cases not all of these dives would be no-decompression according to current procedures, and if decompression stops were required they were taken. The exact profiles are found on the Diskettes accompanying this report. The repetitive dive procedures for the USN '55 (25) and the P07'80 (26) decompression tables were the Fleet procedures used for comparison of repetitive dives where a single gas was breathed at depth and all time between dives was spent at the surface (Dive Types I and VII). For air dives where the depth varied but no

intervals were taken at the surface (Dive Type III), the CSMD procedure was used (17). No Fleet procedures are available for computing decompression schedules for Dive Types IV, V, VIII and IX.

Decompression schedules for profiles where the existing Fleet procedures could be used (*USN'55 and P07'80 Repet and CSMD* column in Table 1*)* were computed by hand, and this involved rounding of some bottom times and surface interval times as required by these procedures. The MK15(VVAL18)RTA and MK15(VVAL18-1) RTA were used to compute decompression schedules using the exact depths and times including all breathing gas switches in the skeleton profiles.

In addition to these two algorithms, comparison was made with decompression profiles computed by the *Plan V4* Dive Planner program developed at NMRI using the LE1 PDA.

Types of Comparisons

Single depth decompression profiles were compared either by their TDT or by their total stop time (TST, total of all decompression stops, travel time between stops not being included). In addition decompression profiles were compared according to their PDCS as computed by a computer program incorporating the LE1 PDA, program *RISKNMR2* (see below). In addition the relationship between the TDT and the risk of DCS was examined.

Multi-level and repetitive dives were only compared by their risk of DCS. In order to see how the algorithms under consideration would compute decompression profiles in cases where a dive did not begin with the diver saturated at 1 ata (a so called "clean" diver), the PDCS for the final decompressions from multi-level and repetitive dives was examined.

VVAL18 vs VVAL18-1

The MK15(VVAL18) RTA consists of two parts. One part is the set of equations which defines the mathematical structure of the algorithm, this is designated by MK15 and RTA . The other part is a table containing the values for the adjustable parameters whose name is specified in parenthesis. Thus, the MK15(VVAL18)RTA contains exactly the same mathematical structure as the MK15(VVAL18-1)RTA, only the parameter values differ. Sometimes only the parameter set (VVAL18 or VVAL18-1) is specified to indicate which algorithm was used.

By adjusting the parameter values, the characteristics of the decompression profiles computed can be changed. The development of the MK15(VVAL18) RTA concentrated on a 0.7 ata PO2 in N2 breathing gas and, because of this, the no-decompression limits on air at 35, 40 and 50 fsw differed from the USN'55 limits, especially for depths shallower than 60 fsw (Table 2). The VVAL18-1 parameter values were empirically adjusted to fit the current USN air no-decompression limits at 35, 40 and 50 fsw as closely as possible while affecting the 0.7 ata PO2 in N2 table minimally. Table 2 also shows the air no-decompression limits from the Air'93 Table. In the *Tested* column are shown the numbers of exposures and DCS cases from manned dives conducted to validate the NEDU A/N (RTA(8) and those conducted to evaluate shallow air saturation no-decompression limits. The value of 32767 should be interpreted as infinity, that is saturation at that depth is allowed followed by direct ascent to the surface.

Table 3 shows the VVAL18 parameter values and Table 4 the VVAL18-1 parameter values. Computer files containing these parameters are on Diskette 4, folders *Dmdb7mlo* and *Tblp7*. The modifications made to obtain VVAL18-1 included reducing the number of compartments from 9 to 8, changing some of the tissue half-time values, and changing the maximum permissible tissue tension values at 10 fsw. The values for the maximum permissible tissue tensions at depths greater than 10 fsw are obtained by incrementing the 10 fsw values by 10 for each 10 fsw increase in depth. The values of the maximum permissible tissue tensions in the body of these tables are used by the algorithm to determine the depth of the first decompression stop as well as all subsequent stop times (see Appendix A and reference 1 for details).

Data Files and Computer Programs

All data files and computer program source listings used in this analysis are on the diskettes accompanying this report. The contents of these diskettes and file naming conventions are given in Appendix D.

All dive profiles used for comparison were put into computer data files for analysis. All calculations of risk (*".est"* or *".esf"* files) required that the decompression schedules be in the format of files with the *".mlo"* extension. This is the same format as used for the dives in the published NMRI data base of air and N2O2 dives (23). All profiles in this format are complete, that is all times spent at each depth and the gas breathed are explicitly given. In some cases, the *".mlo"* profiles were entered directly from either published tables or from hand calculations using published repetitive dive or published multi-level dive procedures. These files are found in the *MLO_pri* folder of Diskette 1. In other cases the *".mlo"* profiles were computed using one of the computer programs described below, these are in the folder *MLO_sec* of Diskette 1.

Data Files for Published Tables

Files for the USN'55, Air'93, and P07'93 Tables are in folder *MLO_pri* of Diskette 1. Data files for all of the published USN'55 schedules were supplied by NMRI and were taken directly from the table as published. A subset of these decompression schedules for depths of 200 fsw or less and using ascent and descent rates of 60 fsw/min was constructed for this analysis (*Air55usn.mlo*). The Air'93 table and the P07'93 table were also provided by NMRI in *".mlo"* format. Only the *Current State A* table (those assuming the diver was initially "clean") are used in this report. These tables were adjusted as described above to ensure that there were schedules for all of the depth/time combinations as found in the USN'55 and P07'80 tables. These adjusted schedules are found in files *Air93usn.mlo* and *P0793usn.mlo*. Separate files were made for the no-decompression limits which are found in the files with names ending in *"nd.mlo"*.

For the P07'80 Table, the depth/time profiles as found in the published table were incorporated into file *P0780usn.pcf* (folder *PCF_file)* which was then used along with VVAL18 to compute the set of decompression profiles in file *P0780usn.mlo* (folder *MLO_sec)* using the MK15(VVAL18)RTA. Separate files containing only the no-decompression limits are found in file *P0780nd.pcf* and *P0780nd.mlo*

Data Files for Published Repetitive and Multi-level Dive Procedures

The current USN air repetitive dive procedures or the CSMD procedures were used to construct decompression schedules for the air repetitive dive profiles and the air multi-level dive profiles listed in Table 1 (Types I, III, and VII). Files pertaining to these dives are in folders *PCF_file* and *MLO_sec* of Diskette 1. These profiles were initially entered into file *Mlair55.dcf.* Similarly, schedules were constructed for the constant PO2 repetitive dives profiles using the P07'80 repetitive dive procedures and entered into file *Mlp0780.dcf.* Both of these *".dcf"* files were converted to *".mlo"* format using program *DCF_MLO* (Diskette 3) and appear as files *Mlair55.mlo* and *Mlp0780.mlo.* (These *".dcf"* files are exactly the same format as the skeleton profiles in the *".pcf"* files described in the next section except that all the decompression stop depths and times have been explicitly defined.)

Data Files for Computed Schedules

All decompression schedules not found in published tables or constructed using published procedures were computed using one of two computer algorithms. One algorithm was based on the MK15(VVAL18)RTA and the other on the NMRI LE1 PDA.

MK15(VVAL18)RTA based programs

Programs *DMDB7ML1, DMDB7ML2, TBLP71,* and *TBLP7MLO* all use the same algorithm as found in the MK15(VVAL18)RTA and are used with either the VVAL18 or VVAL18-1 parameter set. All of these programs will all compute identical decompression schedules for a given skeleton profile and parameter set, they differ only in their output format. Source code listings are found in folder *Mk15rta* of Diskette 3. Files in the *PCF_file* directory with the *".pcf"* extension are the input files for these programs.

As described earlier, in skeleton profiles, depths and interval times spent at those depths are specified without regard for any decompression which might be required during ascent (see reference 1 for details of format). The programs then compute any required decompression and output a profile containing the specified depths and interval times along with all interceding decompression stops as required by the particular algorithm. The files with names ending in *"us."* or *"usn."* are the ones for single depth dives which have skeleton profiles with exactly the same depth/time combinations as the tables currently in Fleet

use, USN'55 and P07'80. Program *TBLP7I* was used to compute the set of decompression tables in the format shown in Appendices B and C using files *Air18usn.pcf, Air181us.pcf, P0780usn.pcf,* and *P07181us.pcf.* Program *TBLP7MLO* is used for single depth dives (files beginning with *"Air", "AirO2",* or *"P07"*) where the output is desired in *".mlo"* format for later risk analysis. In addition to computing a decompression profile, program *TBLP7MLO* will output the depth and time of each dive along with the total stop time. The no-decompression limits are in the files of type **nd.mlo.*

Repetitive dives and multi-level dive decompression schedules (skeleton or output files beginning with *"Ml"*) are computed using program *DMDB7ML1.* This program accepts a *'.pcf"* skeleton profile and outputs the computed schedules in *".mlo"* format but does not give a depth and time or a total decompression time as these have no meaning for these types of profiles. Program *DMDB7ML2* computes the decompression schedule exactly as does *DMDB7ML1* but provision is made to output two elapsed time values and a TDT which will be used to compute an interval risk (see below). The current criteria is to find the time that the last decompression begins and output that as the first time, output the second time as 9999.0 ,the time at which it is assumed that all risk of decompression sickness has dissipated after surfacing from a dive, and then output the TDT for the last decompression. The reason for this will be explained below. The *DMDB7ML2* output files containing these two times and the TDT are designated as *".mlf".*

Plan V4 based programs

In order to compute repetitive and multi-level dive decompression profiles using the NMRI LE1 PDA, the NMRI dive planner program *Plan V4* was used. The parameter values used are in files *Le1ex7.var* and *Model.prm* (Diskette 3, folder *V4stuff).* This program requires that the input skeleton profiles are in *".div"* format and such a file for each profile in Table 1 was constructed. All of these files are in folder *DIV_file* of Diskette 1. The files found in the *Nedu* subfolder are those used in the validation studies of the MK15(VVAL18) RTA and the NEDU A/N RTA. Those found in the *Nmri* subfolder were those used in the most recent prospective manned validation trial of the LE1 PDA.

For each *".div"* input file, *Plan V4* outputs a single *".sum"* file containing the computed decompression schedule. A batch program was written that sequentially computes a decompression schedule using *Plan V4* for each of these *".div"* profiles and concatenates each individual *".sum"* output file into a single *".csm"* output file (See *Doplanv4.bat* in folder *V4stuff* of Diskette 3). In addition, the parameter values are placed at the beginning of the file and the file name for each *".div"* profile is placed just before each computed decompression profile. Program *CSM_MLO* (Diskette 3) is then used to convert this single *".csm"* file to *".mlo"* format.

Some *".mlo"* profiles for repetitive and multi-level dives constructed from published procedures, and computed using *Plan V4*, also had *".mlf"* variants constructed for risk analysis. The program *MLO_MLF* (Diskette 3) takes as input a file in *".mlo"* format and then finds the time of the final decompression and TST for the last decompression and outputs the profile in *".mlf"* format.

Risk Estimates

Program *RISKNMR2* (Diskette 3) takes dive profiles files in *".mlo"* or *".mlf"* format and computes a risk (PDCS) for each profile. This program incorporates exactly the same risk computation procedure as used in the LE1 PDA and the *Plan V4* dive planner program discussed above. It uses the parameter values in file *Le1ex7.var* (Diskette 4, folder *Riskcomp*) which are identical to those used by *Plan V4.* If the input is in *".mlo"* format the risk is computed for the entire profile from the beginning until the instantaneous risk approaches zero (Time 9999.0). These risks are output as an *".est"* file. If the profile is in *".mlf"* format then the risk is computed for the interval beginning with the start of the last decompression until it approaches zero after surfacing. This risk along with the total stop time for the last decompression are output as an *".esf"* file when the batch program *Risk_mlf.bat* (Diskette 3, folder *Riskcomp*) is used. Unless otherwise stated, all risk estimates found in this report were computed with program *RISKNMR2.*

RESULTS

Single Depth Air Dives

No-Decompression Limit Comparisons

Air no-decompression limits are given in Table 2 and risk estimates in Appendix G, Tables G-1 through G-4. As mentioned earlier, VVAL18-1 was constructed to match the current air no-decompression limits at 35, 40 and 50 fsw. VVAL18 predicts that the air saturation no-decompression limit is at 22 fsw and still gives considerable no-decompression times at 24 and 25 fsw. In contrast VVAL18-1 predicts that the air saturation no-decompression limit is at 20 fsw and drops it considerably at 22 fsw were further decreases become more gradual.

Figure 1 is a plot of the risk of DCS vs depth for the no-decompression limits in Table 2. The 95% confidence limits are shown for the USN'55 no-decompression times at each published depth. In the 50 to 90 fsw range the risks for no-decompression times as computed by all methods are essentially identical. The risks for the VVAL18, VVAL18-1 and Air'93 algorithms are essentially identical from 50 fsw down to 190 fsw. The largest difference in risk for these three algorithms occurs at 120 fsw. The VVAL18 risk is the highest at 2.61 ±0.81% and the lowest risk is for VVAL18-1 at 1.99± 0.68%. The difference is not significant. Deeper than 90 fsw the USN'55 risks are lower reflecting the shorter no-decompression times. However, the longer times predicted by the other three algorithms have been verified in manned validation trials as shown in Table 2

For no-decompression times shallower than 50 fsw there is a wide divergence in risks (Figure 2). The AIR'93 risks are the lowest reflecting the much shorter times predicted by the LE1 PDA algorithm. However, as mentioned earlier the LE1 PDA tends to over predict risk at theses shallow depths resulting in it's computing no-decompression times which are shorter than necessary. The increase in risk for the VVAL18 no-decompression times at 22 and 24 fsw means that their more generous no-decompression are associated with a higher risk of DCS than for the risk from direct ascent to the surface after saturation at 22 fsw. Although not plotted, shallower than 22 fsw, the risk will fall, since once saturated, the shallower the depth the lower the risk of DCS.

The VVAL18-1 no-decompression limit risks are greater than their VVAL18 counterparts at 35 and 40 fsw but are identical to the USN'55 no-decompression limit risks. This is not surprising since these times were purposely made identical 50 fsw and shallower. Shallower than 35 fsw the VVAL18-1 algorithm predicts that the highest risk of DCS is at it's air saturation no-decompression limit of 20 fsw and it falls of monotonically for the predicted limits at greater depths.

Single Depth Air Dive Decompression Schedule Comparisons

Decompression tables for air and a constant 0.7 ata PO2 in N2 using both VVAL18 and VVAL18-1 are found in Appendices B and C. Risk estimates with 95% confidence limits for individual schedules from these tables as well as from the USN'55, AIR'93, and P07'93 Tables are found in Appendices E and F.

Table 5 compares the total stop times of the VVAL18 and VVAL18-1 air tables with the USN'55 and AIR'93 tables sorted by depth and time. The TST for the USN'55 schedules are shown but in the other columns only the difference in TST between the other schedules and the USN'55 schedules are given. A negative time means the TST is shorter than the USN'55 TST by that amount, a positive time means it is longer. The vast majority of the VVAL18 and VVAL18-1 decompression schedules are longer than their USN'55 counterparts suggesting "safer" schedules. When schedules are shorter they differ by only 1 to 3 min and these are always close to the USN'55 no-decompression limits.

Table 6 shows the computed risk of DCS for each air schedule sorted by depth and time. Again the risk for the USN'55 schedule is given, and the difference in risk given for the other schedules. A negative number signifies a lower risk, a positive number a higher risk. In Table 7 the schedules are sorted by their USN'55 schedule risk. As would be expected, based on the longer TDTs, the vast majority of risks for the VVAL18 and VVAL18-1 schedules are less than for the corresponding USN'55 schedule. While there are some very substantial decreases in risk compared to the USN'55 schedules (as large as 28.55%), when VVAL18 or VVAL18-1 risks are greater, they differ by 0.28% at the most.

Figures 3 and 4 show the data in Tables 5 and 6 graphically. For each depth/time combination there will be a set of 4 different decompression profiles, one for each of the methods under consideration, each with its own risk. Thus, associated with each USN'55 risk are a set of three other risks, for the three other decompression profiles associated with that depth/time combination. In Figures 3 and 4, the values for each

risk in a particular set are plotted as a function it's USN'55 risk. If the USN'55 risks were plotted, they would fall along a straight line with an intercept of zero and a slope of 1.0. However, only the upper and lower 95% confidence limits for each of the USN'55 risk values are plotted. Thus, any risk value falling above the upper line signifies that that the decompression profile associated with that particular depth/time combination has a significantly higher risk of DCS than the USN'55 profile. If the risk falls below the lower line, the profile has a lower risk, and if it falls between the two lines them the risk for that profile is not significantly different from the USN'55 profile. As can be seen in Figure 3, none of the decompression profiles as computed by either VVAL18 or VVAL18-1 have risks which are significantly greater than those for the USN'55 decompression profile, and in most cases they are significantly lower.

Figure 4 shows the same data with an expanded scale. In this figure, the risks for the Air'93 decompression profiles are also plotted for profiles with a TDT of 180 min or less[4]. There is essentially no difference between the risk of DCS for air decompression profiles computed using VVAL18, VVAL18-1 and those from the Air'93 Table. Also, in no case is do these risks exceed the USN'55 risks, and for may of the depth/time combinations the other three methods compute decompression profiles with lower risks.

Single Depth Constant PO2 in N2 Dives

No-Decompression Limit Comparisons

Table 8 gives the no-decompression limits for a constant 0.7 ata PO2 in N2 breathing gas and the risk estimates are given in Appendix G, Tables G-5 - G-7. The current operational limits are the P07'80 limits and the shallowest depth listed in the current table is 10 fsw where an unlimited no-decompression time is allowed. Even though the MK15(VVAL18)RTA predicts a saturation no-decompression depth of 35 fsw, the no-decompression times at 20 and 30 fsw were truncated to a maximum of 720 min, the maximum anticipated mission duration at the time the table was published. Instead of the published times, the no-decompression times given in Table 8 for P07'80 from 30 to 38 fsw are those actually computed by the MK15(VVAL18)RTA. The shallowest tested no-decompression limit during the MK15(VVAL18)RTA validation trials was 40 fsw for 366 min with no DCS in 10 exposures (3).

Figure 5 plots the risk of DCS for the no-decompression limits as computed by the LE1 PDA as a function of depth. The 95% confidence limits for the P07'80 time risks are also shown. For depths of 50 fsw and deeper there is no significant difference in risk for any of the three sets of limits. Figure 4 shows risks for the shallow no-decompression limits on an expanded scale. Only at 45 fsw is the VVAL18-1 no-decompression time risk significantly greater than that from the current P07'80 table, an increase of 64 min. This reflects the fact that the 40 fsw limit on air for VVAL18-1 was set to 37 min longer than the VVAL18 limit to fit the 200 min current air limit. Since the same set of parameter values are used in computing both air and constant PO2 decompressions, adjusting them to lengthen the air no-decompression time results in predicting longer times on some of the constant PO2 breathing gas no-decompression times, they cannot be adjusted independently. At depths shallower than 40 fsw the VVAL18-1 no-decompression times are of a lower or essentially the same risk as those computed using VVAL18.

In contrast to its behavior on air, the VVAL18 no-decompression limit risks decrease monotonically from their maximum value at the saturation no-decompression depth of 35 fsw as the depth increases. Again, for depths shallower than the maximum no-decompression saturation depth the risk will decrease as depth decreases.

Single Depth Constant PO2 in N2 Decompression Schedule Comparisons

Table 9 shows the TST comparison for the constant 0.7 ata PO2 in N2 decompression schedules. In this case the P07'80 schedules are those computed using the MK15(VVAL18)RTA. The VVAL18-1 and P07'93 algorithms both produce many schedules which are shorter than the P07'80 schedules, sometimes

[4] In computing the Air'93 decompression schedules, all were computed to a specific target risk. Up to a TDT of 20 min the target risk was 2.3%. As the TDT went form 20 min to 60 min the target risk increased linearly to 5.0%. When the TDT exceeded 180 min the target risk was allowed to increase up to a maximum of 10%. As discussed later, the maximum target risk for real time computation of decompression schedules in a UDM was specified as 5.0%, thus the schedules computed at a higher target risk for the Air'93 tables are not plotted.

shortening decompression schedule TST by as much as 50%. In Table 10 risks are shown sorted by depth and time. More informative is Table 11 where the profiles are sorted by the P07'80 risk. The difference in risk from the published P07'80 schedules are not great, the largest decrease being 2.26% and the largest increase being 1.13%.

In Figure 7, the risks for the profiles computed for each depth/time combination are plotted as a function of their P07'80 risk. This plot was constructed in the same manner as Figures 3 and 4 described above. For the same reason as for the Air'93 table only those P07'93 schedules with TDTs 180 min or less are plotted (see footnote 1). All of the VVAL18-1 schedule risks fall between the 95% confidence limits for the P07'80 schedules, indicating there is no significant difference. At risks above 5.0% there is a tendency for the VVAL18-1 schedule risks to approach the lower P07'80 confidence limit.

As can be seen in Figure 7, there are several P07'93 schedules which have risks that fall outside of the VVAL18 risk confidence limits. The depth/time combinations accounting for these risks are show in Table 12. The majority of these schedules have higher risks reflecting shorter decompression times for the NMRI'93 schedules. Of the 6 NMRI'93 schedules which are of lower risk than the VVAL18 schedules, 4 are for the long bottom time 40 fsw dives. This is a direct result of the longer 40 fsw no-decompression limit predicted by VVAL18. The other two NMRI'93 decompression schedules which are of lower risk are the 170 fsw/8 min and the 160 fsw/9 min. This is because dives below 150 fsw are exceptional exposure dives in the NMRI'93 table and there aren't any no-decompression limits for these two depths, the shortest published bottom time being 20 min. The low risk reflects that the 20 min decompression schedule was used for these NMRI'93 schedules. However, the VVAL18 risk for these two dives is still below the 2.3% target risk level for no-decompression dives used to compute the other NMRI'93 no-decompression limits.

Multi-level, Repetitive, and Gas Switch Dives

Computed risks for the multi-level, repetitive, and gas switch Test Dives done in the various NEDU and NMRI manned validation trials have been given in Table 1. Single depth dives on air (Type II) or on 0.7 ata constant PO2 (Type VI) breathing gas throughout are not presented here since these types of dives have already been addressed above.

As mentioned earlier, the profile descriptions are for skeleton profiles, the particular decompression stops required for ascents being computed by each of the four methods under consideration. Comparing these multi-level dives using total stop times is complicated by the fact that the decompression schedule for first part of the dive will effect the stop depths and times for the second. The only way to compare these profiles is by their overall risk.

Multi-level Air Dive Decompression Schedule Comparisons

Figure 8 compares the risks of the air decompression schedules for all of the Type I and Type III dives in Table 1. In constructing this figure, for each skeleton profile, required decompression stops were computed by one of 4 methods; using current Fleet procedures (air repetitive dive procedures or CSMD) designated as *USN'55 repet and CSMD*, or using VVAL18, VVAL18-1, or *Plan V4*. The risks of DCS for the resulting decompression profiles were then sorted according to the USN'55 decompression risk for that skeleton profile as is shown in Table I-1, Appendix I. For each of the risks computed by a particular algorithm in Table I-1 that value was plotted against the corresponding USN'55 decompression risk for that particular skeleton profile. Like the earlier figures presented in this way, only the upper and lower 95% confidence limits for the USN'55 risk are shown as the two solid lines. Risks for other profiles falling above the top line will be riskier, and those falling below the bottom line less risky. As shown, there is little difference in the overall risk between decompression profiles computed using VVAL18, VVAL18-1 and *Plan V4*. For skeleton profiles whose USN'55 decompression profile risk is less than 6%, all the other methods compute profiles whose risks are not significantly different from the USN'55 profiles. For skeleton profiles whose USN'55 decompression profile risk is greater than 6%, the other three methods are still essentially equivalent but they compute profiles with significantly lower risks than the USN'55 procedures.

Multi-level 0.7 ata Constant PO2 in N2 Dive Decompression Schedule Comparisons

Figure 9 compares the risks of all of the Type IV, V, VII, VIII, and IX dives from Table 1. These were arranged in Table I-2, Appendix I, and plotted in the same way as the air profiles above except here the independent variable was the VVAL18 risk. Profiles computed with VVAL18-1 had essentially the same risk as those computed using VVAL18. The P07'80 Repetitive Dive procedure computed decompression profiles which had lower risks than those computed using VVAL18. This would be expected because of having to round up surface intervals and bottom times which would be expected to result in more conservative decompression profiles.

In three cases, *Plan V4* computed decompression profiles with risks outside of the VVAL18 95% confidence limits. In increasing order of their VVAL18 PDCS they are the NEDU *8-85 #26* profile (greater risk), the NEDU *1-84 #21* profile (lower risk), and the NMRI *D2* profile (lower risk) (Table 1). The largest difference is for the second of the three, and the lower risk here is due directly to the shorter 40 fsw no-decompression limit predicted by *Plan V4*.

DISCUSSION

The main purpose of the analyses made in this report is to determine if there is sufficient evidence available to determine if diving on air decompression profiles computed by VVAL18 is safe. In order to determine this, a definition of what is safe must first be established. The determining factor of safety here is the risk of DCS occurring, or PDCS. One comparison which will be made is to look at how the PDCS for decompression profiles computed by VVAL18 compares with that computed using existing Fleet procedures for the same basic depth/bottom time combination or skeleton profile. Here we are making a relative comparison, i.e.; Are decompression profiles computed using VVAL18 at least as safe or safer than those computed using current operational procedures? In this context we do not have to specify an acceptable PDCS, we simply need to show that for one procedure the computed PDCS is less than or equal to that of another procedure.

In other comparisons it may not be possible to show that one procedure computes decompression profiles with a PDCS equal to or lower than another procedure under all conditions. In this case we must determine what an acceptable level or risk is, or at least how much of an increase in risk over that of another procedure we are willing to accept.

Determining Acceptable Levels of Risk of DCS

The NMRI LE1 PDA computes decompression schedules to a specified level of DCS risk called the target risk. Once target risk is specified, the algorithm computes a decompression schedule such that at no time during the decompression would the risk of DCS occurring at any time in the future exceed the target amount (18) while keeping the TDT as short as possible. During development of the NMRI'93 decompression table, appropriate levels of target risk were the subject of discussions in meetings with the U.S. Navy Supervisor of Salvage, Supervisor of Diving and representatives from the Special Warfare and Fleet diving community. As a result of these meetings the recommendations regarding target risk levels for the LE1 PDA discussed immediately below were arrived at. These recommendations will form the basis for determining acceptable risk levels for the other algorithms under consideration.

NMRI'93 Decompression Tables, Target Risks of DCS

For the NMRI'93 decompression tables, it was recommended that dives with TDTs of 20 min or less be computed using a target risk of 2.3%, the approximate risk level for diving the current USN'55 no-decompression limits in the 60 - 90 fsw range (Figure 1, Table G-1, Appendix G). This low risk level was chosen because it was assumed that divers would expect no-decompression dives to be the safest type of diving and that it would not be uncommon to perform this type of diving at some distance from recompression facilities. In order to allow no-decompression dives to be done right up their published limits, there will be instances where these limits may be exceeded and a decompression dive will have to be done. In these cases there should be decompression schedules, out to some maximum TDT, which could be used as a matter of course to back up the no-decompression limits. The 20 min TDT was chosen because it was felt that this amount of decompression could easily and safely be done by free swimming SCUBA divers. Decompression schedules in this TDT range should be as safe as no-decompression dives.

If all decompression schedules were computed to this 2.3% level of risk, then extremely long decompressions would be required for bottom times currently encountered operationally. To minimize the operational impact, it was decided to allow the target risk to increase from 2.3% to 5.0% as the TDT increased from 20 min to 60 min. In doing dives where the decompressions are computed at the 5.0% target risk level, it was expected that recompression facilities would be within a reasonable distance from the dive site so that any DCS which did arise could be easily and rapidly treated. Also, based on the type of DCS which occurred during the various NEDU and NMRI manned validation studies on dives in the 5-6% range, it was expected that if DCS did occur it would most likely not be serious. Once the TDT reached 180 min it was decided to allow the target risk to slide up to 10.0% as the TDT increased to 220 min to keep decompression times from becoming impractically long. In the NMRI'93 tables, decompression schedules computed using target risks greater than 5.0% are Exceptional Exposure, and here recompression facilities and medical expertise would have to be at the dive site. Thus the increased risk of DCS incurred to shorten in water time would be offset by immediate access to recompression facilities thus making the likelihood of permanent injury very low.

In discussing risk levels to be used during SDV operations using a UDM, it was decided that the target risk should be allowed to slide from 2.3% to 5.0% but that it should never exceed 5.0%.

The way in which the target risk is used, that is in keeping the future risk of DCS below a certain level, means that the final overall risk of DCS may be somewhat higher (18). When using *Plan V4* to compute decompression schedules for profiles based on those in Appendix H with TDT's exceeding 180 min using a maximum target risk of 5.0%, the largest final overall risk for single depth dives was 5.7%. Because *Plan V4* always computes decompression profiles to the same target risk, 5.7% is the maximum risk that would also be expected in computing the final decompression schedule from even a complex multi-level or repetitive dive.

In doing repetitive dives, the overall risk may exceed the target risk by quite a bit. This is because each separate decompression schedule is computed using the 5.0% target risk but performing several such decompressions close together will result in a higher risk. This is seen in Table 1 where overall risks exceeding 8% are encountered from doing repetitive 150 fsw dives (Profile *8-85 #36, 1-93 D1a*). Simply put, even though the individual risks from each decompression never exceed 5.7%, the more of these decompression that are done over the course of a day, the more likely that DCS will occur.

Expected Outcomes Using Recommended Target Risk Levels

The computed risk levels are difficult to interpret as absolute values since they do not contain any information regarding severity. If all DCS symptoms were only joint pain, with no neurological involvement, then a higher risk of DCS could be tolerated. If severe neurological symptoms were likely then very few DCS cases could be tolerated and lower risk decompression would be required. In order to put these risk estimates into perspective, it is useful to examine the types of DCS symptoms which actually occurred on dives covering a wide range of risks.

Appendix H-3 contains information on the types of DCS which occurred on all of the dives in Table H-1. The profiles are sorted by increasing PDCS. All 120 DCS cases were reviewed and placed in one of three categories. The DCS I category are dives meeting the USN Type I DCS criteria, that is only joint pain or cutaneous rashes were present with no neurological or cardiovascular symptoms. The DCS II(p) category is where limb paresthesias were found with or without accompanying joint pain, but no other neurological symptom was present. The DCS II(w) category is where muscle weakness, cerebral neurological symptoms or cardiovascular symptoms (severe hypotension) were observed with or without symptoms from the other two categories. Of all the DCS symptoms, approximately 77% were DCS I, 12% DCS II(p), and 11% DCS II(w). In Figure 10 the cumulative fraction of total symptoms from Table H-3 are plotted as a function of PDCS for type of DCS. The heavy solid line shows the cumulative fraction of all man-exposures with a PDCS less than or equal to the specified value on the X axis.

No symptoms were observed for dives having PDCS values below about 3.4%. As seen from the heavy solid line, about 11% of all of the 2251 man-dives shown in Appendix H have PDCS values less than or equal to this amount. For dives with a PDCS of 4.0% or less (about 18% of all of the dives), the 2

symptoms which did occur were of the type DCS II(p). The first occurrence of a DCS I symptom was at a PDCS of 4.32%. No DCS II(w) symptoms occurred until the PDCS exceeded 6.5%, a level not exceeded by 50% of all dives.

The DCS II(w) symptom which occurred at the lowest risk (6.6%) was leg paresthesia which evolved into weakness over the next three days but was not reported until 7 days post dive. The DCS II(w) symptom with the next highest PDCS (7.0%) involved extreme fatigue followed by nausea and bilateral lower extremity paresthesias. The next symptoms occurred beginning at a PDCS of 8.5% and among these symptoms are cardiovascular collapse, major cerebral dysfunction, and visual disturbances, along with simple muscular weakness. All symptoms noted above were successfully treated.

Maximum Acceptable DCS Risk Levels

Based on the above data, it would seem that dives with PDCS values of 6.6% or above should be avoided if possible to minimize the chance of encountering the severe DCS II(w) symptoms. The one DCS II(w) symptom which did occur just above this risk level was a late developing problem and did not seem to pose an immediate danger to the divers health. The next severe symptom was not encountered until a 7.0% risk was exceeded.

As noted above, the LE1 PDA will keep the overall PDCS below 5.7% for decompressions involving single depth dives. Given no other considerations, limiting risk to this level would keep the likelihood of DCS II(w) symptoms very low based on Figure 10. However, as will be seen later, other considerations argue that allowing single dive risks up to 6.5% might reasonable under certain conditions. This would put dives into the risk range of the one producing the late onset weakness but is still lower than the risks where all the other DCS II(w) symptoms occurred.

Choosing a maximum single dive risk level to avoid any DCS II(p) symptoms would be too restrictive, requiring that the overall PDCS be confined to 3.0% or less. Many decompression dives with long in-water times encountered operationally would have prohibitively long decompression times at this level of risk.

As noted above, even restricting the single dive (e.g. single decompression) risk will still result in much higher risks for repetitive dives. Unless repetitive dives are simply not allowed, this cannot be avoided.

VVAL18 Air Decompression Profiles

For single depth dives, VVAL18 computes decompression profiles of lower risk than the current USN'55 schedules for most depth/bottom time combinations (Table 7). Where the risks are greater, they exceed USN'55 risks by only a small amount and in every case they are within the 95% confidence limits of the USN'55 risks (Figures 3&4). Some of the air no-decompression limits are longer than the USN'55 limits (Figure 1) but as mentioned above the safety of these longer limits has been verified in manned validation trials (3).There are no published USN no-decompression limits for air dives shallower than 35 fsw, so in this region we have to decide if the computed risk is acceptable. For air saturation dives at 20 fsw, the NMRI data base (23) contains 32 exposures followed by direct ascent to the surface with no resulting DCS. In addition another 30 of these 20 fsw air saturation dives were done at NMRI in 1992 with the same results. This gives a total of 62 exposures with no DCS giving an upper binomial 95% confidence limit for the PDCS value as 5.68%. This shows conclusively that the LE1 PDA computed risk of 7.44% is an over estimate. Given the large number of DCS free dives here, it seems reasonable to assume that direct ascent after saturation at 20 fsw on air should have no higher risk of DCS than from no-decompression dives in the 60-90 fsw range, or about 2.3%. This means that the LE1 PDA is probably overestimating risk by a factor of three in this region. The VVAL18 no-decompression limit risk does not monotonically decrease from 20 fsw but peaks at around 10.7% at 24 fsw. Assuming that the LE1 PDA is overestimating risk here to the same degree it does at 20 fsw, we would expect the observed risk to actually be around 3%. Even though VVAL18 has the highest predicted risk of all methods in the 20-25 fsw range, experience has shown that when DCS does occur on these long shallow exposures it is almost always very mild joint pain. In 27 saturation no-decompression air exposures in the 24-25.5 fsw range documented in the NMRI data base, there was only 1 definite pain only DCS and 4 niggles. Overall these very shallow no-decompression limits predicted by VVAL18 are probably no riskier than the other deeper no decompression limits.

On multi-level and repetitive air dives VVAL18 has either the same or less risk than the decompression profiles computed by the current USN Fleet procedures (Figure 8). **Overall using the VVAL18 algorithm on air should result in no higher an incidence of DCS than current Fleet procedures and will result in a significantly lower risk in many cases.**

VVAL18-1

As noted previously, VVAL18-1 was constructed to fit particular shallow air no-decompression limits. As a result VVAL18-1 computes decompression profiles from VVAL18 on a constant 0.7 ata PO2 gas, so its performance must be examined both on that gas and on air.

VVAL18-1 Air Decompressions

For decompression dives with PDCS values of 7.0% or less, VVAL18-1 computes decompression profiles for single depth dives (Table 7, Figure 4) , multi-level and repetitive dives (Figure 8) where there is no significant difference in computed risk compared to VVAL18 profiles. Compared to USN'55 decompression schedules, the VVAL18-1 schedules are either not significantly different or are significantly lower. For no-decompression dives, the VVAL18-1 limits are essentially identical to the VVAL18 limits for depths of 50 fsw or deeper. Shallower than this the risks of the no-decompression limits are the same as the current USN'55 limits to 35 fsw. However, unlike VVAL18, the no-decompression limits decrease monotonically from 20 (Figure 2). **If one accepts that the published USN'55 no-decompression limits at 35 and 40 fsw are safe, and considering the experience with air no-decompression saturation dives cited above, then using VVAL18-1 on air should have no higher an incidence of DCS than the current USN'55 table and procedures, and in many cases the risk will be lower.**

Constant 0.7 ata PO2 in N2 No-Decompression, Decompression and Gas Switch Dives

In modifying VVAL18 to obtain VVAL18-1, the focus was on adjusting the parameter values (Tables 3 and 4) to obtain a good fit to the current air no-decompression limits at 40 and 35 fsw. However, since the algorithm uses these same values when computing decompression schedules for a constant 0.7 ata PO2 in N2 breathing gas (only the method of computing tissue nitrogen changes) some of these decompression profiles will be affected. The MK15(VVAL18)RTA is the currently approved method for doing repetitive and multi-level dives using a constant 0.7 ata PO2 in N2 breathing gas and is the benchmark for comparing decompression schedules computed by other methods. For single depth decompression dives, the largest differences in risk between VVAL18-1 and VVAL18 for the same depth/bottom time combination are decreases (Table 11). Where VVAL18-1 computes schedules with greater risks, these increases are small and always within the 95 % confidence limits for the VVAL18 risks (Figure 9). The only place that VVAL18-1 results in a significantly higher predicted risk of DCS than VVAL18 is the 45 fsw no-decompression time (Figure 6). As a result of lengthening the 35 and 40 fsw air no-decompression times, the 45 fsw constant 0.7 ata PO2 in N2 time was increased from 206 min to 270 minutes with a risk increase from 3.13 % to 4.92 %. The only no-decompression limit actually tested on the constant 0.7 ata PO2 breathing gas in this depth range was 366 min at 40 fsw, where there were no cases of DCS in 10 exposures. This does not give much information on whether or not the LE1 PDA overestimates risk in this area. However, the LE1 PDA considers only nitrogen in computing DCS risk and the equivalent air depth when breathing a 0.7 ata PO2 in N2 gas at 45 fsw is 36 fsw. If one accepts the current 35 fsw air no-decompression limit (risk 5.42 %) as being as safe as the 60 fsw limit (risk 2.37%) then it would appear that the LE1 PDA is overestimating risk by a factor of 2.3 in this depth range. This would give an estimate of the true risk as 45 fsw breathing a constant 0.7 ata PO2 gas as 2.15%, essentially no different than the risks 60 fsw and deeper.

For multi-level, repetitive, and gas switch dives there is essentially no difference in risks computed using VVAL18-1 compared to VVAL18 (Figure 9).

Overall, VVAL18-1 should result DCS risks that are not significantly greater than the VVAL18 risks for the vast majority of dives using a 0.7 ata PO2 breathing gas. Where risk are greater, the best estimate of their absolute value shows that they will be no riskier than diving the current no-

decompression limits. The advantage of VVAL18-1 are the longer air no-decompression limits and it's better behavior at transitioning the no-decompression times from 20 fsw to 30 fsw on air.

Requirement for Additional Man-Dives

The above discussion indicates that both VVAL18 and VVAL18-1 will computed decompression schedules for air dives which have risks of DCS that are not significantly greater than those using current USN'55 schedules. While some no-decompression limits at depth of 50 fsw and deeper are of a slightly higher risk, they have been subject to man testing and appear to be of no greater risk than the other no-decompression limits. Except for a longer no-decompression time a 45 fsw, VVAL18 and VVAL18-1 compute decompression schedules with similar levels of risk over a wide range of dives. Based on these considerations, it would seem reasonable to recommend that either VVAL18 or VVAL18-1 could be used to compute decompression profiles in real time breathing a 0.7 ata constant PO2 in N2 gas, or, or where switches are made between the two.

The above recommendation is based the assumption that the LE1 PDA computes accurate risk values. The question is, however, are there any areas where more man-diving experience is required to substantiate that assumption? In examining the data presented in this report, the areas where one might want more data are the 35 and 40 fsw air no-decompression limits and the 45 fsw constant PO2 in N2 no-decompression limit.

The results of manned diving would be used in one of two ways, One would be to combined new manned dive results with that already in hand to compute an updated set of LE1 PDA parameters values which might give better risk estimates in areas where current parameter values are thought to over estimate risk, e.g. shallow no-decompression limits. The other is to target certain dives and conduct sufficient numbers of dives to verify risk predictions for those particular profiles.

It was noted earlier that when the 700 or so manned dives from the prospective study done to validate the LE1 PDA were added to the then existing data base, the parameter values and risk predictions of the LE1 PDA changed very little. An experiment was carried out a NMRI where addition numbers of DCS free 20 fsw air saturation dives were added to the data base to see how many would be required to lower the predicted PDCS from 7.44% to somewhere in the 3-4% range. Over a hundred additional exposures would be required, and if even one DCS resulted then the required number goes up considerably. In short, unless large numbers of exposures are done then new parameter values do not result in much of a change in predicted risk.

If the three no-decompression limits noted above were targeted, then dives would be conducted simply to verify risk predictions, or to establish that current predictions are an overestimate. This was done for the 20 fsw air saturation dives. The 1992 series conducted a NMRI added 30 additional DCS free dives to the existing data base, but the best estimate of risk was only that it was less than 5.68%. In the past, 62 DCS free dives would have been sufficient to declare a profile safe, and certainly there are more exposures here than on some of the deeper no-decompression limits. Over a hundred DCS free dives would be required to establish a risk of 2.3% or less. The point is, given the current experience at this depth, additional dives would be unlikely to show that this no-decompression limit "unsafe". Since the 35 and 40 fsw no-decompression limits are currently part of the current air decompression table, additional dives at these depths would only be necessary if it were felt that there was not enough fleet experience to declare them "safe". There is no basis of comparison for the longer 45 fsw no-decompression limit on a constant PO2 breathing gas. However, if one accepts the concept of equivalent air depth, the risk of DCS here should be no greater than for the current air no-decompression limit at 35 fsw.

If additional manned diving is done on specific targeted profiles, then a minimum of 50 exposures on each would be required.

Bounding Decompression Risk

As noted above, even if the risk of DCS for a single dive is computed to approximately the same level each time, there are situations where high risk areas can occur for certain types of dives. Here we will examine whether or not decompression algorithms will tend to approach maximum risk levels asymptotically or if

there is some simple way to indicate when high risk areas are being encountered. Specifically, we will look at the relationship between the TDT and PDCS.

As noted earlier, the LE1 PDA was designed to compute risk to a specified target risk level which was a function of the TDT. Figures 11 and 12 show how well it does this. The solid line is the NMRI target risk criteria established for the NMRI'93 decompression tables. The dashed line shows the maximum target risk allowed for real time decompression computations. In these plots the single depth dives are shown as crosses. Only the single dive depth/time combinations found in Appendix H were used to compute profiles. In these computations, the risk was allowed to slide from 2.3% to 5.0% but it was never allowed to exceed the latter value. Plotting the risks for the schedules from the NMRI'93 tables would not be appropriate since some were computed using target risks greater than 5.0%.

The open symbols represent the risk of DCS from the final decompression of repetitive and multi-level dives. These final decompression schedule risks bear the same relationship to the TDT as do the single dive risks. The vertical lines connect each last decompression risk to a dash which is at the level of the overall risk for these dives.

For single depth air dives, VVAL18 shows a slow increase in risk with increasing TDT for all types of dives but generally keeps the risk for a given TDT below the NMRI risk criteria (Figure 13). VVAL18-1 shows a little more scatter but has a similar behavior (Figure 14). The relationship of the last decompression risks to the TDT is similar to that for the single depth dives. This indicates, that computing a decompression schedule even at the end of a long complicated profile would generally result in no higher a risk at a specific TDT than for single depth dives. The behavior of both of these algorithms is that single dive and last decompression risks exceeding 6.0% all have TDTs greater than 160 min.

Figures 15 and 16 show similar plots for VVAL18 and VVAL18-1 constant PO2 in N2 dives. As seen in Figure 15, VVAL 18 exhibits a somewhat bizarre behavior for some single depth dives. The plot shows a 5 series of "strings" of crosses moving upward to the right. The left most string is the most obvious and represents all of the 50 fsw schedules. The second string represents the 60 fsw schedules, the third the 70 fsw schedules, the forth the 80 fsw schedules and the fifth the 90 fsw schedules. In these cases the single depth decompression schedules exceed 6.0% even at TDT's close to 90 min. In Figure 16, it can be seen that VVAL18-1 does not exhibit this type of behavior. The string of crosses beginning at around 3.5% on the Y axis represent the 50 fsw schedules and while the risk increases rapidly as the TDT approaches 30 min, it rapidly levels off at around 5.0%. For both VVAL18 and VVAL18-1 the last decompression risks exhibit behavior similar to the single depth dive risks for the majority of dives. In a few cases these last decompression risks are higher for a given TDT than some single bounce dives of a similar TDT. For a 0.7 ata PO2 in N2 breathing gas, the relationship between TDT and PDCS cannot be used in any practical way to indicate when the diver is entering a particularly high risk area.

The question now arises, is there any way to avoid high risk dives. If we set a limit of 6.5% or greater for high risk, what are the chances of exceeding that level? Profiles with risks exceeding 6.5% are emboldened in Table 1. For air dives or repetitive dive profiles *8-85/34, 35* and *36*, and 1-*93/C1a* and *D1a* exceed this level, and they do so for all 4 methods of computation. These are all 100 fsw and 150 fsw repetitive dives unlikely to be encountered during Special Warfare diving missions.

For repetitive dives breathing only a 0.7 ata PO2 in N2 gas at depth, Profiles *1-84/24, 24.2*, and *25.2* have risks which exceed 6.5%. These are 100 fsw and 150 fsw repetitive dives unlikely to be encountered in Special Warfare Diving Scenarios. Profile *1-84/21* also exceeds the 6.5% risk level, but the first part of the profile is a 40 fsw no-decompression dive where the risk may be overestimated as discussed above.

None of the multi-level air dive risks exceed 6.5%, but three multi-level dives breathing the constant PO2 gas throughout do. These are profiles *11-80/1, 3, 4*, and *B*. Two of these are deep 150-175 fsw repetitive dives. The other is a triple 125 fsw/30 min repetitive dive. Again these profile are unlikely to be encountered during Special Warfare missions.

Some of the multi-level dives involving gas switches have risks exceeding 6.5% for at least one of the methods of computing decompression schedules. Profiles 1-93 C2 and A2 with decompressions computed by VVAL18-1 and profile 1-93 A2 exceed a risk of 6.5%. The dives were designed to simulate Special

Warfare scenarios with lockout and lock in depths of 60 of 90 fsw with long transits at 15 or 30 fsw. The lock in and lockout times, according to SDV team personnel, are longer than would be encountered during a typical mission, 30 min or so being more likely.

As noted earlier, the serious DCSII (w) symptoms did not occur until PDCS of greater than 6.5% was encountered. Thus, it appears unlikely that dive profiles with risk levels where there are significant number of serious DCS symptoms will be encountered during the vast majority of Special Warfare missions.

It was pointed out earlier that the overall risk of DCS for repetitive dives may be quite a bit higher than for the risk of the last decompressions (Figures 13-16). This cannot be avoided unless repetitive diving is not allowed. What is shown, is that the future risk of DCS, that is the probability of DCS occurring as a result of the next decompression, will rarely exceed 5% or so for single depth dives and 6.5% for multi-level dives. Once a diver has completed a dive and DCS has not occurred, it is reasonable to allow him to perform his next dive to the same level of risk. Being consistent in computing each decompression schedule so that the risk of DCS is about the same as the previous one is more important than what the overall risk is for these repetitive and multi-level dives.

CONCLUSIONS

- VVAL 18 will compute decompression schedules on air with PDCS values either not significantly higher and in most case lower than the current USN'55 procedures.
- VVAL18-1 will compute decompression schedules on air with PDCS values either not significantly higher and in most case lower than the current USN'55 procedures.
- VVAL18-1 computes decompression profiles breathing a 0.7 ata constant PO2 in N2 breathing gas or switching between this gas and air during dives with risks which are either not significantly different from VVAL18 schedules or have no higher a risk of DCS than diving the current air no-decompression limits.
- VVAL18-1 does a better job of limiting risk of DCS for single depth dives to values below 6.5% than VVAL 18.
- If one accepts the air no-decompression limits at 50, 40 and 35 fsw as "safe" the additional manned diving is not required.
- If manned diving is done, it should be targeted a specific dive profiles and at least 50 man-dives should be done on each profile.

RECOMMENDATIONS

Based on the analyses in this report:

1. The MK15(VVAL18)RTA be submitted for approval for diving on air and switching between air and a constant 0.7 ata PO2 in N2 gas while computing decompression schedules in real time.
2. The MK15(VVAL18-1)RTA be submitted for approval for diving on air while computing decompression schedules in real time.
3. The MK15(VVAL18-1)RTA be submitted for approval for diving on a constant 0.7 ata PO2 in N2 gas and switching between air and a constant 0.7 ata PO2 in N2 gas while computing decompression schedules in real time.
4. VVAL18-1 be the parameter set used in the final version of the diver carried UDMs now undergoing evaluation at NEDU.

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Tables

Table 1

TEST DIVES
Multi-level, Repet, and Gas Switch
Manned Validation Dives
Risk for Entire Profile

Facility	Report	Type	Pro #	Profile Description fsw/min, shallow/surface intervals in ()	VVAL18 (mlair18.est) (mlmix18.est) (mlp0718.est) (AirO218.est) PDCS %	VVAL18-1 (mlair181.est) (mlmix181.est) (mlp07181.est) (AirO2818.est) PDCS %	USN '55 and P07'80 Repet and CSMD (mlair55.est) (mlp0787.est) PDCS %	PLAN V4 (mlv4nmri.est) (mlv4nedu.est) (Air02v4.est) PDCS %
NEDU	8-85	(I)	27	80/ND (0/60) 80/ND	3.55	3.64	3.60	3.38
NEDU	8-85	(I)	28	80/ND (0/95) 80/ND	3.80	3.90	3.86	3.63
NEDU	8-85	(I)	29	80/ND (0/180) 80/ND	4.27	4.39	4.35	4.09
NEDU	8-85	(I)	30	100/ND (0/60) 100/ND	3.78	3.76	3.11	3.45
NEDU	8-85	(I)	31	100/ND (0/60) 100/ND (0/60) 100/ND	5.01	5.08	4.01	4.63
NEDU	8-85	(I)	32	120/ND (0/60) 120/ND	3.97	3.71	3.10	3.54
NEDU	8-85	(I)	33	150/ND (0/95) 150/ND	4.20	3.68	2.91	3.82
NEDU	8-85	(I)	34	100/60 (0/90)100/40	8.51	8.90	11.64	7.45
NEDU	8-85	(I)	35	100/60 (0/90)100/50	9.01	8.84	12.90	7.58
NEDU	8-85	(I)	36	150/40 (0/90) 150/30	10.16	8.83	13.73	8.18
NMRI	1-93	(I)	A1b	60/ND (0/140) 60/ND (0/140) 60/ND	5.70	6.06	5.74	5.37
NMRI	1-93	(I)	C1a	100/60 (0/90) 100/60	9.35	8.56	14.09	7.82
NMRI	1-93	(I)	D1a	150/40 (0/90) 150/30	10.16	8.83	13.73	8.40
NMRI	1-93	(I)	D1b	100/ND (0/200) 100/ND (0/140) 100/ND	6.35	6.33	5.00	5.77
NMRI	1-93	(I)	G1a	60/60 (0/140) 60/30 (0/140) 60/ND	5.61	5.79	5.55	5.28
NMRI	1-93	(I)	H1a	100/25 (0/200) 100/15 (0/140) 100/ND	5.93	6.02	5.43	5.62
NMRI	1-93	(III)	A3	50/45 (15/360) 50/45	3.79	3.79	3.25	3.18
NMRI	1-93	(III)	B1b	80/60 (30/120) 80/60	6.04	6.02	9.78	5.33
NMRI	1-93	(III)	Ca1b	60/60 (30/120) 60/60	4.89	5.65	6.59	5.17
NMRI	1-93	(III)	Cb1b	60/60 (30/180) 60/60	5.34	5.84	7.60	5.17
NMRI	1-93	(III)	Cc1b	60/60 (15/180) 60/60	5.02	5.44	5.06	4.93
NMRI	1-93	(III)	E1b	80/60 (30/120) 80/60	6.04	6.02	9.78	5.26
NEDU	8-85	(IV)	37	80/60 (20/180) 80/50	5.44	5.58		5.25
NEDU	8-85	(IV)	38	80/50 (20/120) 100/20 (20/60) 60/40	5.57	6.04		4.45
NMRI	1-93	(IV)	B2	80/60 (30/120) 80/60	4.99	5.47		5.12
NMRI	1-93	(IV)	C2	80/60 (15/220) 80/60	6.18	6.85		5.29
NMRI	1-93	(IV)	D2	60/90 (15/345) 60/90	6.79	6.30		5.20
NMRI	1-93	(IV)	E2	80/60 (30/235) 80/60	6.39	5.53		5.15
NMRI	1-93	(V)	A2	80/60 (30/115) 80/60	5.74	6.57		5.16
NMRI	1-93	(V)	B3	80/30 (15/175) 60/60 (15/175) 80/30	3.12	3.12		2.80
NMRI	1-93	(V)	C3	60/45 (15/180) 60/60 (15/170) 60/45	3.14	3.14		2.69
NMRI	1-93	(V)	D3	80/30 (15/240) 60/60 (15/235) 80/45	4.07	4.12		3.78
NMRI	1-93	(V)	E3	60/45 (15/235) 60/60 (15/235) 60/45	2.65	2.65		2.37
NEDU	1-84	(VII)	20	60/ND (0/80) 60/ND (0/80) 60/ND	4.57	4.97	2.97	4.43
NEDU	1-84	(VII)	21	40/ND (0/80) 100/ND	6.39	6.99	4.48	3.41
NEDU	1-84	(VII)	22	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	6.24	6.28	3.12	6.06
NEDU	1-84	(VII)	23	80/ND (0/80) 80/ND (0/80) 80/ND (0/60) 80/ND	5.52	5.75	2.82	5.60
NEDU	1-84	(VII)	24	150/27 (0/80) 150/24 (0/60) 100/ND	7.74	8.30	3.83	6.61
NEDU	1-84	(VII)	24.2	150/30 (0/80) 150/30	7.02	7.24	4.99	6.69
NEDU	1-84	(VII)	25.2	100/60 (0/80) 100/50	6.61	7.28	2.47	6.86
NEDU	1-84	(VII)	27	120/ND (0/80) 120/ND (0/80) 120/ND (0/60) 120/ND	6.45	6.41	3.05	6.15
NEDU	1-84	(VII)	30	50/ND (0/80) 80/ND	4.09	5.14	3.39	3.57
NEDU	11-80	(VIII)	1	175/30 (10/60) 175/30	7.22	6.44		6.13
NEDU	11-80	(VIII)	3	150/30 (30/120) 150/30	6.18	5.96		5.73
NEDU	11-80	(VIII)	4	125/30 (10/30) 125/30 (10/30) 125/30	7.48	7.43		6.00
NEDU	11-80	(VIII)	5	75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30	5.36	5.96		5.52
NEDU	11-80	(VIII)	B	150/30 (10/90) 150/30	6.16	6.56		5.96
NEDU	8-85	(IX)	24	60/120	2.68	3.37		4.53
NEDU	8-85	(IX)	25	100/90	4.20	4.77		4.85
NEDU	8-85	(IX)	26	150/40	3.13	3.40		2.97

Dive Type	
I	Repetitive Air
II	Single Air
III	Multi-level Air
IV	Multi level, O2 during decompression
V	O2 breathing during shallow interval
VI	Single 0.7 ata constant PO2
VII	Repet 0.7 ata constant PO2
VIII	Multi-level 0.7 ata constant PO2
IX	Single Air, O2 during decompression

Table 2

No-Decompression Times (min)
Air

					Tested &	
Depth (fsw)	USN '55	VVAL18	VVAL18-1	NMRI '93	Time(min)	Dives/DCS
20			32767	513	72-96 hrs	62/0 *
22		32767	889		>72 hrs	18/2 @
24		2277	663		>72 hrs	18/1 #
25		1103	595	338	48 hrs	19/0 #
30		372	405	245		
35	310	232	310	185		
40	200	163	200	144		
45		125	135	114		
50	100	92	100	93		
55		74	81	77		
60	60	63	66	64	66	29/0
65		55	57			
70	50	49	50	48		
75		44	44			
80	40	40	40	38		
85		36	35			
90	30	34	32	32		
95		31	29			
100	25	29	26	27	30	20/0
105		27	24			
110	20	26	21	24		
115		24	19			
120	15	23	18	21	24	19/0
125		21	17			
130	10	19	15	18		
135		18	14			
140	5	17	14	16		
145		15	13			
150	5	14	12	14	14	20/0
155		13	12			
160	5	12	11	13		
165		11	11			
170	5	11	10	12		
175		10	10			
180	5	10	9	11		
185		9	9			
190	5	9	9	11	10	19/0
195		8	8			
200		8	8			

see Appendix G for risks
& - Dives from NEDU Report 8-85 (8) unless otherwise noted.
* - 32 dives in NMRI Published Data Base (23), other 30 dives conducted at NMRI in 1992.
@ -Dives conducted at NMRI in 1992.
# - Dive in NMRI Published Data Base

Table 3

VVAL 18 Parameters

TABLE OF MAXIMUM PERMISSIBLE TISSUE TENSIONS

{VVAL18.DAT (NITROGEN)}

TISSUE HALF-TIMES

DEPTH	5 MIN 1.00 SDR	10 MIN 1.00 SDR	20 MIN 1.00 SDR	40 MIN 1.00 SDR	80 MIN 1.00 SDR	120 MIN 1.00 SDR	160 MIN 1.00 SDR	200 MIN 1.00 SDR	240 MIN 1.00 SDR
10 FSW	120.000	98.000	78.000	56.000	48.500	45.500	44.500	44.000	43.500
20 FSW	130.000	108.000	88.000	66.000	58.500	55.500	54.500	54.000	53.500
30 FSW	140.000	118.000	98.000	76.000	68.500	65.500	64.500	64.000	63.500
40 FSW	150.000	128.000	108.000	86.000	78.500	75.500	74.500	74.000	73.500
50 FSW	160.000	138.000	118.000	96.000	88.500	85.500	84.500	84.000	83.500
60 FSW	170.000	148.000	128.000	106.000	98.500	95.500	94.500	94.000	93.500
70 FSW	180.000	158.000	138.000	116.000	108.500	105.500	104.500	104.000	103.500
80 FSW	190.000	168.000	148.000	126.000	118.500	115.500	114.500	114.000	113.500
90 FSW	200.000	178.000	158.000	136.000	128.500	125.500	124.500	124.000	123.500

BLOOD PARAMETERS
(PRESSURE IN FSW; 33 FSW ATA)

PACO2	PH2O	PVCO2	PVO2	AMBAO2	PBOVP
1.50	.00	2.30	2.00	.00	.000

Table 4

VVAL 18-1 Parameters

TABLE OF MAXIMUM PERMISSIBLE TISSUE TENSIONS

{VVAL18-1.DAT(NITROGEN)}

TISSUE HALF-TIMES

DEPTH	5 MIN 1.00 SDR	10 MIN 1.00 SDR	20 MIN 1.00 SDR	35 MIN 1.00 SDR	45 MIN 1.00 SDR	80 MIN 1.00 SDR	120 MIN 1.00 SDR	255 MIN 1.00 SDR
10 FSW	120.000	90.000	71.500	59.200	55.600	50.550	47.600	40.400
20 FSW	130.000	100.000	81.500	69.200	65.600	60.550	57.600	50.400
30 FSW	140.000	110.000	91.500	79.200	75.600	70.550	67.600	60.400
40 FSW	150.000	120.000	101.500	89.200	85.600	80.550	77.600	70.400
50 FSW	160.000	130.000	111.500	99.200	95.600	90.550	87.600	80.400
60 FSW	170.000	140.000	121.500	109.200	105.600	100.550	97.600	90.400
70 FSW	180.000	150.000	131.500	119.200	115.600	110.550	107.600	100.400
80 FSW	190.000	160.000	141.500	129.200	125.600	120.550	117.600	110.400
90 FSW	200.000	170.000	151.500	139.200	135.600	130.550	127.600	120.400

BLOOD PARAMETERS
(PRESSURE IN FSW; 33 FSW ATA)

PACO2	PH2O	PVCO2	PVO2	AMBAO2	PBOVP
1.50	.00	2.30	2.00	.00	.000

Table 5

Total Stop Times Compared to USN '55 Schedules (min)
Air
(delta: + longer, - shorter)

		(AIR55USN)	(AIR18USN)	(AIR181US)	(AIR93USN)
Depth	Time	USN '55	VVAL18	VVAL18-1	Air '93
(fsw)	(min)	TST(min)	delta(min)	delta(min)	delta(min)
40	210	2	45	7	38
40	230	7	57	17	43
40	250	11	78	26	44
40	270	15	97	38	50
40	300	19	122	86	101
40	360	23	164	207	162
40	480	41	245	384	174
40	720	69	413	579	301
50	100	0	9	0	5
50	110	3	17	9	22
50	120	5	24	18	25
50	140	10	60	30	30
50	160	21	84	46	29
50	180	29	105	67	31
50	200	35	135	85	80
50	220	40	167	109	125
50	240	47	191	136	138
60	60	0	0	0	0
60	70	2	14	4	3
60	80	7	30	18	13
60	100	14	55	50	21
60	120	26	97	66	24
60	140	39	130	94	51
60	160	48	159	122	117
60	180	56	197	146	139
60	200	70	226	184	125
60	240	81	289	325	129
60	360	139	449	613	251
60	480	192	609	777	423
60	720	265	781	938	655
70	50	0	4	0	5
70	60	8	30	21	2
70	70	14	53	41	11
70	80	18	73	65	17
70	90	23	84	82	22
70	100	33	107	89	22
70	110	43	129	93	62
70	120	51	151	114	109
70	130	58	171	134	122
70	140	64	188	153	131
70	150	70	209	169	125
70	160	85	224	175	110
70	170	98	239	206	97
80	40	0	0	0	5
80	50	10	36	29	5
80	60	17	68	56	13
80	70	23	89	81	17
80	80	33	99	97	22
80	90	46	123	106	69
80	100	57	151	116	118
80	110	66	177	141	129
80	120	73	201	165	122
80	130	82	221	185	113
80	140	95	240	224	115
80	150	109	260	274	101
80	180	120	341	413	120
80	240	178	465	628	232
80	360	279	718	877	501
80	480	353	862	1023	-354
80	720	454	1017	1178	-455

		(AIR55USN)	(AIR18USN)	(AIR181US)	(AIR93USN)
Depth	Time	USN '55	VVAL18	VVAL18-1	Air '93
(fsw)	(min)	TST(min)	delta(min)	delta(min)	delta(min)
90	30	0	0	0	
90	40	7	28	25	
90	50	18	69	59	7
90	60	25	97	87	10
90	70	37	112	108	23
90	80	53	131	120	97
90	90	66	161	126	119
90	100	75	194	158	110
90	110	85	221	186	115
90	120	100	242	245	100
90	130	115	270	304	105
100	25	0	0	0	0
100	30	3	-1	12	2
100	40	15	56	49	5
100	50	26	94	83	9
100	60	37	120	111	18
100	70	56	126	126	114
100	80	71	163	137	114
100	90	83	200	165	102
100	100	96	242	235	109
100	110	116	270	306	119
100	120	131	301	371	104
100	180	201	535	702	254
100	240	282	722	869	-284
100	360	415	928	1077	-417
100	480	502	1058	1211	
100	720	612	1193	1360	
110	20	0	0	0	
110	25	3	-3	8	
110	30	7	24	31	3
110	40	23	80	69	7
110	50	34	117	103	11
110	60	54	131	127	101
110	70	72	156	143	108
110	80	87	206	172	93
110	90	106	254	265	109
110	100	124	290	348	91
120	15	0	0	0	0
120	20	2	-2	5	-2
120	25	6	7	25	-1
120	30	14	46	43	6
120	40	30	100	87	5
120	50	46	132	120	59
120	60	69	144	141	106
120	70	87	200	166	103
120	80	105	258	279	100
120	90	130	310	374	105
120	100	148	365	459	252
120	120	174	472	623	226
120	180	282	760	907	-284
120	240	394	915	1061	-396
120	360	549	1092	1241	
120	480	652	1193	1351	
120	720	771	1315	1486	
130	10	0	0	0	
130	15	1	-1	-1	
130	20	4	-3	16	1
130	25	10	28	38	5
130	30	21	66	56	-1
130	40	35	120	105	5

Table 5 (con't)

Depth (fsw)	Time (min)	(AIR55USN) USN '55 TST(min)	(AIR18USN) VVAL18 delta(min)	(AIR181US) VVAL18-1 delta(min)	(AIR93USN) Air '93 delta(min)
130	50	61	142	131	94
130	60	84	174	153	101
130	70	101	252	272	104
130	80	129	317	379	116
130	90	152	378	475	163
140	10	0	0	0	0
140	15	2	-2	4	-2
140	20	6	8	24	-1
140	25	16	45	48	-1
140	30	26	85	70	-1
140	40	44	134	116	46
140	50	74	151	142	101
140	60	95	230	231	100
140	70	123	303	362	107
140	80	153	379	473	227
140	90	164	454	596	216
140	120	238	652	821	317
140	180	384	921	1070	-386
140	240	509	1061	1208	-511
140	360	682	1212	1362	
140	480	799	1294	1455	
140	720	922	1401	1578	
150	5	0	0	0	
150	10	1	-1	-1	
150	15	3	-1	13	2
150	20	9	17	34	-4
150	25	21	61	56	-1
150	30	32	99	83	-2
150	40	57	142	122	93
150	50	86	181	156	99
150	60	110	274	323	135
150	70	144	366	451	306
150	80	171	438	576	279
160	5	0	0	0	0
160	10	1	-1	-1	-1
160	15	5	3	21	0
160	20	14	28	41	1
160	25	27	75	63	-7
160	30	38	111	94	-3
160	40	69	148	131	86
160	50	96	232	239	99
160	60	130	331	403	125
160	70	164	417	541	346
170	5	0	0	0	0
170	10	2	-2	-2	-2
170	15	7	11	27	-2
170	20	19	39	49	-4
170	25	32	87	73	-7
170	30	43	123	105	7
170	40	79	158	151	86
170	50	107	278	323	88
170	60	150	383	479	160
170	70	181	480	634	394
170	90	244	677	848	331
170	120	354	884	1041	466
170	180	533	1105	1253	-536
170	240	679	1216	1367	-682
170	360	871	1343	1501	
170	480	1005	1402	1572	
180	5	0	0	0	

Depth (fsw)	Time (min)	(AIR55USN) USN '55 TST(min)	(AIR18USN) VVAL18 delta(min)	(AIR181US) VVAL18-1 delta(min)	(AIR93USN) Air '93 delta(min)
180	10	3	-3	-2	
180	15	9	18	32	-4
180	20	23	51	55	-8
180	25	37	99	82	-7
180	30	50	132	118	45
180	40	90	202	182	85
180	50	125	321	396	115
180	60	165	430	562	195
190	5	0	0	0	0
190	10	4	1	4	-4
190	15	11	24	37	-6
190	20	28	61	61	-8
190	25	41	112	95	-1
190	30	60	138	129	85
190	40	100	243	257	80
190	50	144	368	464	271
190	60	180	490	647	235
200	5	1	-1	-1	19
200	10	5	5	11	15
200	15	15	26	39	5
200	20	37	69	61	-17
200	25	46	121	112	9
200	30	70	151	140	80
200	40	109	282	329	81
200	50	158	414	532	312
200	60	196	546	726	274
200	90	321	895	1055	469
200	120	470	1054	1202	-473
200	180	682	1235	1387	-685
200	240	839	1329	1486	
200	360	1058	1428	1595	

Table 6

Risk of DCS [P(DCS)] Compared to USN '55 Schedules
Air
(sorted by profile depth/time)
(delta: + more risk, - less risk)

		(AIR55USN)	(AIR18USN)	(AIR181US)	(AIR93USN)
Depth	Time	USN '55	VVAL18	VVAL18-1	Air'93
(fsw)	(min)	P(DCS) (%)	delta P(DCS)%	delta P(DCS)%	delta P(DCS)%
40	210	4.17	-0.62	-0.16	-0.60
40	230	4.68	-0.75	-0.24	-0.64
40	250	5.26	-1.09	-0.39	-0.70
40	270	5.83	-1.43	-0.61	-0.85
40	300	6.69	-1.95	-1.44	-1.72
40	360	8.40	-2.99	-3.46	-3.02
40	480	11.30	-4.42	-5.83	-3.51
40	720	15.53	-6.70	-8.65	-5.53
50	100	2.53	-0.27	0.01	-0.26
50	110	2.75	-0.21	-0.14	-0.42
50	120	3.11	-0.26	-0.20	-0.42
50	140	3.93	-0.66	-0.35	-0.49
50	160	4.71	-1.02	-0.59	-0.49
50	180	5.51	-1.40	-0.94	-0.55
50	200	6.32	-1.94	-1.31	-1.35
50	220	7.12	-2.55	-1.80	-2.15
50	240	7.84	-3.16	-2.35	-2.51
60	60	2.13	0.01	0.01	0.00
60	70	2.37	-0.23	-0.13	-0.19
60	80	2.69	-0.27	-0.17	-0.38
60	100	3.77	-0.57	-0.52	-0.43
60	120	4.89	-1.13	-0.80	-0.48
60	140	5.97	-1.83	-1.41	-0.91
60	160	7.06	-2.45	-1.98	-1.98
60	180	8.10	-3.20	-2.56	-2.53
60	200	8.91	-3.75	-3.28	-2.48
60	240	10.94	-5.05	-5.46	-2.89
60	360	15.75	-8.03	-9.52	-5.41
60	480	19.21	-10.64	-12.45	-8.49
60	720	24.14	-13.97	-15.91	-12.73
70	50	2.37	-0.22	0.02	-0.35
70	60	2.60	-0.28	-0.20	-0.25
70	70	3.21	-0.49	-0.39	-0.42
70	80	3.95	-0.74	-0.66	-0.45
70	90	4.72	-1.10	-1.06	-0.48
70	100	5.45	-1.45	-1.25	-0.49
70	110	6.08	-1.75	-1.33	-1.03
70	120	6.74	-2.11	-1.66	-1.71
70	130	7.43	-2.52	-2.05	-2.01
70	140	8.11	-2.92	-2.46	-2.29
70	150	8.76	-3.37	-2.85	-2.34
70	160	9.20	-3.75	-3.07	-2.19
70	170	9.63	-4.07	-3.66	-2.04
80	40	2.37	0.02	0.02	-0.36
80	50	2.72	-0.33	-0.27	-0.37
80	60	3.50	-0.64	-0.53	-0.46
80	70	4.45	-1.13	-1.04	-0.52
80	80	5.33	-1.29	-1.26	-0.50
80	90	6.17	-1.62	-1.42	-1.10
80	100	7.09	-2.21	-1.70	-1.88
80	110	7.99	-2.79	-2.31	-2.20
80	120	8.87	-3.35	-2.84	-2.28
80	130	9.67	-3.85	-3.35	-2.30
80	140	10.33	-4.31	-4.14	-2.16
80	150	10.90	-4.69	-4.95	-2.26
80	180	13.41	-6.32	-7.19	-2.98
80	240	16.66	-8.22	-10.06	-5.72
80	360	21.44	-12.06	-14.07	-10.06
80	480	25.07	-14.82	-16.93	na
80	720	29.89	-18.32	-20.39	na

		(AIR55USN)	(AIR18USN)	(AIR181US)	(AIR93USN)
Depth	Time	USN '55	VVAL18	VVAL18-1	Air '93
(fsw)	(min)	P(DCS) (%)	delta P(DCS)%	delta P(DCS)%	delta P(DCS)%
90	30	2.11	0.02	0.02	0.00
90	40	2.64	-0.28	-0.25	-0.33
90	50	3.48	-0.64	-0.72	-0.49
90	60	4.63	-1.25	-1.15	-0.54
90	70	5.66	-1.42	-1.38	-0.51
90	80	6.79	-1.92	-1.79	-1.57
90	90	7.93	-2.54	-2.06	-2.09
90	100	9.07	-3.27	-2.75	-2.15
90	110	10.12	-3.96	-3.43	-2.42
90	120	10.97	-4.57	-4.59	-2.29
90	130	11.65	-5.06	-5.55	-2.41
100	25	2.05	0.03	0.03	0.00
100	30	2.34	0.06	-0.20	-0.21
100	40	3.17	-0.52	-0.65	-0.50
100	50	4.32	-1.12	-1.02	-0.50
100	60	5.68	-1.51	-1.53	-0.48
100	70	7.07	-1.91	-1.92	-1.88
100	80	8.46	-2.66	-2.30	-2.12
100	90	9.74	-3.52	-2.98	-2.06
100	100	10.95	-4.50	-4.40	-1.77
100	110	11.91	-5.17	-5.70	-2.73
100	120	12.91	-5.77	-6.63	-2.50
100	180	18.38	-9.69	-11.41	-6.85
100	240	21.45	-12.00	-13.94	na
100	360	25.93	-15.20	-17.33	na
100	480	29.55	-17.88	-20.14	na
100	720	34.90	-21.65	-24.05	na
110	20	1.88	0.03	0.03	0.00
110	25	2.21	0.23	-0.17	-0.22
110	30	2.67	-0.23	-0.30	-0.35
110	40	3.75	-0.91	-0.88	-0.53
110	50	5.28	-1.42	-1.42	-0.43
110	60	6.94	-1.96	-1.91	-1.72
110	70	8.59	-2.56	-2.47	-2.04
110	80	10.13	-3.68	-3.15	-1.94
110	90	11.53	-4.86	-5.02	-2.49
110	100	12.79	-5.70	-6.46	-2.28
120	15	1.60	0.04	0.04	0.00
120	20	2.01	0.18	-0.19	0.14
120	25	2.48	-0.09	-0.30	-0.15
120	30	3.08	-0.45	-0.69	-0.59
120	40	4.44	-1.15	-1.20	-0.45
120	50	6.37	-1.89	-1.78	-1.12
120	60	8.25	-2.30	-2.36	-1.94
120	70	10.12	-3.57	-3.04	-2.14
120	80	11.90	-5.02	-5.41	-2.36
120	90	13.31	-6.18	-6.96	-2.67
120	100	14.79	-7.17	-8.17	-5.81
120	120	17.73	-9.24	-10.74	-6.10
120	180	22.78	-13.28	-15.16	na
120	240	25.46	-15.12	-17.18	na
120	360	29.37	-17.48	-19.76	na
120	480	33.20	-20.11	-22.56	na
120	720	38.80	-24.01	-26.65	na
130	10	1.29	0.04	0.04	0.00
130	15	1.72	0.12	0.12	0.08
130	20	2.19	0.18	-0.20	-0.18
130	25	2.82	-0.27	-0.63	-0.47
130	30	3.38	-0.72	-0.87	-0.38
130	40	5.31	-1.61	-1.48	-0.41

Table 6 (con't)

		(AIR55USN)	(AIR18USN)	(AIR181US)	(AIR93USN)
Depth	Time	USN '55	VVAL18	VVAL18-1	Air'93
(fsw)	(min)	P(DCS) (%)	delta P(DCS)%	delta P(DCS)%	delta P(DCS)%
130	50	7.40	-2.10	-2.06	-1.64
130	60	9.61	-3.04	-2.80	-2.04
130	70	11.81	-4.89	-5.27	-2.43
130	80	13.46	-6.31	-7.06	-2.89
130	90	15.12	-7.39	-8.41	-4.15
140	10	1.41	0.04	0.04	0.00
140	15	1.85	0.19	-0.17	0.15
140	20	2.43	-0.09	-0.47	-0.15
140	25	3.08	-0.59	-0.87	-0.36
140	30	3.86	-0.96	-1.06	-0.38
140	40	6.15	-1.84	-1.74	-0.92
140	50	8.58	-2.50	-2.44	-1.87
140	60	11.15	-4.38	-4.42	-2.27
140	70	13.24	-6.08	-6.91	-2.68
140	80	15.09	-7.46	-8.42	-5.42
140	90	17.38	-9.05	-10.38	-5.79
140	120	21.75	-12.64	-14.41	-9.22
140	180	26.16	-15.90	-17.88	na
140	240	28.27	-17.05	-19.22	na
140	360	32.53	-19.52	-21.89	na
140	480	36.51	-22.17	-24.76	na
140	720	42.06	-25.69	-28.55	na
150	5	1.03	0.05	0.05	0.00
150	10	1.46	0.12	0.12	0.07
150	15	2.00	0.06	-0.22	-0.23
150	20	2.60	-0.21	-0.53	-0.03
150	25	3.38	-0.76	-0.96	-0.38
150	30	4.43	-1.29	-1.33	-0.38
150	40	7.00	-2.11	-1.93	-1.58
150	50	9.85	-3.27	-2.88	-2.07
150	60	12.56	-5.47	-6.27	-3.00
150	70	14.76	-7.30	-8.20	-6.55
150	80	16.98	-8.68	-10.03	-6.92
160	5	1.09	0.04	0.04	0.00
160	10	1.58	0.12	0.12	0.07
160	15	2.08	-0.02	-0.32	-0.11
160	20	2.83	-0.41	-0.81	-0.32
160	25	3.75	-1.03	-1.10	-0.24
160	30	4.99	-1.54	-1.43	-0.28
160	40	7.98	-2.41	-2.19	-1.60
160	50	11.15	-4.37	-4.56	-2.17
160	60	13.90	-6.73	-7.58	-3.20
160	70	16.34	-8.27	-9.51	-7.71
170	5	1.14	0.05	0.05	0.00
170	10	1.62	0.21	0.21	0.16
170	15	2.20	-0.16	-0.42	-0.01
170	20	3.08	-0.71	-0.96	-0.26
170	25	4.14	-1.23	-1.16	-0.23
170	30	5.64	-1.73	-1.54	-0.37
170	40	9.00	-2.73	-2.66	-1.73
170	50	12.46	-5.55	-6.27	-2.18
170	60	15.19	-7.64	-8.60	-4.10
170	70	18.04	-9.56	-11.02	-8.91
170	90	22.70	-13.52	-15.32	-9.86
170	120	26.40	-16.24	-18.30	-13.12
170	180	29.75	-18.29	-20.50	na
170	240	31.50	-18.92	-21.27	na
170	360	37.01	-22.46	-25.00	na
170	480	40.91	-24.74	-27.64	na
180	5	1.19	0.05	0.05	0.00

		(AIR55USN)	(AIR18USN)	(AIR181US)	(AIR93USN)
Depth	Time	USN '55	VVAL18	VVAL18-1	Air'93
(fsw)	(min)	P(DCS) (%)	delta P(DCS)%	delta P(DCS)%	delta P(DCS)%
180	10	1.68	0.28	0.15	0.22
180	15	2.35	-0.27	-0.53	0.03
180	20	3.32	-0.84	-1.01	-0.17
180	25	4.62	-1.38	-1.21	-0.21
180	30	6.35	-1.98	-1.71	-0.92
180	40	10.00	-3.63	-3.29	-1.80
180	50	13.59	-6.54	-7.39	-2.90
180	60	16.69	-8.55	-9.88	-5.17
190	5	1.24	0.05	0.05	0.00
190	10	1.72	0.00	-0.06	0.31
190	15	2.53	-0.46	-0.68	0.07
190	20	3.58	-1.00	-1.00	-0.19
190	25	5.15	-1.56	-1.27	-0.27
190	30	7.04	-2.13	-1.84	-1.47
190	40	11.07	-4.57	-4.71	-1.82
190	50	14.71	-7.35	-8.31	-6.06
190	60	18.26	-9.81	-11.29	-6.40
200	5	1.22	0.12	0.12	-0.45
200	10	1.81	-0.04	-0.09	-0.35
200	15	2.67	-0.53	-0.74	-0.32
200	20	3.85	-1.05	-0.92	-0.03
200	25	5.73	-1.69	-1.38	-0.41
200	30	7.77	-2.34	-1.96	-1.46
200	40	12.16	-5.50	-6.05	-1.97
200	50	15.97	-8.20	-9.34	-7.00
200	60	19.77	-11.05	-12.70	-7.66
200	90	27.30	-17.22	-19.26	-13.88
200	120	29.95	-18.90	-21.01	na
200	180	31.95	-19.33	-21.71	na
200	240	35.02	-21.08	-23.61	na
200	360	40.87	-24.73	-27.59	na

Table 7

Risk of DCS [P(DCS)] Compared to USN '55 Schedules
Air
(sorted by USN '55 Risk)
(delta: + more risk, - less risk)

		(AIR55USN)	(AIR18USN)	(AIR181US)	(AIR93USN)
Depth	Time	USN '55	VVAL18	VVAL18-1	Air'93
(fsw)	(min)	P(DCS) (%)	delta P(DCS)%	delta P(DCS)%	delta P(DCS)%
140	720	42.06	-25.69	-28.55	na
170	480	40.91	-24.74	-27.64	na
200	360	40.87	-24.73	-27.59	na
120	720	38.80	-24.01	-26.65	na
170	360	37.01	-22.46	-25.00	na
140	480	36.51	-22.17	-24.76	na
200	240	35.02	-21.08	-23.61	na
100	720	34.90	-21.65	-24.05	na
120	480	33.20	-20.11	-22.56	na
140	360	32.53	-19.52	-21.89	na
200	180	31.95	-19.33	-21.71	na
170	240	31.50	-18.92	-21.27	na
200	120	29.95	-18.90	-21.01	na
80	720	29.89	-18.32	-20.39	na
170	180	29.75	-18.29	-20.50	na
100	480	29.55	-17.88	-20.14	na
120	360	29.37	-17.48	-19.76	na
140	240	28.27	-17.05	-19.22	na
200	90	27.30	-17.22	-19.26	-13.88
170	120	26.40	-16.24	-18.30	-13.12
140	180	26.16	-15.90	-17.88	na
100	360	25.93	-15.20	-17.33	na
120	240	25.46	-15.12	-17.18	na
80	480	25.07	-14.82	-16.93	na
60	720	24.14	-13.97	-15.91	-12.73
120	180	22.78	-13.28	-15.16	na
170	90	22.70	-13.52	-15.32	-9.86
140	120	21.75	-12.64	-14.41	-9.22
100	240	21.45	-12.00	-13.94	na
80	360	21.44	-12.06	-14.07	-10.06
200	60	19.77	-11.05	-12.70	-7.66
60	480	19.21	-10.64	-12.45	-8.49
100	180	18.38	-9.69	-11.41	-6.85
190	60	18.26	-9.81	-11.29	-6.40
170	70	18.04	-9.56	-11.02	-8.91
120	120	17.73	-9.24	-10.74	-6.10
140	90	17.38	-9.05	-10.38	-5.79
150	80	16.98	-8.68	-10.03	-6.92
180	60	16.69	-8.55	-9.88	-5.17
80	240	16.66	-8.22	-10.06	-5.72
160	70	16.34	-8.27	-9.51	-7.71
200	50	15.97	-8.20	-9.34	-7.00
60	360	15.75	-8.03	-9.52	-5.41
40	720	15.53	-6.70	-8.65	-5.53
170	60	15.19	-7.64	-8.60	-4.10
130	90	15.12	-7.39	-8.41	-4.15
140	80	15.09	-7.46	-8.42	-5.42
120	100	14.79	-7.17	-8.17	-5.81
150	70	14.76	-7.30	-8.20	-6.55
190	50	14.71	-7.35	-8.31	-6.06
160	60	13.90	-6.73	-7.58	-3.20
180	50	13.59	-6.54	-7.39	-2.90
130	80	13.46	-6.31	-7.06	-2.89
80	180	13.41	-6.32	-7.19	-2.98
120	90	13.31	-6.18	-6.96	-2.67
140	70	13.24	-6.08	-6.91	-2.68
100	120	12.91	-5.77	-6.63	-2.50
110	100	12.79	-5.70	-6.46	-2.28
150	60	12.56	-5.47	-6.27	-3.00
170	50	12.46	-5.55	-6.27	-2.18

		(AIR55USN)	(AIR18USN)	(AIR181US)	(AIR93USN)
Depth	Time	USN '55	VVAL18	VVAL18-1	Air'93
(fsw)	(min)	P(DCS) (%)	delta P(DCS)%	delta P(DCS)%	delta P(DCS)%
200	40	12.16	-5.50	-6.05	-1.97
100	110	11.91	-5.17	-5.70	-2.73
120	80	11.90	-5.02	-5.41	-2.36
130	70	11.81	-4.89	-5.27	-2.43
90	130	11.65	-5.06	-5.55	-2.41
110	90	11.53	-4.86	-5.02	-2.49
40	480	11.30	-4.42	-5.83	-3.51
160	50	11.15	-4.37	-4.56	-2.17
140	60	11.15	-4.38	-4.42	-2.27
190	40	11.07	-4.57	-4.71	-1.82
90	120	10.97	-4.57	-4.59	-2.29
100	100	10.95	-4.50	-4.40	-1.77
60	240	10.94	-5.05	-5.46	-2.89
80	150	10.90	-4.69	-4.95	-2.26
80	140	10.33	-4.31	-4.14	-2.16
110	80	10.13	-3.68	-3.15	-1.94
120	70	10.12	-3.57	-3.04	-2.14
90	110	10.12	-3.96	-3.43	-2.42
180	40	10.00	-3.63	-3.29	-1.80
150	50	9.85	-3.27	-2.88	-2.07
100	90	9.74	-3.52	-2.98	-2.06
80	130	9.67	-3.85	-3.35	-2.30
70	170	9.63	-4.07	-3.66	-2.04
130	60	9.61	-3.04	-2.80	-2.04
70	160	9.20	-3.75	-3.07	-2.19
90	100	9.07	-3.27	-2.75	-2.15
170	40	9.00	-2.73	-2.66	-1.73
60	200	8.91	-3.75	-3.28	-2.48
80	120	8.87	-3.35	-2.84	-2.28
70	150	8.76	-3.37	-2.85	-2.34
110	70	8.59	-2.56	-2.47	-2.04
140	50	8.58	-2.50	-2.44	-1.87
100	80	8.46	-2.66	-2.30	-2.12
40	360	8.40	-2.99	-3.46	-3.02
120	60	8.25	-2.30	-2.36	-1.94
70	140	8.11	-2.92	-2.46	-2.29
60	180	8.10	-3.20	-2.56	-2.53
80	110	7.99	-2.79	-2.31	-2.20
160	40	7.98	-2.41	-2.19	-1.60
90	90	7.93	-2.54	-2.06	-2.09
50	240	7.84	-3.16	-2.35	-2.51
200	30	7.77	-2.34	-1.96	-1.46
70	130	7.43	-2.52	-2.05	-2.01
130	50	7.40	-2.10	-2.06	-1.64
50	220	7.12	-2.55	-1.80	-2.15
80	100	7.09	-2.21	-1.70	-1.88
100	70	7.07	-1.91	-1.92	-1.88
60	160	7.06	-2.45	-1.98	-1.98
190	30	7.04	-2.13	-1.84	-1.47
150	40	7.00	-2.11	-1.93	-1.58
110	60	6.94	-1.96	-1.91	-1.72
90	80	6.79	-1.92	-1.79	-1.57
70	120	6.74	-2.11	-1.66	-1.71
40	300	6.69	-1.95	-1.44	-1.72
120	50	6.37	-1.89	-1.78	-1.12
180	30	6.35	-1.98	-1.71	-0.92
50	200	6.32	-1.94	-1.31	-1.35
80	90	6.17	-1.62	-1.42	-1.10
140	40	6.15	-1.84	-1.74	-0.92
70	110	6.08	-1.75	-1.33	-1.03

Table 7 (con't)

		(AIR55USN)	(AIR18USN)	(AIR181US)	(AIR93USN)
Depth	Time	USN '55	VVAL18	VVAL18-1	Air '93
(fsw)	(min)	P(DCS) (%)	delta P(DCS)%	delta P(DCS)%	delta P(DCS)%
60	140	5.97	-1.83	-1.41	-0.91
40	270	5.83	-1.43	-0.61	-0.85
200	25	5.73	-1.69	-1.38	-0.41
100	60	5.68	-1.51	-1.53	-0.48
90	70	5.66	-1.42	-1.38	-0.51
170	30	5.64	-1.73	-1.54	-0.37
50	180	5.51	-1.40	-0.94	-0.55
70	100	5.45	-1.45	-1.25	-0.49
80	80	5.33	-1.29	-1.26	-0.50
130	40	5.31	-1.61	-1.48	-0.41
110	50	5.28	-1.42	-1.42	-0.43
40	250	5.26	-1.09	-0.39	-0.70
190	25	5.15	-1.56	-1.27	-0.27
160	30	4.99	-1.54	-1.43	-0.28
60	120	4.89	-1.13	-0.80	-0.48
70	90	4.72	-1.10	-1.06	-0.48
50	160	4.71	-1.02	-0.59	-0.49
40	230	4.68	-0.75	-0.24	-0.64
90	60	4.63	-1.25	-1.15	-0.54
180	25	4.62	-1.38	-1.21	-0.21
80	70	4.45	-1.13	-1.04	-0.52
120	40	4.44	-1.15	-1.20	-0.45
150	30	4.43	-1.29	-1.33	-0.38
100	50	4.32	-1.12	-1.02	-0.50
40	210	4.17	-0.62	-0.16	-0.60
170	25	4.14	-1.23	-1.16	-0.23
70	80	3.95	-0.74	-0.66	-0.45
50	140	3.93	-0.66	-0.35	-0.49
140	30	3.86	-0.96	-1.06	-0.38
200	20	3.85	-1.05	-0.92	-0.03
60	100	3.77	-0.57	-0.52	-0.43
160	25	3.75	-1.03	-1.10	-0.24
110	40	3.75	-0.91	-0.88	-0.53
190	20	3.58	-1.00	-1.00	-0.19
80	60	3.50	-0.64	-0.53	-0.46
90	50	3.48	-0.64	-0.72	-0.49
150	25	3.38	-0.76	-0.96	-0.38
130	30	3.38	-0.72	-0.87	-0.38
180	20	3.32	-0.84	-1.01	-0.17
70	70	3.21	-0.49	-0.39	-0.42
100	40	3.17	-0.52	-0.65	-0.50
50	120	3.11	-0.26	-0.20	-0.42
170	20	3.08	-0.71	-0.96	-0.26
140	25	3.08	-0.59	-0.87	-0.36
120	30	3.08	-0.45	-0.69	-0.59
160	20	2.83	-0.41	-0.81	-0.32
130	25	2.82	-0.27	-0.63	-0.47
50	110	2.75	-0.21	-0.14	-0.42
80	50	2.72	-0.33	-0.27	-0.37
60	80	2.69	-0.27	-0.17	-0.38
200	15	2.67	-0.53	-0.74	-0.32
110	30	2.67	-0.23	-0.30	-0.35
90	40	2.64	-0.28	-0.25	-0.33
150	20	2.60	-0.21	-0.53	-0.03
70	60	2.60	-0.28	-0.20	-0.25
190	15	2.53	-0.46	-0.68	0.07
50	100	2.53	-0.27	0.01	-0.26
120	25	2.48	-0.09	-0.30	-0.15
140	20	2.43	-0.09	-0.47	-0.15
80	40	2.37	0.02	0.02	-0.36

		(AIR55USN)	(AIR18USN)	(AIR181US)	(AIR93USN)
Depth	Time	USN '55	VVAL18	VVAL18-1	Air '93
(fsw)	(min)	P(DCS) (%)	delta P(DCS)%	delta P(DCS)%	delta P(DCS)%
70	50	2.37	-0.22	0.02	-0.35
60	70	2.37	-0.23	-0.13	-0.19
180	15	2.35	-0.27	-0.53	0.03
100	30	2.34	0.06	-0.20	-0.21
110	25	2.21	0.23	-0.17	-0.22
170	15	2.20	-0.16	-0.42	-0.01
130	20	2.19	0.18	-0.20	-0.18
60	60	2.13	0.01	0.01	0.00
90	30	2.11	0.02	0.02	0.00
160	15	2.08	-0.02	-0.32	-0.11
100	25	2.05	0.03	0.03	0.00
120	20	2.01	0.18	-0.19	0.14
150	15	2.00	0.06	-0.22	-0.23
110	20	1.88	0.03	0.03	0.00
140	15	1.85	0.19	-0.17	0.15
200	10	1.81	-0.04	-0.09	-0.35
190	10	1.72	0.00	-0.06	0.31
130	15	1.72	0.12	0.12	0.08
180	10	1.68	0.28	0.15	0.22
170	10	1.62	0.21	0.21	0.16
120	15	1.60	0.04	0.04	0.00
160	10	1.58	0.12	0.12	0.07
150	10	1.46	0.12	0.12	0.07
140	10	1.41	0.04	0.04	0.00
130	10	1.29	0.04	0.04	0.00
190	5	1.24	0.05	0.05	0.00
200	5	1.22	0.12	0.12	-0.45
180	5	1.19	0.05	0.05	0.00
170	5	1.14	0.05	0.05	0.00
160	5	1.09	0.04	0.04	0.00
150	5	1.03	0.05	0.05	0.00

Table 8

No-Decompression Times (min) 0.7 ata PO2 in N2			
	(P0780ND)	(P07181ND)	(P0793ND)
Depth (fsw)	P07'80	VVAL18-1	P07'93
30	32767*		633
32		32767	
34		807	
35	32767	677	359
36	1076	590	
38	559	476	
40	367	402	240
45	206	270	171
50	143	165	128
55	97	105	98
60	74	80	78
65	60	63	
70	51	53	52
75	45	45	
80	39	39	39
85	36	34	
90	32	30	32
95	30	27	
100	27	23	26
105	25	21	
110	24	18	22
115	21	17	
120	19	15	19
125	17	14	
130	16	13	16
135	14	12	
140	13	12	14
145	11	11	
150	11	10	14
155	10	10	
160	9	9	0
165	9	9	
170	8	8	0
175	8	8	
180	7	7	0
185	7	7	
190	7	7	0
195	7	7	
200	6	6	0

Depths in published P07'80 Tables shown in bold.

* The published P07'80 Tables cut off times at 720 min

see Appendix G for risks

Table 9

Total Stop times Compared to P07'80 (VVAL18) Schedules (min)
0.7 ata Constant PO2 in N2
(delta: + longer, - shorter)

		(P0787USN)	(P07181US)	(P0793USN)
Depth	Time	P07'80	VVAL18-1	P07'93
(fsw)	(min)	TST(min)	delta(min)	delta(min)
40	367	0	0	90
40	370	1	-1	86
40	380	2	-2	94
40	390	3	-3	98
50	143	0	0	35
50	150	4	-4	26
50	160	8	-8	24
50	170	12	-11	23
50	180	16	-12	24
50	190	19	-12	23
50	200	22	-12	23
50	210	25	-12	25
50	220	29	-13	22
50	230	33	-15	22
50	240	38	-18	17
50	250	42	-18	15
50	260	46	-18	15
50	270	49	-17	18
50	280	53	-13	18
50	290	56	-9	20
50	300	59	-4	27
50	310	62	0	35
50	320	64	5	47
50	330	67	9	50
50	340	70	13	67
50	350	73	16	73
50	360	77	19	74
50	370	80	22	81
50	380	84	24	86
50	390	87	27	98
60	74	0	0	6
60	80	4	-4	1
60	90	9	-4	-3
60	100	13	-2	12
60	110	17	-2	14
60	120	25	-7	10
60	130	32	-10	3
60	140	39	-12	-2
60	150	45	-12	-4
60	160	50	-11	-5
60	170	56	-12	-6
60	180	63	-14	-13
60	190	70	-17	-18
60	200	77	-18	-21
60	210	84	-18	-24
60	220	90	-18	-24
60	230	96	-12	-21
60	240	101	-5	-16
60	250	107	0	-7
60	260	112	5	4
60	270	117	11	23
60	280	123	14	23
60	290	129	18	33
60	300	135	21	41
60	310	141	24	44
60	320	147	27	45
60	330	152	31	43
60	340	157	35	43
60	350	162	38	38
60	360	167	41	33
60	370	174	42	26

		(P0787USN)	(P07181US)	(P0793USN)
Depth	Time	P07'80	VVAL18-1	P07'93
(fsw)	(min)	TST(min)	delta(min)	delta(min)
60	380	179	45	22
60	390	185	47	25
70	51	0	0	6
70	60	9	-3	-4
70	70	18	-4	-12
70	80	25	-3	0
70	90	31	-2	0
70	100	41	-6	-6
70	110	51	-10	-11
70	120	61	-12	-16
70	130	70	-12	-24
70	140	78	-11	-27
70	150	87	-13	-32
70	160	98	-17	-38
70	170	108	-18	-43
70	180	118	-18	-47
70	190	127	-14	-47
70	200	135	-7	-35
70	210	143	0	-27
70	220	151	6	-6
70	230	159	11	6
70	240	169	15	16
70	250	178	20	7
70	260	186	25	9
70	270	195	30	5
70	280	203	34	-3
70	290	211	39	-11
70	300	219	42	-19
70	310	227	46	-17
70	320	236	47	-26
70	330	245	49	-35
70	340	255	49	-40
70	350	264	50	-39
80	39	0	0	10
80	40	1	0	4
80	50	15	-2	-10
80	60	27	-4	-6
80	70	37	-2	-8
80	80	46	-2	-6
80	90	59	-6	-15
80	100	73	-11	-28
80	110	86	-12	-36
80	120	98	-12	-42
80	130	109	-12	-39
80	140	123	-17	-48
80	150	136	-16	-47
80	160	149	-8	-43
80	170	161	-1	-41
80	180	172	6	-12
80	190	183	12	-3
80	200	194	19	1
80	210	207	24	-7
80	220	219	30	-19
80	230	232	33	-32
80	240	243	38	-33
80	250	255	41	-45
80	260	268	43	-53
80	270	281	45	-66
80	280	295	45	-65
80	290	308	46	-78
80	300	320	48	0

Table 9 (con't)

Depth (fsw)	Time (min)	(P0787USN) P07'80 TST(min)	(P07181US) VVAL18-1 delta(min)	(P0793USN) P07'93 delta(min)
80	310	332	49	-12
80	320	344	50	-24
90	32	0	2	21
90	40	14	-1	-8
90	50	31	-3	-21
90	60	45	-3	-15
90	70	57	-2	-17
90	80	73	-6	-27
90	90	90	-12	-35
90	100	106	-12	-41
90	110	121	-12	-42
90	120	139	-17	-45
90	130	156	-10	-41
90	140	173	-1	-32
90	150	187	9	-21
90	160	202	17	-17
90	170	218	24	-23
90	180	233	31	-33
90	190	249	37	-49
100	27	0	4	21
100	30	6	3	-1
100	35	17	0	-3
100	40	28	-2	-7
100	45	38	-3	-17
100	50	47	-4	-22
100	55	56	-4	-22
100	60	63	-2	-23
100	65	70	-1	-21
100	70	79	-3	-25
100	75	90	-7	-31
100	80	101	-11	-37
100	90	121	-12	-41
100	100	143	-16	-39
100	110	164	-8	-34
110	24	0	7	25
110	25	3	6	2
110	30	17	1	3
110	35	30	-1	-9
110	40	42	-2	-18
110	45	53	-3	-23
110	50	63	-3	-28
110	55	73	-3	-29
110	60	81	-1	-27
110	65	93	-4	-33
110	70	106	-9	-32
110	80	131	-13	-22
110	90	161	-13	-42
120	19	0	5	15
120	20	1	6	4
120	25	12	5	8
120	30	28	-1	-8
120	35	43	-2	-19
120	40	56	-3	-27
120	45	68	-3	-33
120	50	79	-2	-34
120	55	90	-2	-31
120	60	103	-4	-24
120	70	136	-13	-27
120	80	171	-9	-27
130	16	0	5	5
130	20	6	6	-1
130	25	22	2	-3
130	30	39	-1	-19
130	35	55	-2	-30
130	40	70	-4	-35
130	45	83	-3	-38
130	50	96	-2	-32

Depth (fsw)	Time (min)	(P0787USN) P07'80 TST(min)	(P07181US) VVAL18-1 delta(min)	(P0793USN) P07'93 delta(min)
130	60	131	-9	-21
130	70	173	-6	-29
140	13	0	3	4
140	15	2	5	-2
140	20	11	7	-3
140	25	32	0	-22
140	30	50	-1	-26
140	35	68	-3	-35
140	40	84	-4	-40
140	45	98	-2	-34
140	50	117	-4	-27
140	60	166	-10	-47
140	70	212	12	-43
150	11	0	1	0
150	15	6	6	-7
150	20	19	6	-11
150	25	41	0	-21
150	30	62	-2	-34
150	35	80	-2	-37
150	40	97	-1	-38
150	45	119	-3	-35
150	50	147	-8	-38
150	60	202	8	-49
150	70	259	26	-65
160	9	0	0	-1
160	10	1	0	-3
160	15	10	6	-10
160	20	27	5	-9
160	25	51	-1	-28
160	30	73	-1	-39
160	40	118	-2	-45
160	50	179	-1	-61
170	8	0	0	-2
170	10	3	1	-5
170	15	14	6	-11
170	20	36	2	-27
170	25	61	0	-33
170	30	85	1	-41
170	40	141	0	-43
170	50	213	17	-64

Table 10

Risk of DCS [P(DCS)] Compared to P07'80 (VVAL18) Schedules
0.7 ata Constant PO2 in N2
(sorted by profile depth/time)
(delta: + more risk, - less risk)

		(P0780USN)	(P07181US)	(P0793USN)
Depth	Time	P07'80	VVAL18-1	P07'93
(fsw)	(min)	PDCS %	delta %	delta %
40	367	4.76	0.00	0.18
40	370	4.68	0.14	0.74
40	380	4.81	0.21	0.23
40	390	4.95	0.27	0.04
50	143	2.71	0.00	0.52
50	150	2.57	0.36	0.35
50	160	2.70	0.57	0.62
50	170	2.83	0.62	0.32
50	180	2.96	0.64	0.26
50	190	3.14	0.64	1.04
50	200	3.32	0.65	0.67
50	210	3.50	0.65	0.40
50	220	3.63	0.70	0.79
50	230	3.75	0.82	0.51
50	240	3.82	0.98	0.67
50	250	3.95	0.96	0.81
50	260	4.07	0.95	0.54
50	270	4.23	0.89	1.15
50	280	4.35	0.66	0.83
50	290	4.51	0.44	0.62
50	300	4.66	0.20	0.42
50	310	4.82	0.00	0.34
50	320	5.02	-0.22	0.04
50	330	5.17	-0.37	0.22
50	340	5.33	-0.52	-0.11
50	350	5.50	-0.63	-0.47
50	360	5.62	-0.72	-1.02
50	370	5.79	-0.81	-1.12
50	380	5.92	-0.87	-1.26
50	390	6.09	-0.97	-1.11
60	74	2.10	0.00	-0.10
60	80	1.93	0.38	0.31
60	90	2.11	0.17	-0.20
60	100	2.36	0.09	-0.14
60	110	2.63	0.09	0.19
60	120	2.71	0.35	0.35
60	130	2.84	0.51	0.30
60	140	2.96	0.63	0.83
60	150	3.13	0.63	0.19
60	160	3.35	0.57	0.58
60	170	3.51	0.63	0.30
60	180	3.60	0.75	0.69
60	190	3.74	0.83	1.16
60	200	3.89	0.81	0.73
60	210	4.05	0.75	0.79
60	220	4.23	0.74	0.88
60	230	4.43	0.40	0.37
60	240	4.66	0.08	0.33
60	250	4.87	-0.12	0.12
60	260	5.11	-0.30	-0.02
60	270	5.36	-0.50	-0.58
60	280	5.59	-0.60	-0.51
60	290	5.82	-0.74	-0.34
60	300	6.04	-0.85	-0.83
60	310	6.26	-0.95	-1.21
60	320	6.47	-1.06	-0.25
60	330	6.70	-1.20	-0.88
60	340	6.93	-1.34	-1.28
60	350	7.15	-1.46	-0.75
60	360	7.36	-1.57	-1.36
60	370	7.48	-1.60	-0.05

		(P0780USN)	(P07181US)	(P0793USN)
Depth	Time	P07'80	VVAL18-1	P07'93
(fsw)	(min)	PDCS %	delta %	delta %
60	380	7.66	-1.7	-1.83
60	390	7.81	-1.78	-0.89
70	51	2.15	0	-0.36
70	60	1.97	0.12	-0.16
70	70	2.12	0.16	-0.1
70	80	2.39	0.14	-0.19
70	90	2.67	0.17	0.13
70	100	2.86	0.28	0.21
70	110	3.04	0.5	0.53
70	120	3.21	0.61	0.3
70	130	3.42	0.61	0.67
70	140	3.67	0.56	0.97
70	150	3.89	0.62	0.47
70	160	4.02	0.76	0.67
70	170	4.2	0.76	0.82
70	180	4.37	0.72	0.88
70	190	4.58	0.49	0.5
70	200	4.84	0.15	0.18
70	210	5.16	-0.17	-0.17
70	220	5.5	-0.41	-1.04
70	230	5.83	-0.61	-0.85
70	240	6.12	-0.8	-0.76
70	250	6.42	-0.98	-0.96
70	260	6.73	-1.16	-0.37
70	270	6.99	-1.35	-0.96
70	280	7.26	-1.5	-0.11
70	290	7.51	-1.67	0.66
70	300	7.75	-1.79	-0.14
70	310	7.97	-1.94	0.01
70	320	8.13	-1.98	0.92
70	330	8.32	-2.08	1.26
70	340	8.43	-2.09	0.59
70	350	8.59	-2.14	0.8
80	39	2.19	0	0.16
80	40	2.06	0	0.3
80	50	2.07	0.07	0.28
80	60	2.26	0.17	-1.36
80	70	2.52	0.09	0.69
80	80	2.98	0.09	0.39
80	90	3.24	0.29	0.58
80	100	3.39	0.58	0.47
80	110	3.64	0.6	0.9
80	120	3.92	0.59	0.91
80	130	4.29	0.53	0.7
80	140	4.48	0.73	0.35
80	150	4.7	0.65	0.15
80	160	4.96	0.19	0.47
80	170	5.28	-0.12	-0.25
80	180	5.68	-0.42	-0.98
80	190	6.09	-0.66	-1.43
80	200	6.49	-0.91	-1.44
80	210	6.82	-1.14	-1.54
80	220	7.16	-1.37	-0.38
80	230	7.47	-1.52	-0.76
80	240	7.83	-1.76	-0.38
80	250	8.1	-1.91	0.42
80	260	8.33	-2.02	-0.03
80	270	8.52	-2.1	1.21
80	280	8.68	-2.13	1.01
80	290	8.85	-2.15	1.52
80	300	9.03	-2.21	-1.43

Table 10 (con't)

Depth	Time	(P0780USN) P07'80	(P07181US) VVAL18-1	(P0793USN) P07'93
(fsw)	(min)	PDCS %	delta %	delta %
80	310	9.19	-2.23	-1.03
80	320	9.33	-2.26	-0.6
90	32	2.28	-0.37	-1.5
90	40	2.13	0.03	0.28
90	50	2.19	0.12	0.04
90	60	2.58	0.14	0.16
90	70	3.11	0.09	0.46
90	80	3.5	0.28	0.74
90	90	3.83	0.63	0.28
90	100	4.17	0.61	0.79
90	110	4.52	0.58	0.47
90	120	4.79	0.73	0.16
90	130	5.09	0.29	-0.13
90	140	5.38	-0.12	0
90	150	5.9	-0.53	-0.54
90	160	6.39	-0.86	-1.79
90	170	6.82	-1.11	0.09
90	180	7.28	-1.38	-1.97
90	190	7.71	-1.66	-1
100	27	2.33	-0.49	0.52
100	30	2.08	-0.1	-0.4
100	35	2.21	-0.05	0.02
100	40	2.3	-0.06	-1.29
100	45	2.3	0.12	-0.56
100	50	2.51	0.12	0.29
100	55	2.76	0.13	0.59
100	60	3.09	0.09	0.17
100	65	3.51	0.03	0.7
100	70	3.82	0.13	0.75
100	75	4.01	0.35	0.62
100	80	4.15	0.59	0.83
100	90	4.63	0.63	0.6
100	100	4.96	0.78	-0.08
100	110	5.33	0.22	-0.37
110	24	2.48	-0.63	-0.09
110	25	2.11	-0.21	-0.32
110	30	2.23	-0.17	0.25
110	35	2.26	-0.02	-1.47
110	40	2.36	-0.01	0.17
110	45	2.61	0.07	-0.01
110	50	2.89	0.17	0.54
110	55	3.3	0.11	0.87
110	60	3.85	0.02	0.37
110	65	4.13	0.23	0.62
110	70	4.43	0.49	0.42
110	80	4.97	0.69	0.02
110	90	5.2	0.6	-0.28
120	19	2.22	-0.57	0.12
120	20	2.13	-0.41	-0.56
120	25	2.26	-0.32	0.34
120	30	2.25	-0.07	0.13
120	35	2.36	-0.03	-0.14
120	40	2.55	0.15	0.07
120	45	2.96	0.15	0.92
120	50	3.45	0.16	0.68
120	55	4.02	0.16	0.9
120	60	4.52	0.23	0.41
120	70	5	0.79	-0.04
120	80	5.39	0.43	-0.76
130	16	2.12	-0.58	-0.46
130	20	2.12	-0.35	0.26
130	25	2.22	-0.2	0.15
130	30	2.28	-0.02	0.15
130	35	2.52	0.04	0.41
130	40	2.9	0.24	0.53
130	45	3.48	0.22	-0.85
130	50	4.16	0.19	0.72

Depth	Time	(P0780USN) P07'80	(P07181US) VVAL18-1	(P0793USN) P07'93
(fsw)	(min)	PDCS %	delta %	delta %
130	60	5.02	0.59	0.03
130	70	5.44	0.34	-0.43
140	13	1.94	-0.53	0.13
140	15	1.84	-0.29	0.31
140	20	2.18	-0.36	-0.11
140	25	2.21	-0.1	0.28
140	30	2.38	0.04	-0.3
140	35	2.76	0.19	0.26
140	40	3.36	0.33	0.6
140	45	4.17	0.28	0.69
140	50	4.77	0.38	0.64
140	60	5.29	0.67	-0.21
140	70	5.98	-0.51	-0.93
150	11	1.85	-0.25	0.11
150	15	1.79	-0.23	0.46
150	20	2.19	-0.29	0.09
150	25	2.27	-0.03	-0.73
150	30	2.56	0.18	0.38
150	35	3.17	0.3	0.02
150	40	4.05	0.28	0.44
150	45	4.67	0.41	0.28
150	50	5.02	0.64	-0.14
150	60	5.68	-0.23	-0.96
150	70	6.65	-0.87	-1.37
160	9	1.71	0	0.61
160	10	1.62	0	0.58
160	15	1.86	-0.24	0.01
160	20	2.22	-0.22	-0.08
160	25	2.37	0.15	0.31
160	30	2.88	0.3	0.2
160	40	4.44	0.43	0.49
160	50	5.29	0.33	-0.29
170	8	1.69	0	0.55
170	10	1.49	-0.04	0.66
170	15	1.92	-0.21	-0.09
170	20	2.21	-0.04	0.04
170	25	2.6	0.24	0.24
170	30	3.36	0.33	0.34
170	40	4.84	0.53	0.09
170	50	5.67	-0.31	-1.32

Table 11

Risk of DCS [P(DCS)] Compared to P07'80 (VVAL18) Schedules
0.7 ata Constant PO2 in N2
(sorted by P07'80 P(DCS))
(delta: + more risk, - less risk)

		(P0780USN)	(P07181US)	(P0793USN)
Depth	Time	P07'80	VVAL18-1	P07'93
170	10	1.49	-0.04	0.66
160	10	1.62	0.00	0.58
170	8	1.69	0.00	0.55
160	9	1.71	0.00	0.61
150	15	1.79	-0.23	0.46
140	15	1.84	-0.29	0.31
150	11	1.85	-0.25	0.11
160	15	1.86	-0.24	0.01
170	15	1.92	-0.21	-0.09
60	80	1.93	0.38	0.31
140	13	1.94	-0.53	0.13
70	60	1.97	0.12	-0.16
80	40	2.06	0.00	0.30
80	50	2.07	0.07	0.28
100	30	2.08	-0.10	-0.40
60	74	2.10	0.00	-0.10
110	25	2.11	-0.21	-0.32
60	90	2.11	0.17	-0.20
130	16	2.12	-0.58	-0.46
130	20	2.12	-0.35	0.26
70	70	2.12	0.16	-0.10
120	20	2.13	-0.41	-0.56
90	40	2.13	0.03	0.28
70	51	2.15	0.00	-0.36
140	20	2.18	-0.36	-0.11
150	20	2.19	-0.29	0.09
80	39	2.19	0.00	0.16
90	50	2.19	0.12	0.04
170	20	2.21	-0.04	0.04
140	25	2.21	-0.10	0.28
100	35	2.21	-0.05	0.02
120	19	2.22	-0.57	0.12
160	20	2.22	-0.22	-0.08
130	25	2.22	-0.20	0.15
110	30	2.23	-0.17	0.25
120	30	2.25	-0.07	0.13
120	25	2.26	-0.32	0.34
110	35	2.26	-0.02	-1.47
80	60	2.26	0.17	-1.36
150	25	2.27	-0.03	-0.73
130	30	2.28	-0.02	0.15
90	32	2.28	-0.37	-1.50
100	40	2.30	-0.06	-1.29
100	45	2.30	0.12	-0.56
100	27	2.33	-0.49	0.52
120	35	2.36	-0.03	-0.14
110	40	2.36	-0.01	0.17
60	100	2.36	0.09	-0.14
160	25	2.37	0.15	0.31
140	30	2.38	0.04	-0.30
70	80	2.39	0.14	-0.19
110	24	2.48	-0.63	-0.09
100	50	2.51	0.12	0.29
130	35	2.52	0.04	0.41
80	70	2.52	0.09	0.69
120	40	2.55	0.15	0.07
150	30	2.56	0.18	0.38
50	150	2.57	0.36	0.35
90	60	2.58	0.14	0.16
170	25	2.60	0.24	0.24
110	45	2.61	0.07	-0.01
60	110	2.63	0.09	0.19

		(P0780USN)	(P07181US)	(P0793USN)
Depth	Time	P07'80	VVAL18-1	P07'93
(fsw)	(min)	PDCS %	delta %	delta %
70	90	2.67	0.17	0.13
50	160	2.7	0.57	0.62
60	120	2.71	0.35	0.35
50	143	2.71	0	0.52
140	35	2.76	0.19	0.26
100	55	2.76	0.13	0.59
50	170	2.83	0.62	0.32
60	130	2.84	0.51	0.3
70	100	2.86	0.28	0.21
160	30	2.88	0.3	0.2
110	50	2.89	0.17	0.54
130	40	2.9	0.24	0.53
120	45	2.96	0.15	0.92
60	140	2.96	0.63	0.83
50	180	2.96	0.64	0.26
80	80	2.98	0.09	0.39
70	110	3.04	0.5	0.53
100	60	3.09	0.09	0.17
90	70	3.11	0.09	0.46
60	150	3.13	0.63	0.19
50	190	3.14	0.64	1.04
150	35	3.17	0.3	0.02
70	120	3.21	0.61	0.3
80	90	3.24	0.29	0.58
110	55	3.3	0.11	0.87
50	200	3.32	0.65	0.67
60	160	3.35	0.57	0.58
170	30	3.36	0.33	0.34
140	40	3.36	0.33	0.6
80	100	3.39	0.58	0.47
70	130	3.42	0.61	0.67
120	50	3.45	0.16	0.68
130	45	3.48	0.22	-0.85
90	80	3.5	0.28	0.74
50	210	3.5	0.65	0.4
100	65	3.51	0.03	0.7
60	170	3.51	0.63	0.3
60	180	3.6	0.75	0.69
50	220	3.63	0.7	0.79
80	110	3.64	0.6	0.9
70	140	3.67	0.56	0.97
60	190	3.74	0.83	1.16
50	230	3.75	0.82	0.51
100	70	3.82	0.13	0.75
50	240	3.82	0.98	0.67
90	90	3.83	0.63	0.28
110	60	3.85	0.02	0.37
70	150	3.89	0.62	0.47
60	200	3.89	0.81	0.73
80	120	3.92	0.59	0.91
50	250	3.95	0.96	0.81
100	75	4.01	0.35	0.62
120	55	4.02	0.16	0.9
70	160	4.02	0.76	0.67
150	40	4.05	0.28	0.44
60	210	4.05	0.75	0.79
50	260	4.07	0.95	0.54
110	65	4.13	0.23	0.62
100	80	4.15	0.59	0.83
130	50	4.16	0.19	0.72
140	45	4.17	0.28	0.69

Table 11 (con't)

Depth	Time	(P0780USN) P07'80	(P07181US) VVAL18-1	(P0793USN) P07'93
(fsw)	(min)	PDCS %	delta %	delta %
90	100	4.17	0.61	0.79
70	170	4.2	0.76	0.82
60	220	4.23	0.74	0.88
50	270	4.23	0.89	1.15
80	130	4.29	0.53	0.7
50	280	4.35	0.66	0.83
70	180	4.37	0.72	0.88
110	70	4.43	0.49	0.42
60	230	4.43	0.4	0.37
160	40	4.44	0.43	0.49
80	140	4.48	0.73	0.35
50	290	4.51	0.44	0.62
120	60	4.52	0.23	0.41
90	110	4.52	0.58	0.47
70	190	4.58	0.49	0.5
100	90	4.63	0.63	0.6
60	240	4.66	0.08	0.33
50	300	4.66	0.2	0.42
150	45	4.67	0.41	0.28
40	370	4.68	0.14	0.74
80	150	4.7	0.65	0.15
40	367	4.76	0	0.18
140	50	4.77	0.38	0.64
90	120	4.79	0.73	0.16
40	380	4.81	0.21	0.23
50	310	4.82	0	0.34
170	40	4.84	0.53	0.09
70	200	4.84	0.15	0.18
60	250	4.87	-0.12	0.12
40	390	4.95	0.27	0.04
100	100	4.96	0.78	-0.08
80	160	4.96	0.19	0.47
110	80	4.97	0.69	0.02
120	70	5	0.79	-0.04
150	50	5.02	0.64	-0.14
130	60	5.02	0.59	0.03
50	320	5.02	-0.22	0.04
90	130	5.09	0.29	-0.13
60	260	5.11	-0.3	-0.02
70	210	5.16	-0.17	-0.17
50	330	5.17	-0.37	0.22
110	90	5.2	0.6	-0.28
80	170	5.28	-0.12	-0.25
160	50	5.29	0.33	-0.29
140	60	5.29	0.67	-0.21
100	110	5.33	0.22	-0.37
50	340	5.33	-0.52	-0.11
60	270	5.36	-0.5	-0.58
90	140	5.38	-0.12	0
120	80	5.39	0.43	-0.76
130	70	5.44	0.34	-0.43
70	220	5.5	-0.41	-1.04
50	350	5.5	-0.63	-0.47
60	280	5.59	-0.6	-0.51
50	360	5.62	-0.72	-1.02
170	50	5.67	-0.31	-1.32
150	60	5.68	-0.23	-0.96
80	180	5.68	-0.42	-0.98
50	370	5.79	-0.81	-1.12
60	290	5.82	-0.74	-0.34
70	230	5.83	-0.61	-0.85
90	150	5.9	-0.53	-0.54
50	380	5.92	-0.87	-1.26
140	70	5.98	-0.51	-0.93
60	300	6.04	-0.85	-0.83
80	190	6.09	-0.66	-1.43
50	390	6.09	-0.97	-1.11

Depth	Time	(P0780USN) P07'80	(P07181US) VVAL18-1	(P0793USN) P07'93
(fsw)	(min)	PDCS %	delta %	delta %
70	240	6.12	-0.8	-0.76
60	310	6.26	-0.95	-1.21
90	160	6.39	-0.86	-1.79
70	250	6.42	-0.98	-0.96
60	320	6.47	-1.06	-0.25
80	200	6.49	-0.91	-1.44
150	70	6.65	-0.87	-1.37
60	330	6.7	-1.2	-0.88
70	260	6.73	-1.16	-0.37
90	170	6.82	-1.11	0.09
80	210	6.82	-1.14	-1.54
60	340	6.93	-1.34	-1.28
70	270	6.99	-1.35	-0.96
60	350	7.15	-1.46	-0.75
80	220	7.16	-1.37	-0.38
70	280	7.26	-1.5	-0.11
90	180	7.28	-1.38	-1.97
60	360	7.36	-1.57	-1.36
80	230	7.47	-1.52	-0.76
60	370	7.48	-1.6	-0.05
70	290	7.51	-1.67	0.66
60	380	7.66	-1.7	-1.83
90	190	7.71	-1.66	-1
70	300	7.75	-1.79	-0.14
60	390	7.81	-1.78	-0.89
80	240	7.83	-1.76	-0.38
70	310	7.97	-1.94	0.01
80	250	8.1	-1.91	0.42
70	320	8.13	-1.98	0.92
70	330	8.32	-2.08	1.26
80	260	8.33	-2.02	-0.03
70	340	8.43	-2.09	0.59
80	270	8.52	-2.1	1.21
70	350	8.59	-2.14	0.8
80	280	8.68	-2.13	1.01
80	290	8.85	-2.15	1.52
80	300	9.03	-2.21	-1.43
80	310	9.19	-2.23	-1.03
80	320	9.33	-2.26	-0.6

Table 12

Risk of DCS Compared to P07'80 Schedules
0.7 ata Constant PO2 in N2
(profiles where P07'93 Risk Lies Outside of P07'80 95% Confidence Limits)
(delta: + more risk, - less risk)

		(P0780USN)	(P07181US)	(P0793USN)
Depth	**Time**	**P07'80**	VVAL18-1	P07'93
(fsw)	**(min)**	**P(DCS) %**	delta P(DCS) %	delta P(DCS) %
40	390	4.95	0.27	-1.73
40	370	4.68	0.14	-1.62
40	380	4.81	0.21	-1.58
40	367	4.76	0.00	-1.55
160	9	1.71	0.00	-0.92
170	8	1.69	0.00	-0.91
120	40	2.55	0.15	0.77
100	55	2.76	0.13	0.81
110	45	2.61	0.07	0.82
100	60	3.09	0.09	0.87
110	60	3.85	0.02	0.90
100	65	3.51	0.03	0.91
130	35	2.52	0.04	0.91
140	30	2.38	0.04	0.94
110	50	2.89	0.17	0.97
100	75	4.01	0.35	1.01
130	50	4.16	0.19	1.02
140	45	4.17	0.28	1.08
120	55	4.02	0.16	1.09
90	90	3.83	0.63	1.13
120	45	2.96	0.15	1.13
120	50	3.45	0.16	1.17
170	25	2.60	0.24	1.19
80	110	3.64	0.60	1.20
130	40	2.90	0.24	1.23
110	55	3.30	0.11	1.24
150	30	2.56	0.18	1.32
150	40	4.05	0.28	1.33
130	45	3.48	0.22	1.35
160	30	2.88	0.30	1.36
140	40	3.36	0.33	1.40
140	35	2.76	0.19	1.42
150	35	3.17	0.30	1.47
170	30	3.36	0.33	1.54

Figures

Figure 1

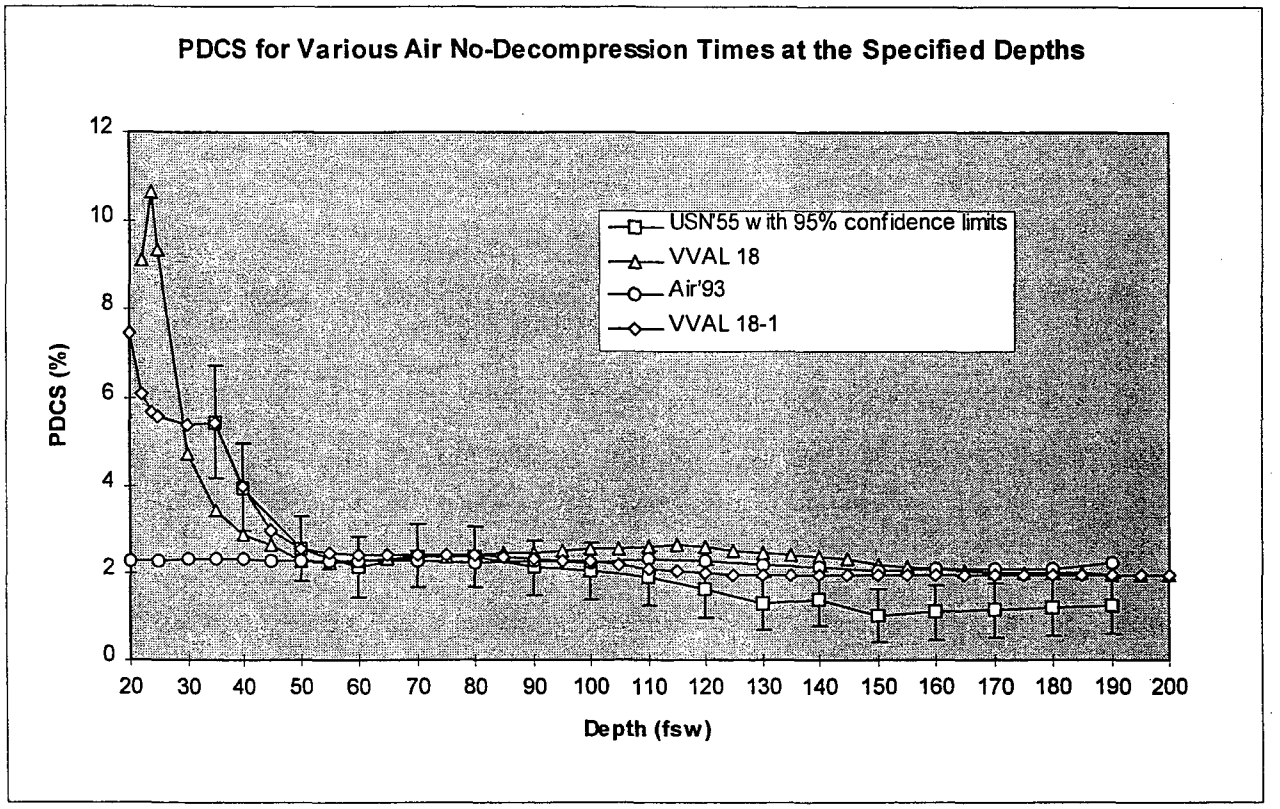


Figure 2

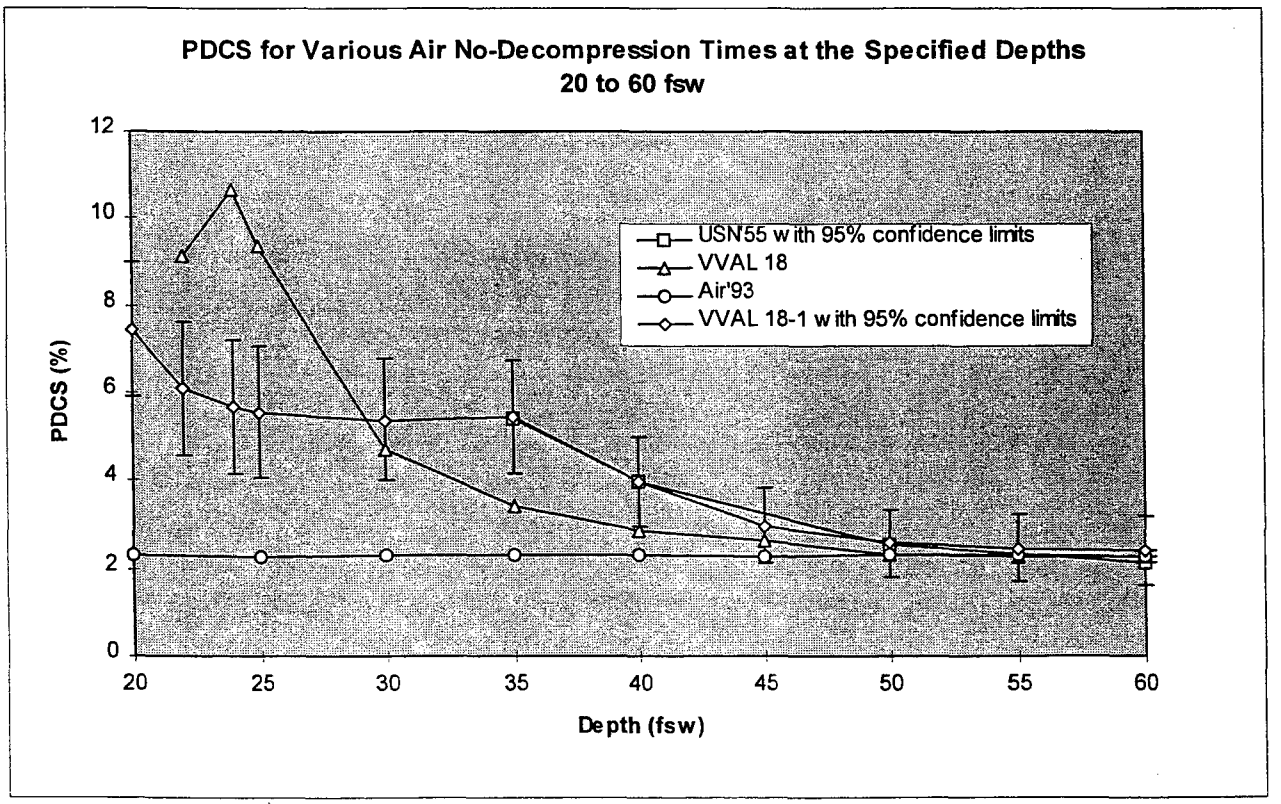


Figure 3

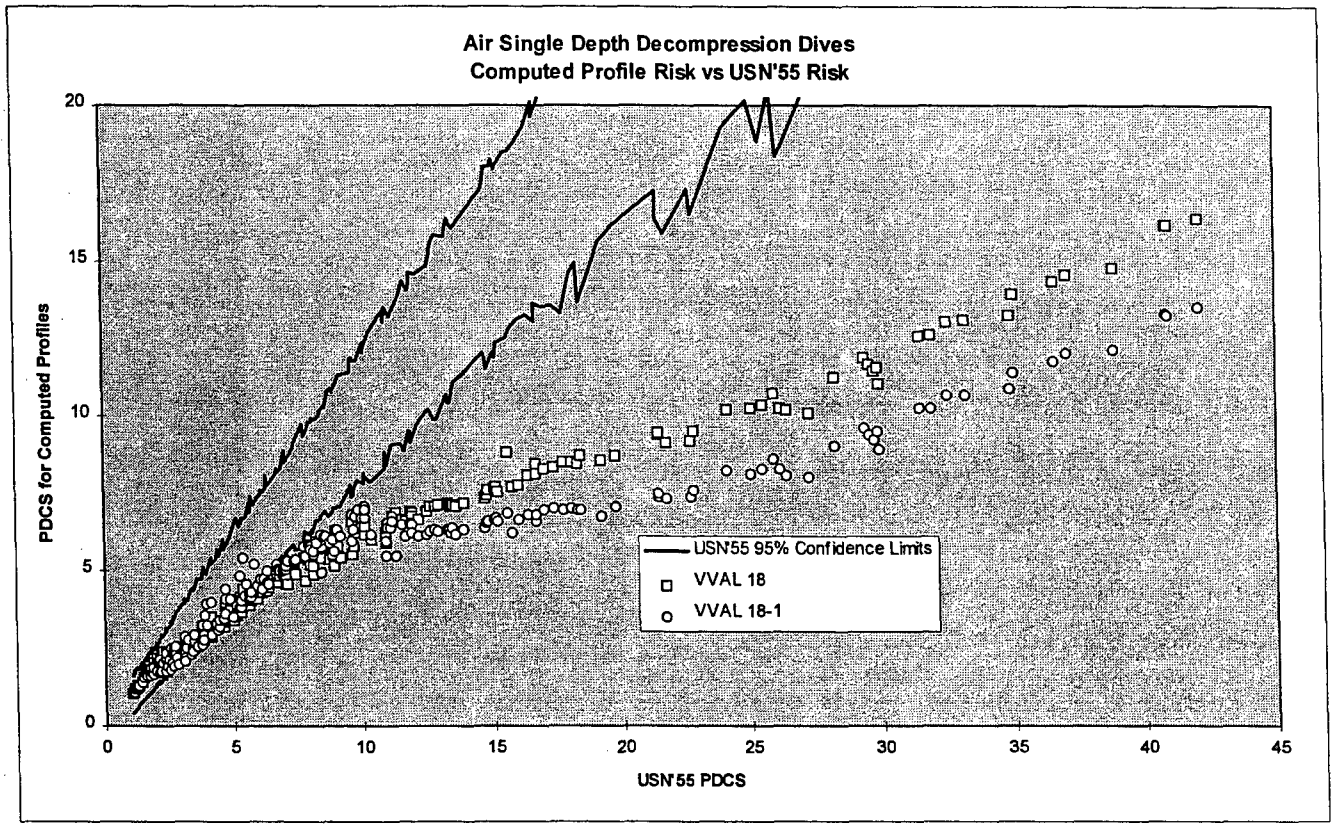


Figure 4

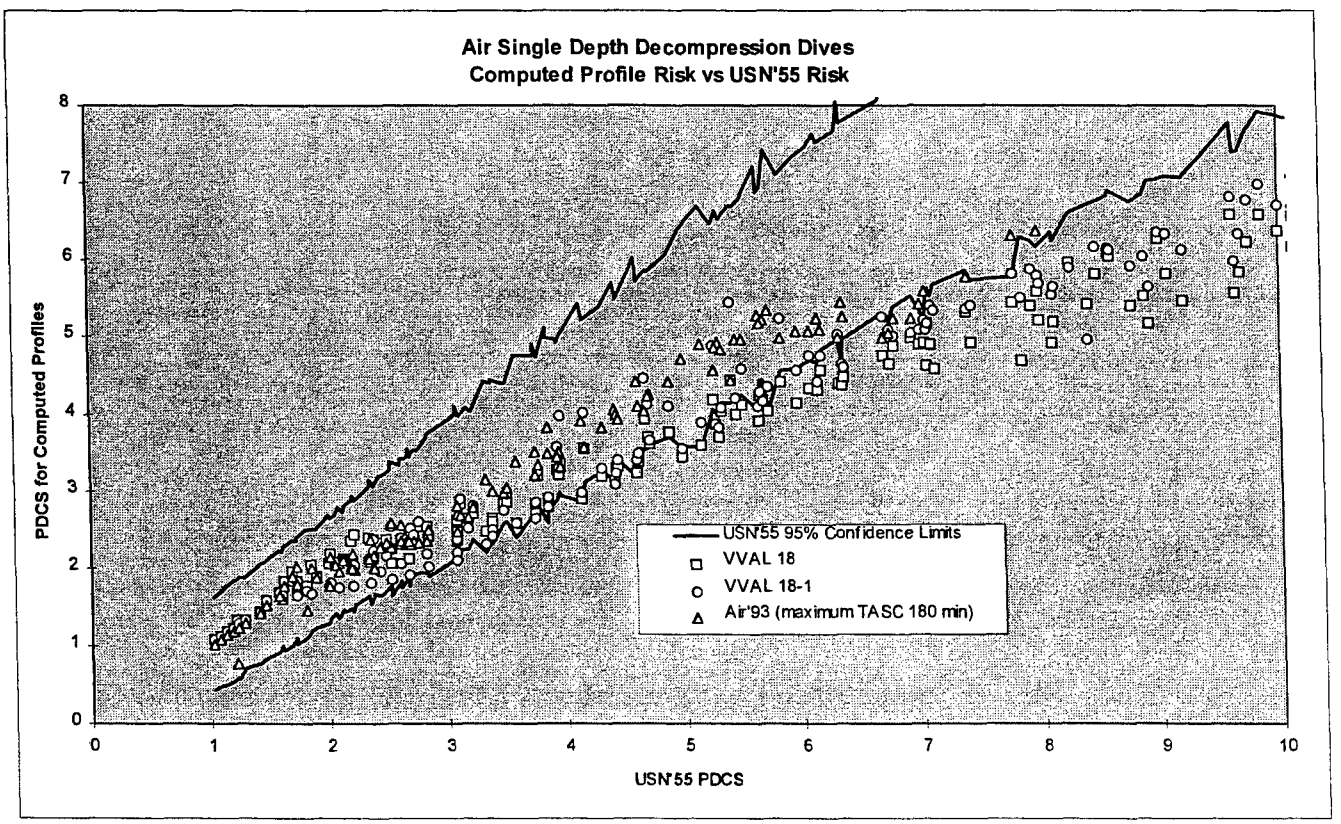


Figure 5

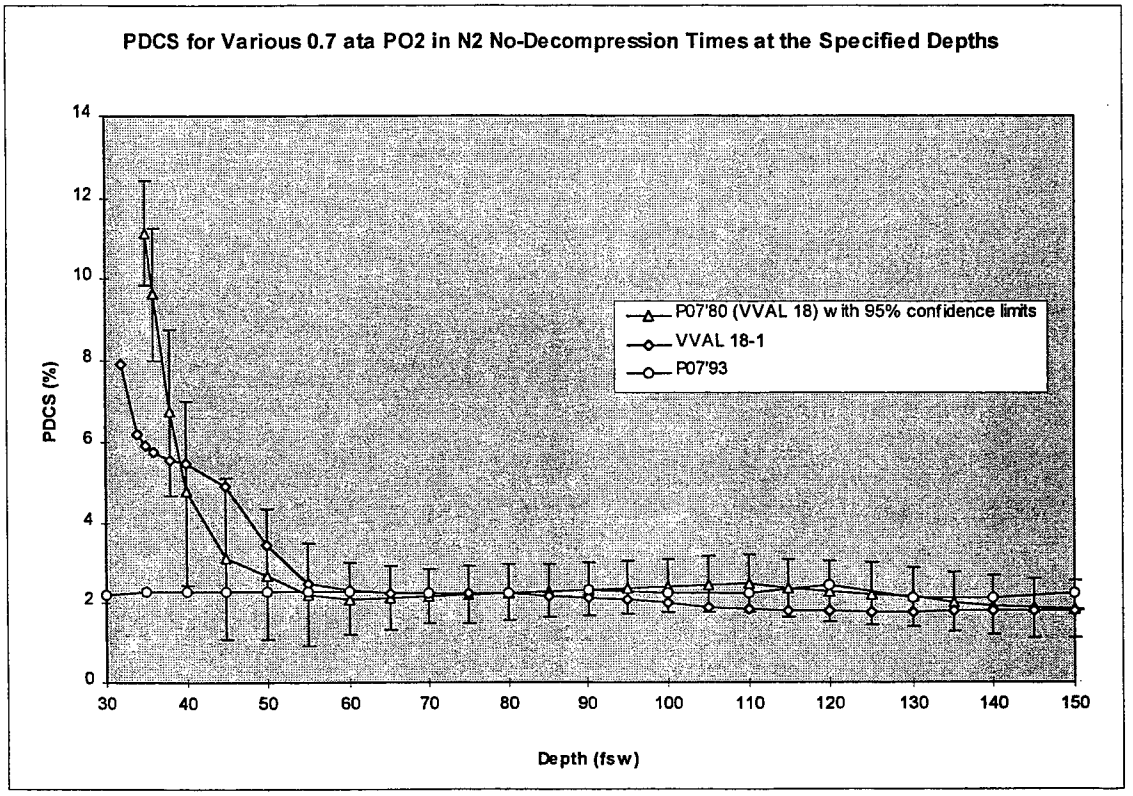


Figure 6

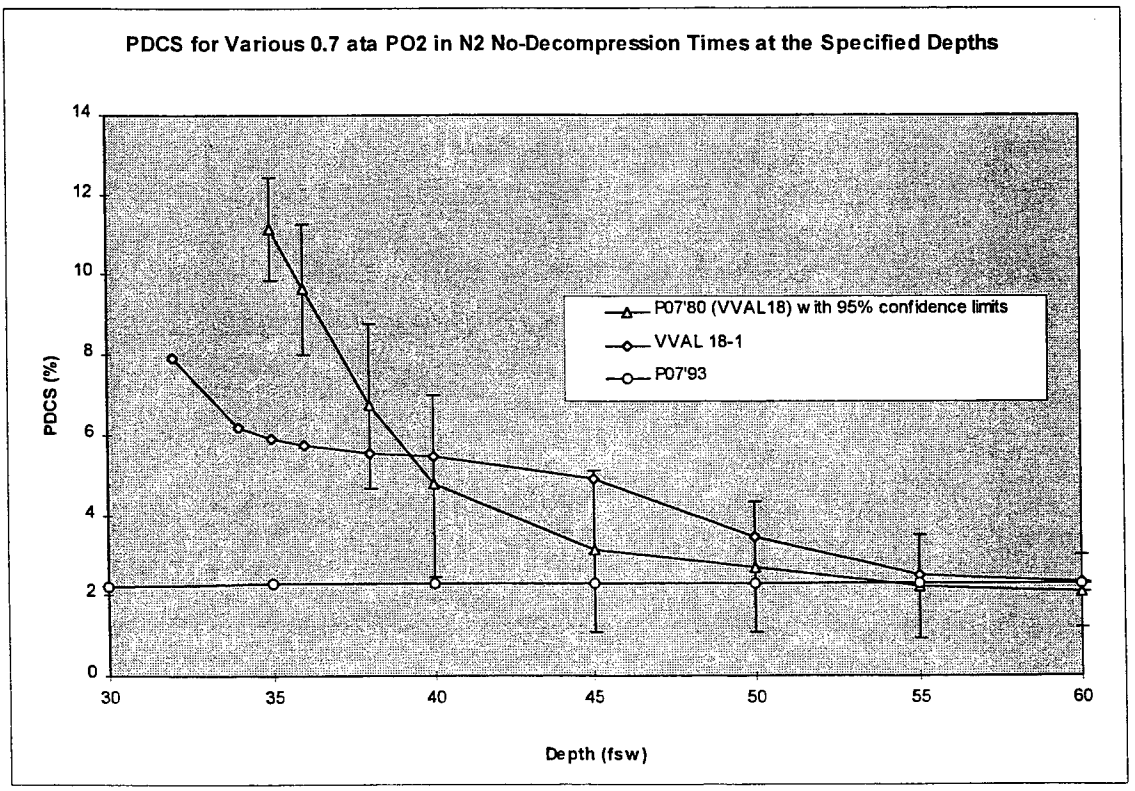


Figure 7

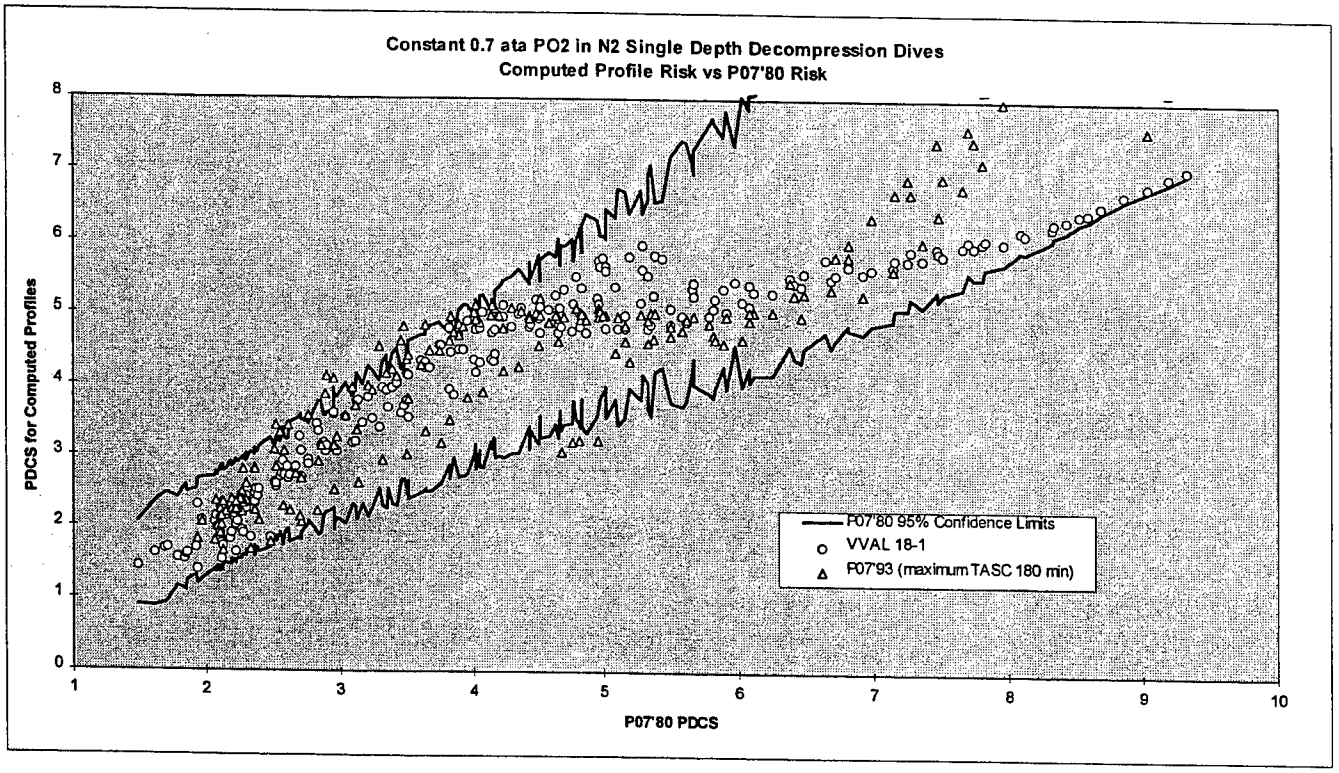


Figure 8

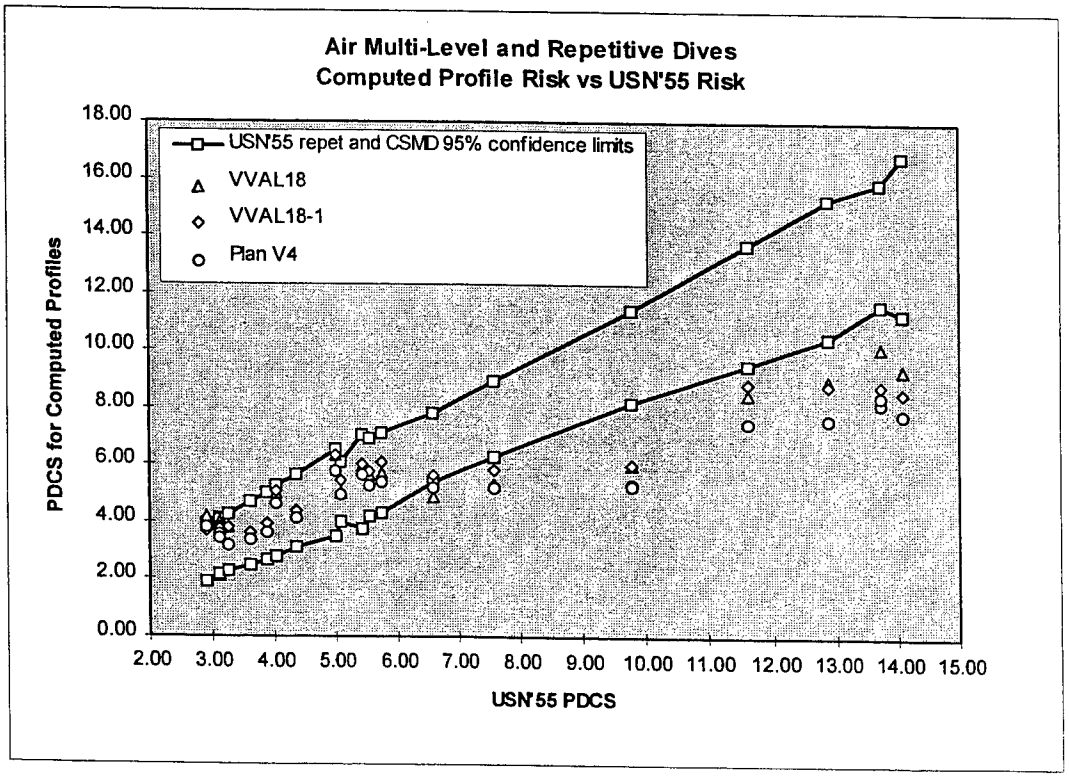


Figure 9

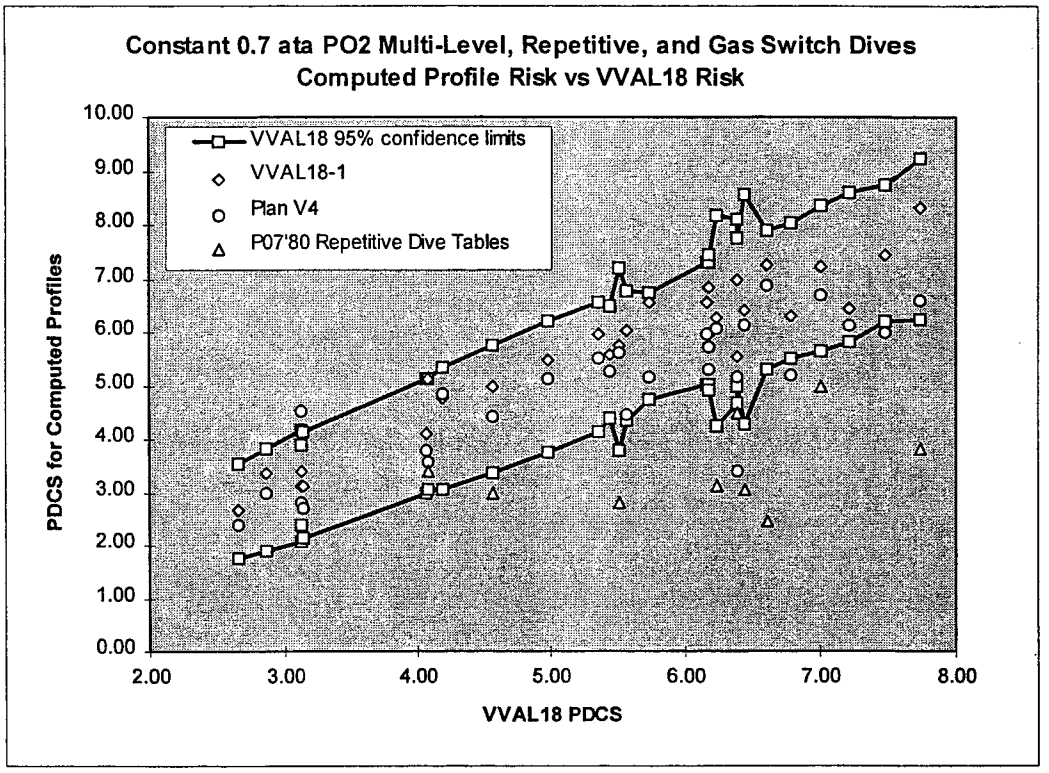


Figure 10

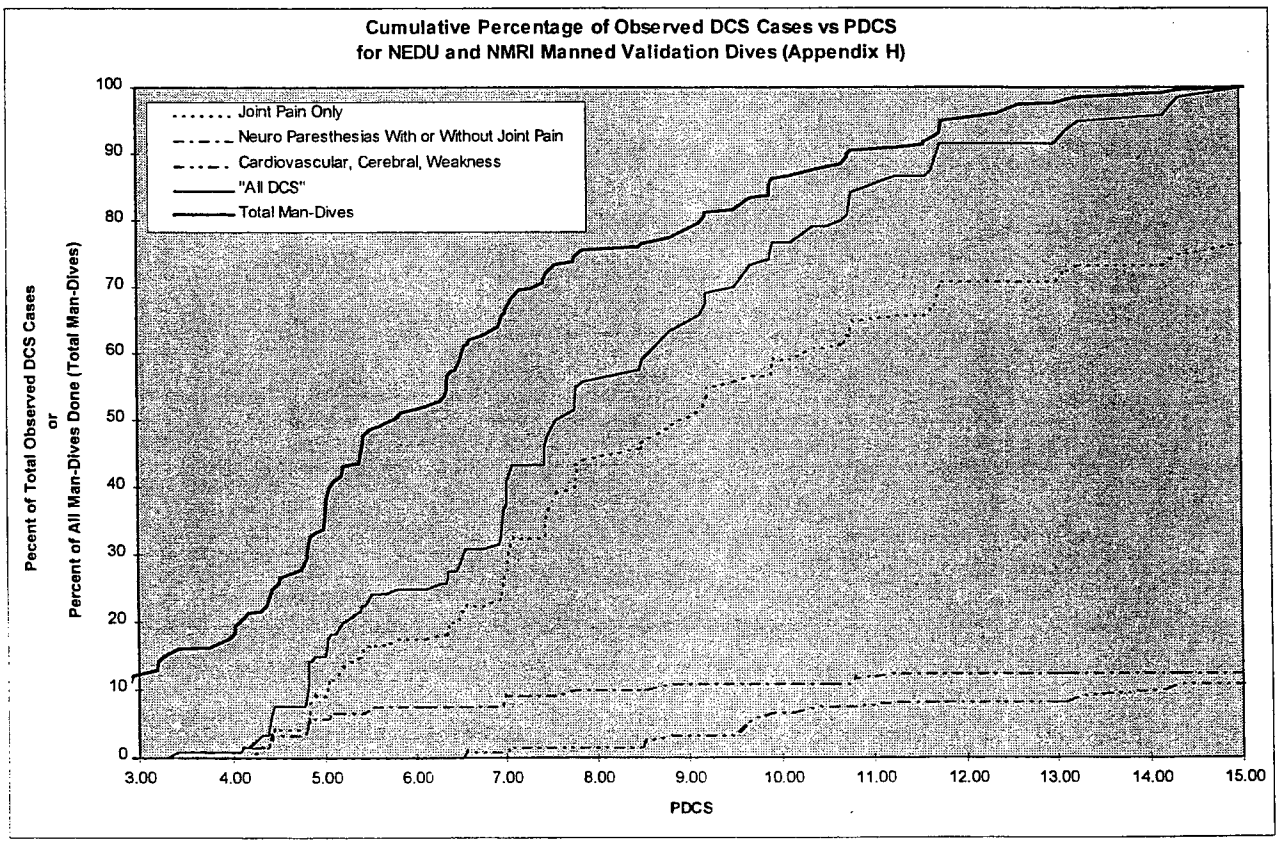


Figure 11

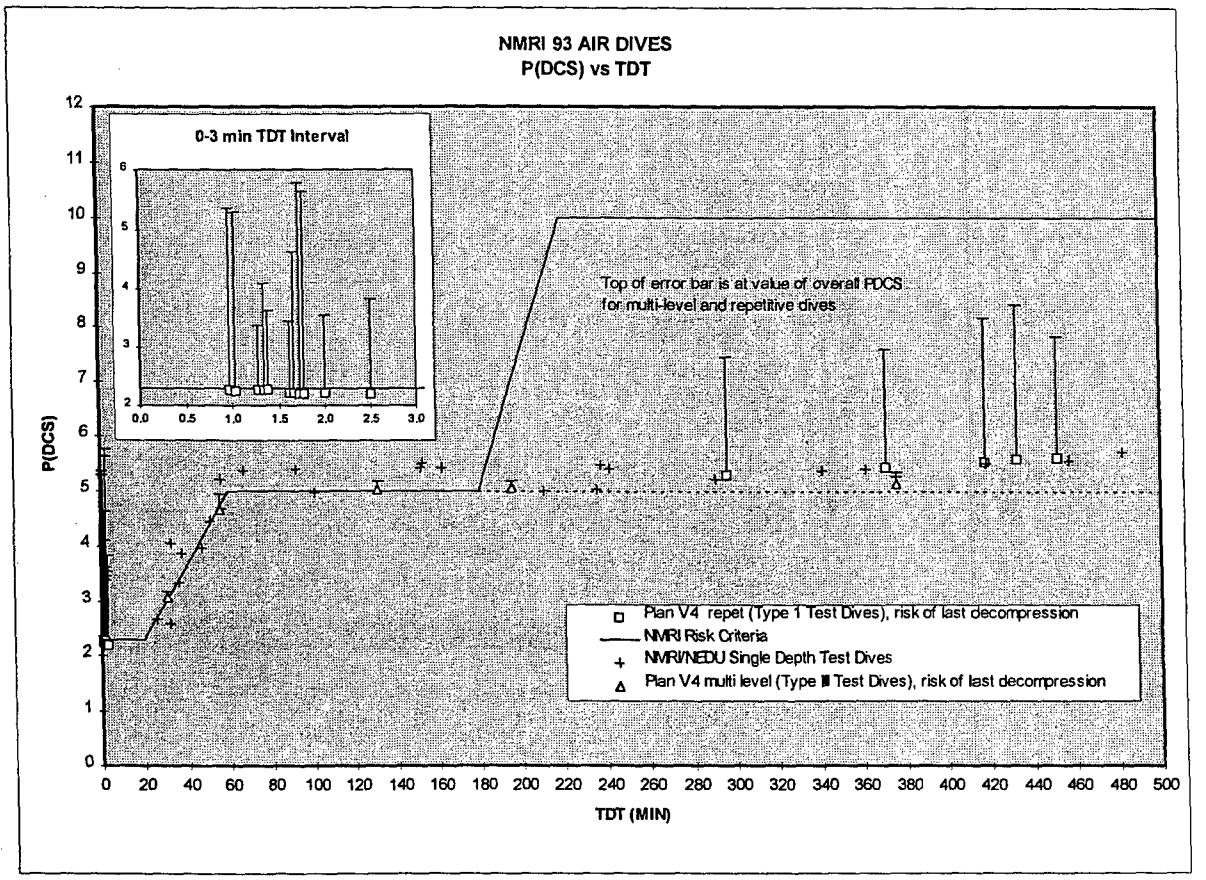


Figure 12

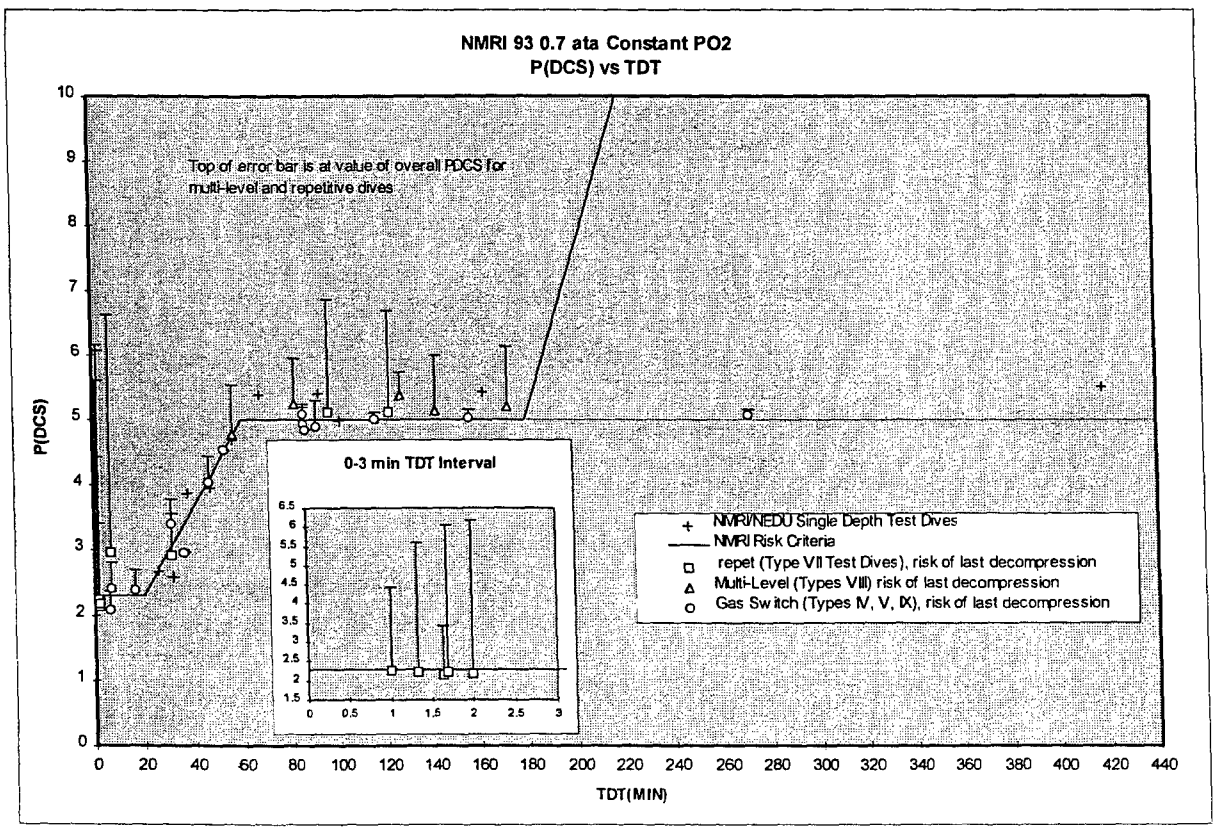


Figure 13

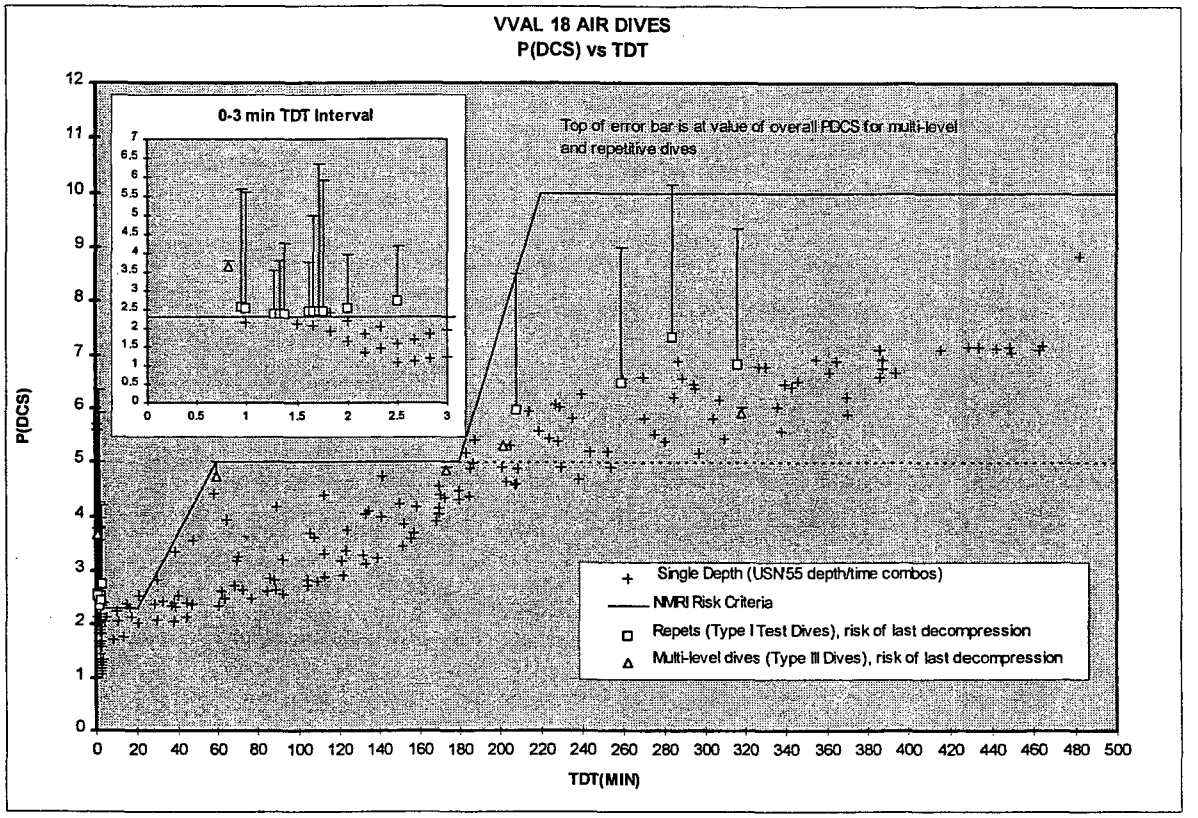


Figure 14

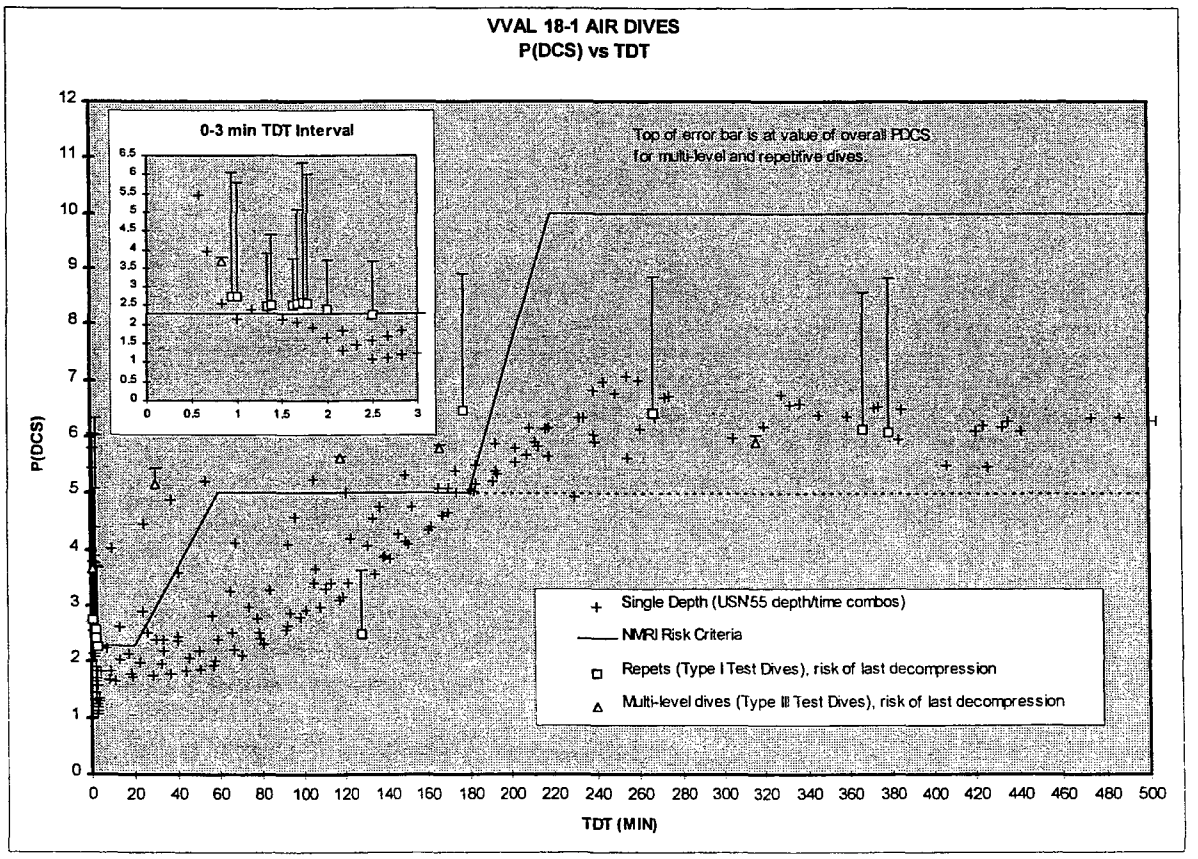


Figure 15

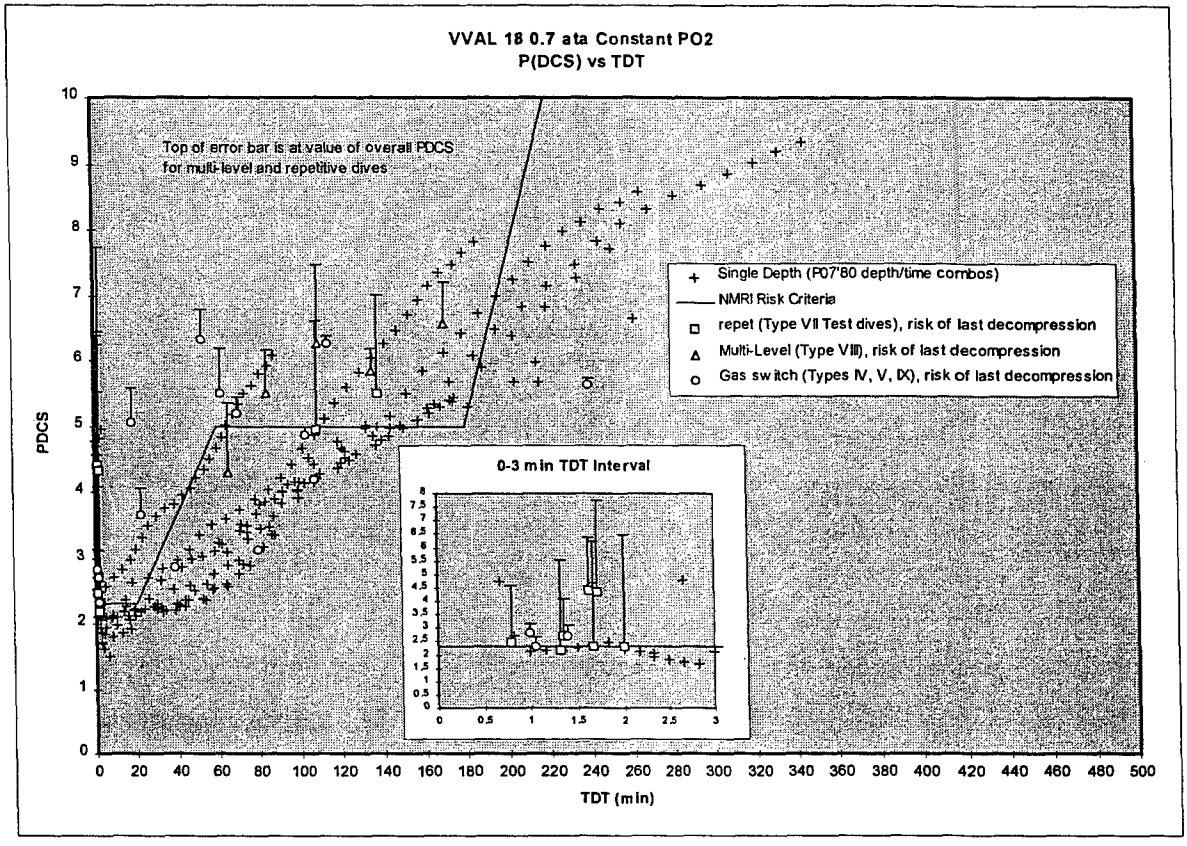
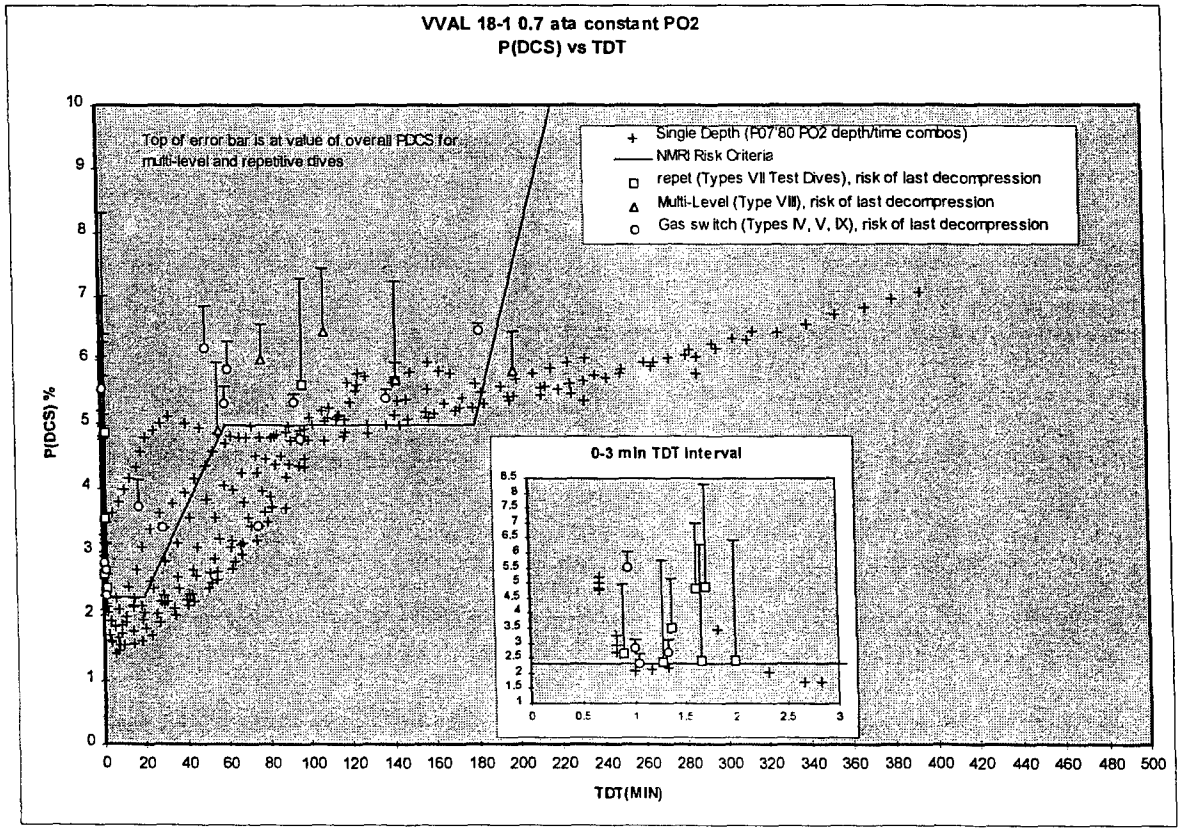


Figure 16



APPENDIX A

VVAL18 L-E Decompression Model
Real Time Implementation

This document describes the real time implementation of the VVAL18 decompression model. The full model description is given in NEDU Report 1-83 entitled: Computer algorithms used in computing the MK15 constant 0.7 ata oxygen partial pressure decompression tables.

The real time implementation assumes instantaneous depth changes. There are two Basic Update Equations (page 2) used to update the 9 tissues. After initialization, the algorithm runs at frequent intervals, generally every 2 seconds. It uses the DEPTH supplied by the computer depth transducer and the appropriate update equation to update the tissue tensions. By running at 2 second or shorter intervals the tissue tensions values will be close to those obtained by the more exact linear update scheme used in the above reference. Thus, assuming instantaneous simplifies the algorithm while producing essentially insignificant errors in tissue tension calculations.

Certain Constants, Variables and Parameters (page 3) as used by the algorithm are presented. An Mvalue Matrix (page 4) gives specific values for these parameters and defines the maximum tissue tensions which will be used to determine decompression stops. Model behavior is changed by changing these parameter values.

When the decompression computer is turned on all the tissues are assumed saturated on air (page 3). So long as the diver is shallower than some specified depth (3-5 fsw) he is assumed to be breathing air. The computer can initially be set up to compute a decompression schedule for a diver breathing air or a constant 0.7 ata PO2. At present there is no way to change the breathing gas used by the computer once it is turned on.

Once the tissue gas tensions are initialized they are updated each time the algorithm runs. There are several routines which use these tissue tensions as input variables to compute information which is displayed to the diver. These routines do not change any of the tissue tensions, these are only changed by the Basic Update Equations.

The Remaining No-Decompression Time Computation (page 5) determines how much time is left before a decompression stop is required. So long as the diver is in a no-decompression status the remaining no-decompression time is displayed.

The Total Decompression Time Computation (page 6 ff)estimates the remaining decompression time. If the diver is in a no-decompression status this time will simply be the depth divided by the maximum ascent rate, or the ascent time to the surface. If decompression stops are required then the stop times are added to this ascent time. The first step in this procedure is to determine the depth of the first stop (FSD). This is the shallowest the diver should be at any time. Once this is found then a complete decompression schedule is computed and the total decompression time displayed.

The diver decompresses by matching his depth to the FSD and not ascending any shallower until the algorithm tells him it is safe to do so.

Basic Update Equations

Time since last update = dt
Run continuously every dt minutes to keep tissue tension P(I) updated as depth changes

$$PAMB = DEPTH + 33$$

If in constant fraction mode: FIO2 = FO2
If in constant PO2 mode: FIO2=(PIO2*33)/(PAMB)

$$PAN2 = (PAMB - PH2O)\,(1\text{-}FIO2) - AMBAO2 - PACO2$$

If P(I) < PAMB + PBOVP - PFVG then:

$$P(I) = P(I) \bullet e^{-K(I) \bullet dt} + PAN2 \bullet (1 - e^{-K(I) \bullet dt}) \quad \text{(exponential update)}$$

If P(I) ≥ PAMB + PBOVP - PFVG then:

$$P(I) = P(I) - K(I) \bullet \left[PAMB - PFVG - PAN2 + PBOVP\right] \bullet dt \quad \text{(linear update)}$$

Depth of first decompression stop (FSD) computed as first step in the Total Decompression Time Computation Procedure. Maximum FSD is 90 fsw in this implementation.

FSD is displayed along with the total decompression time (TDT) continuously.

Constants, Variables and Parameters

Constants

PACO2 = 1.50 fsw
PVO2 = 2.00 fsw
PH2O = 0.00 fsw
PVCO2 = 2.30 fsw
AMBAO2 = 0.00 fsw
PBOVP = 0.00 fsw

I = # tissues
HLFTM(I) = tissue I halftime
M(I,J) = tissue I Mvalue at depth J*10 (matrix rows)
PFVG = PVO2 + PVCO2 + PH2O = 4.3 fsw
K(I) = ln(2) / HLFTM(I)

Parameter values set before initialization

FO2 = 0.21 atm (for air) program running in air mode
PIO2 = 0.70 atm (for MK-15) program running in constant PO2 mode

Program always assumes air breathed when diver at surface.
At depth program runs in either the air mode or the constant PO2 mode.

Measured variables from UDM

DEPTH(fsw)

Initialization of Tissue Tensions at 1 ATA on Air

$$P(I) = (33-PH2O)\ (1 - 0.21) - PACO2$$

using current values

$$P(I) = 33*0.79 - 1.50 = 24.57 \text{ fsw}$$

Mvalue Matrix

TABLE OF MAXIMUM PERMISSIBLE TISSUE TENSIONS

{VVAL18.dat (NITROGEN)}

TISSUE HALF-TIMES

DEPTH	5 MIN 1.00 SDR	10 MIN 1.00 SDR	20 MIN 1.00 SDR	40 MIN 1.00 SDR	80 MIN 1.00 SDR	120 MIN 1.00 SDR	160 MIN 1.00 SDR	200 MIN 1.00 SDR	240 MIN 1.00 SDR
10 FSW	120.000	98.000	78.000	56.000	48.500	45.500	44.500	44.000	43.500
20 FSW	130.000	108.000	88.000	66.000	58.500	55.500	54.500	54.000	53.500
30 FSW	140.000	118.000	98.000	76.000	68.500	65.500	64.500	64.000	63.500
40 FSW	150.000	128.000	108.000	86.000	78.500	75.500	74.500	74.000	73.500
50 FSW	160.000	138.000	118.000	96.000	88.500	85.500	84.500	84.000	83.500
60 FSW	170.000	148.000	128.000	106.000	98.500	95.500	94.500	94.000	93.500
70 FSW	180.000	158.000	138.000	116.000	108.500	105.500	104.500	104.000	103.500
80 FSW	190.000	168.000	148.000	126.000	118.500	115.500	114.500	114.000	113.500
90 FSW	200.000	178.000	158.000	136.000	128.500	125.500	124.500	124.000	123.500

BLOOD PARAMETERS

(PRESSURE IN FSW; 33 FSW ATA)

PACO2	PH2O	PVCO2	PVO2	AMBAO2	PBOVP
1.50	.00	2.30	2.00	.00	.000

Matrix specifies number of tissues, tissue halftimes, and values for PACO2, PH2O, PVCO2, PVO2, AMBAO2, and PBOVP. The body of the matrix shows the maximum values for each tissue tension in fsw at each depth. In this implementation only values down to 90 fsw are used. A value in the matrix is specified as M(I,J), where I is the column (that is the tissue) and J is the row (that is the stop depth). In the above case stops are taken every 10 fsw.

Remaining No-Decompression Time Computation

For each tissue compute the time it will take for that tissue tension to reach the maximum value specified in the first row of the Mvalue Matrix at the current depth.

$$PAMB = DEPTH + 33$$

If in constant fraction mode: $FIO2 = FO2$
If in constant PO2 mode: $FIO2=(PIO2*33)/(PAMB)$

$$PAN2 = (PAMB - PH2O)\ (1-FIO2) - AMBAO2 - PACO2$$

for each tissue compute No-D time, NDT(I):

If $P(I) \geq M(I,1)$ $\quad NDT(I) = 0$
If $PAN2 \leq M(I,1)$ $\quad NDT(I) = 9999$ (infinity)

otherwise: $$NDT(I) = \frac{1}{K(I)} \bullet \ln\left[\frac{P(I) - PAN2}{M(I,1) - PAN2}\right]$$

The no-decompression time is the smallest value of all the computed *NDT(I)*.

Overview of Total Decompression Time Computation Procedure

Step 1 Find depth of first stop. This is a lookup procedure in the Mvalue Matrix. Instantaneous ascent is assumed. The FSD is displayed.

Step 2 Once the first stop depth is known all current tissue tension values are copied to temporary arrays [PP(I)] because the procedure will change these values as the stop times are computed.

If the tissue meets the criteria for being in the linear mode then compute the time it will take for it to enter the exponential mode [STLIN(I)]. Compute the time it will take each tissue to decay to it's Mvalue at the current stop depth. This time is composed of two parts, the time in the linear mode (SL) and the time in the exponential mode (STEXP). Note that SL will equal STLIN only in the case where the tissue Mvalue is less than the tension where it will become exponential (PXO).

The stop time is the longest of all the ST(I,J) computed.

Step 3 Once the stop time is known then each tissue tension must be updated at that stop depth before the next shallower stop time can be computed. A check is done to see if the tissue will changed from the linear to the exponential mode during the stop. This will happen if STLIN exceeds the stop time.

After all tissues have been updated the stop depth is decrement by 10 fsw, and the value of the subscript *J* decrement by one. Then back to Step 2 to compute the next stop time. This continues until the surface is reached, that is when SDEPTH = 0.

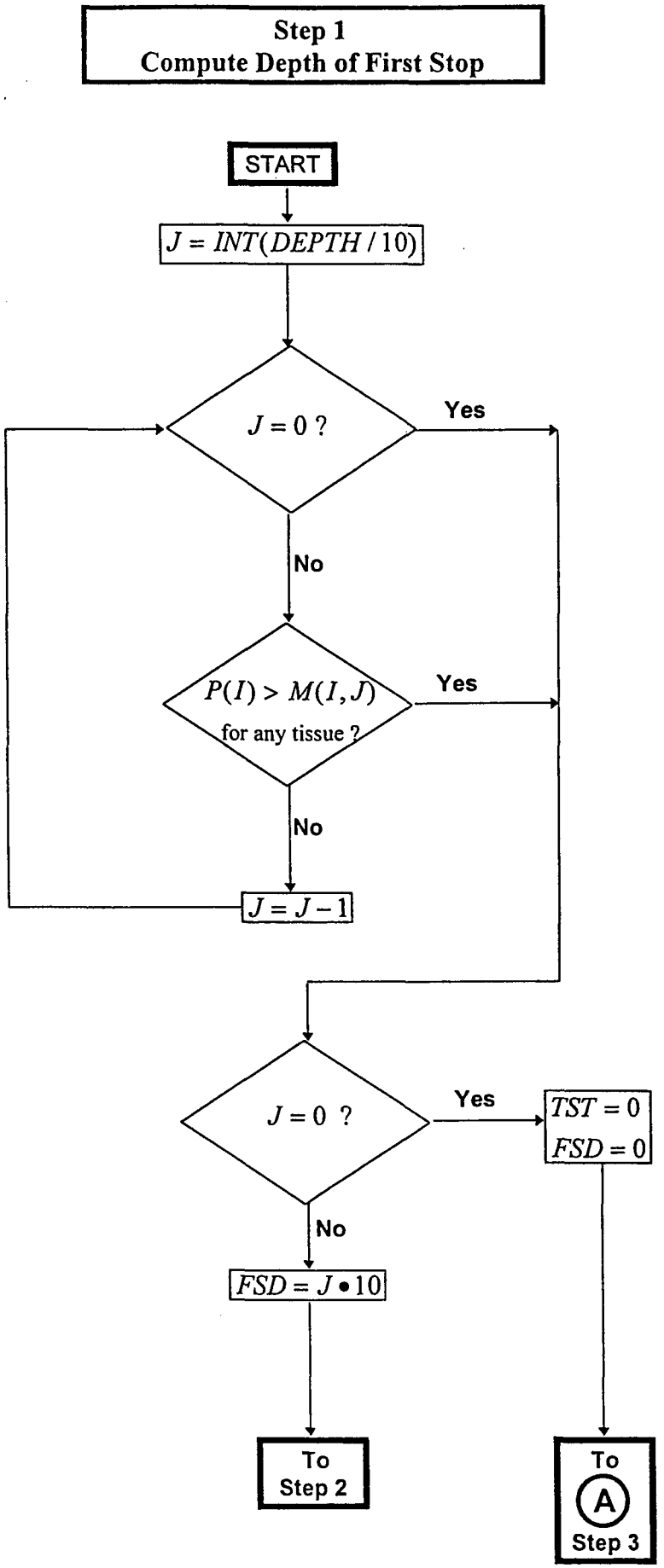
Since the stop times are computed assuming instantaneous ascent the ascent time from the current depth is added to the sum of all the individual stop times.

During these computations instantaneous ascent is assumed to save time and simplify the computation. The value computed for the no-decompression time will under estimate the actual no-decompression time by a small amount, generally less than a minute.

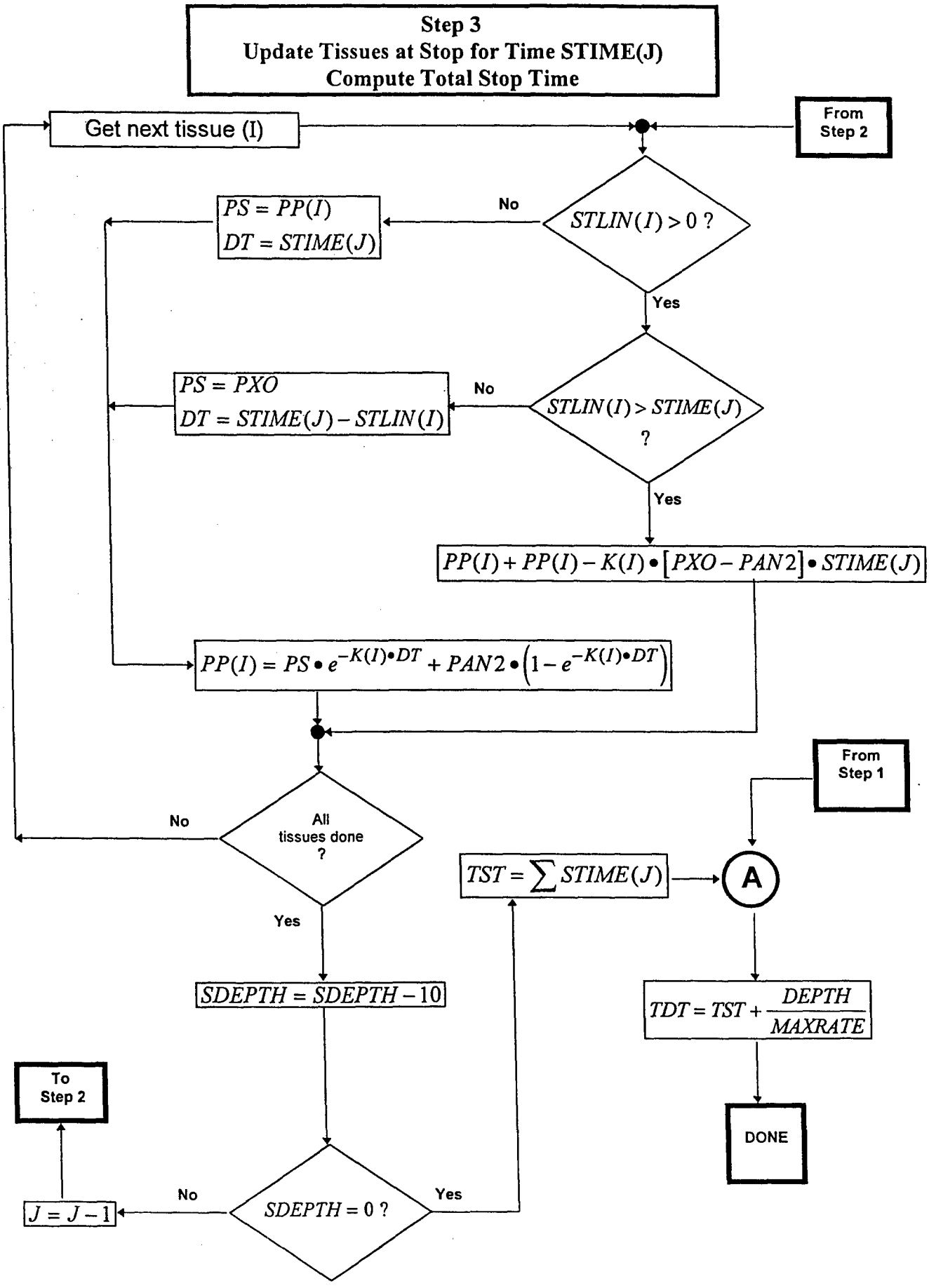
When the TDT is computed, if the diver is deeper than the first stop depth, the computed value will be slightly shorter than the actual TDT taken at the end of the dive. The reason for this is that during the actual ascent to the first stop depth some of the tissues may continue to take up gas while assuming instantaneous ascent will prevent this from happening. The greater the distance from the current depth to the first stop depth, the greater the error. For example after 30 min at 150 fsw the TDT is computed as 57.4 min when the actual TDT is 59.2 min. Once the first stop depth is reached, the computed TDT and the actual TDT will be essentially identical.

The TDT computation is done only to give the diver an estimate of how long it will take to decompress. It is completely separate from the real time updates which will actually determine

what the decompression profile will be, and the TDT computation has no effect on the real time update. The real time computation will always have the diver follow the correct decompression schedule since it updates during the actual ascent. The only error is in the **estimate** of what the TDT will be, there will be no error in the actual stop times computed as the diver follows the FSD as computed by the algorithm to the surface.



Total Decompression Time Computation Procedure



Total Decompression Time Computation Procedure

APPENDIX B

AIR DECOMPRESSION TABLES

Appendix B-1

VVAL18 Air Decompression Tables

TABLE OF MAXIMUM PERMISSIBLE TISSUE TENSIONS

{VVAL18.DAT (NITROGEN)}

TISSUE HALF-TIMES

DEPTH	5 MIN 1.00 SDR	10 MIN 1.00 SDR	20 MIN 1.00 SDR	40 MIN 1.00 SDR	80 MIN 1.00 SDR	120 MIN 1.00 SDR	160 MIN 1.00 SDR	200 MIN 1.00 SDR	240 MIN 1.00 SDR
10 FSW	120.000	98.000	78.000	56.000	48.500	45.500	44.500	44.000	43.500
20 FSW	130.000	108.000	88.000	66.000	58.500	55.500	54.500	54.000	53.500
30 FSW	140.000	118.000	98.000	76.000	68.500	65.500	64.500	64.000	63.500
40 FSW	150.000	128.000	108.000	86.000	78.500	75.500	74.500	74.000	73.500
50 FSW	160.000	138.000	118.000	96.000	88.500	85.500	84.500	84.000	83.500
60 FSW	170.000	148.000	128.000	106.000	98.500	95.500	94.500	94.000	93.500
70 FSW	180.000	158.000	138.000	116.000	108.500	105.500	104.500	104.000	103.500
80 FSW	190.000	168.000	148.000	126.000	118.500	115.500	114.500	114.000	113.500
90 FSW	200.000	178.000	158.000	136.000	128.500	125.500	124.500	124.000	123.500
100 FSW	210.000	188.000	168.000	146.000	138.500	135.500	134.500	134.000	133.500
110 FSW	220.000	198.000	178.000	156.000	148.500	145.500	144.500	144.000	143.500
120 FSW	230.000	208.000	188.000	166.000	158.500	155.500	154.500	154.000	153.500
130 FSW	240.000	218.000	198.000	176.000	168.500	165.500	164.500	164.000	163.500
140 FSW	250.000	228.000	208.000	186.000	178.500	175.500	174.500	174.000	173.500
150 FSW	260.000	238.000	218.000	196.000	188.500	185.500	184.500	184.000	183.500
160 FSW	270.000	248.000	228.000	206.000	198.500	195.500	194.500	194.000	193.500
170 FSW	280.000	258.000	238.000	216.000	208.500	205.500	204.500	204.000	203.500
180 FSW	290.000	268.000	248.000	226.000	218.500	215.500	214.500	214.000	213.500
190 FSW	300.000	278.000	258.000	236.000	228.500	225.500	224.500	224.000	223.500
200 FSW	310.000	288.000	268.000	246.000	238.500	235.500	234.500	234.000	233.500
210 FSW	320.000	298.000	278.000	256.000	248.500	245.500	244.500	244.000	243.500
220 FSW	330.000	308.000	288.000	266.000	258.500	255.500	254.500	254.000	253.500
230 FSW	340.000	318.000	298.000	276.000	268.500	265.500	264.500	264.000	263.500
240 FSW	350.000	328.000	308.000	286.000	278.500	275.500	274.500	274.000	273.500
250 FSW	360.000	338.000	318.000	296.000	288.500	285.500	284.500	284.000	283.500
260 FSW	370.000	348.000	328.000	306.000	298.500	295.500	294.500	294.000	293.500
270 FSW	380.000	358.000	338.000	316.000	308.500	305.500	304.500	304.000	303.500
280 FSW	390.000	368.000	348.000	326.000	318.500	315.500	314.500	314.000	313.500
290 FSW	400.000	378.000	358.000	336.000	328.500	325.500	324.500	324.000	323.500
300 FSW	410.000	388.000	368.000	346.000	338.500	335.500	334.500	334.000	333.500

BLOOD PARAMETERS

(PRESSURE IN FSW; 33 FSW ATA)

PACO2	PH2O	PVCO2	PVO2	AMBAO2	PBOVP
1.50	.00	2.30	2.00	.00	.000

13: 9 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
35	310	0:25													58	58:35
40	200	0:30													38	38:40
40	210	0:30													47	47:40
40	230	0:30													64	64:40
40	250	0:30													89	89:40
40	270	0:30													112	112:40
40	300	0:30													141	141:40
limit line																
40	360	0:30													187	187:40
40	480	0:30													286	286:40
40	720	0:20													8 474	482:40
50	100	0:40													9	9:50
50	110	0:40													20	20:50
50	120	0:40													29	29:50
50	140	0:40													70	70:50
50	160	0:40													105	105:50
50	180	0:40													134	134:50
50	200	0:40													170	170:50
50	220	0:40													207	207:50
50	240	0:30													9 229	238:50
60	60	1:00													0	1:00
60	70	0:50													16	17:00
60	80	0:50													37	38:00
60	100	0:50													69	70:00
60	120	0:50													123	124:00
60	140	0:40													12 157	170:00

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21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
60	160	0:40												22	185	208:00
60	180	0:40												48	205	254:00
60	200	0:40												70	226	297:00
60	240	0:40												104	266	371:00
60	360	0:30											15	200	373	589:00
60	480	0:30											58	247	496	802:00
60	720	0:30											119	372	555	1047:00
70	50	1:00													4	5:10
70	60	1:00													38	39:10
70	70	1:00													67	68:10
70	80	1:00													91	92:10
70	90	0:50												15	92	108:10
70	100	0:50												27	113	141:10
70	110	0:50												38	134	173:10
70	120	0:50												47	155	203:10
70	130	0:50												55	174	230:10
70	140	0:50												67	185	253:10
70	150	0:50												86	193	280:10
70	160	0:40											2	101	206	310:10
70	170	0:40											5	113	219	338:10
80	40	1:20													0	1:20
80	50	1:10													46	47:20
80	60	1:10													85	86:20
80	70	1:00												19	93	113:20
80	80	1:00												40	92	133:20

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21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
80	90	1:00												57	112	170:20
80	100	0:50											2	70	136	209:20
80	110	0:50											12	69	162	244:20
80	120	0:50											21	69	184	275:20
80	130	0:50											28	85	190	304:20
80	140	0:50											34	101	200	336:20
80	150	0:50											38	118	213	370:20
limit line																
80	180	0:50											65	139	257	462:20
80	240	0:40										12	111	184	336	644:20
80	360	0:40										60	166	254	517	998:20
80	480	0:40										115	201	343	556	1216:20
80	720	0:30									15	179	307	415	555	1472:20
90	30	1:30													0	1:30
90	40	1:20													35	36:30
90	50	1:20													87	88:30
90	60	1:10												29	93	123:30
90	70	1:10												57	92	150:30
90	80	1:00											9	69	106	185:30
90	90	1:00											25	69	133	228:30
90	100	1:00											38	69	162	270:30
90	110	1:00											49	72	185	307:30
90	120	0:50										3	55	92	192	343:30
90	130	0:50										9	56	110	210	386:30
100	25	1:40													0	1:40
100	30	1:30													2	3:40

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21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
100	40	1:30													71	72:40
100	50	1:20												28	92	121:40
100	60	1:20												64	93	158:40
100	70	1:10											21	69	92	183:40
100	80	1:10											42	68	124	235:40
100	90	1:00										3	55	70	155	284:40
100	100	1:00										15	56	69	198	339:40
100	110	1:00										26	55	92	213	387:40
100	120	1:00										34	56	114	228	433:40
limit line																
100	180	0:50									16	58	111	169	382	737:40
100	240	0:50									40	92	136	224	512	1005:40
100	360	0:40								11	84	138	197	358	555	1344:40
100	480	0:40								32	118	172	267	416	555	1561:40
100	720	0:40								77	169	257	332	415	555	1806:40
110	25	1:50													0	1:50
110	30	1:40													31	32:50
110	40	1:30												11	92	104:50
110	50	1:30												59	92	152:50
110	60	1:20											24	69	92	186:50
110	70	1:20											51	69	108	229:50
110	80	1:10										16	55	69	153	294:50
110	90	1:10										32	55	68	205	361:50
110	100	1:10										45	55	88	226	415:50
120	20	2:00													0	2:00
120	25	1:50													13	15:00

13: 9 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
120	30	1:50													60	62:00
120	40	1:40												38	92	132:00
120	50	1:30											17	69	92	180:00
120	60	1:30											52	69	92	215:00
120	70	1:20										22	55	69	141	289:00
120	80	1:20										42	56	69	196	365:00
120	90	1:10									12	46	55	84	243	442:00
120	100	1:10									25	45	56	109	278	515:00
120	120	1:00								4	40	45	74	148	335	648:00
120	180	1:00								31	49	92	119	230	521	1044:00
120	240	0:50							5	56	78	105	167	342	556	1311:00
120	360	0:50							41	77	119	158	276	415	555	1643:00
120	480	0:50							73	103	150	216	332	416	555	1847:00
120	720	0:40						20	108	155	225	276	332	415	555	2088:00
130	15	2:10													0	2:10
130	20	2:00													1	3:10
130	25	2:00													38	40:10
130	30	1:50												7	80	89:10
130	40	1:40											7	56	92	157:10
130	50	1:40											41	70	92	205:10
130	60	1:30										20	55	70	113	260:10
130	70	1:20									1	46	55	69	182	355:10
130	80	1:20									20	46	55	74	251	448:10
limit line																
130	90	1:20									36	46	55	100	294	533:10
140	15	2:20													0	2:20

13: 9 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
140	20	2:10													14	16:20
140	25	2:00												8	53	63:20
140	30	1:50											1	21	89	113:20
140	40	1:50											22	64	92	180:20
140	50	1:40										15	48	69	93	227:20
140	60	1:30									5	38	55	68	159	327:20
140	70	1:30									22	46	55	70	233	428:20
140	80	1:20								3	40	46	54	90	299	534:20
limit line																
140	90	1:20								19	39	46	55	140	319	620:20
140	120	1:10							15	35	39	49	110	202	440	892:20
140	180	1:00						11	31	42	79	92	166	328	556	1307:20
140	240	1:00						20	55	69	83	138	238	411	556	1572:20
140	360	0:50					9	54	74	103	133	218	332	415	556	1896:20
140	480	0:50					25	77	92	135	186	276	331	416	555	2095:20
140	720	0:50					59	109	144	196	236	277	331	416	555	2325:20
150	10	2:30													0	2:30
150	15	2:20													2	4:30
150	20	2:10												3	23	28:30
150	25	2:00											1	17	64	84:30
150	30	2:00											10	29	92	133:30
150	40	1:50										9	28	69	93	201:30
150	50	1:40									5	24	55	69	114	269:30
150	60	1:40									18	45	55	70	196	386:30
150	70	1:30								6	37	46	55	77	289	512:30
150	80	1:30								23	40	46	55	129	317	612:30

13: 9 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
160	10	2:40													0	2:40
160	15	2:30													8	10:40
160	20	2:20												12	30	44:40
160	25	2:10											9	18	75	104:40
160	30	2:00										4	14	39	92	151:40
160	40	1:50									2	20	34	69	92	219:40
160	50	1:50									18	29	56	69	156	330:40
160	60	1:40								10	26	46	55	69	255	463:40
limit line																
160	70	1:30							1	22	39	46	55	110	308	583:40
170	10	2:50													0	2:50
170	15	2:30												3	15	20:50
170	20	2:20											4	17	37	60:50
170	25	2:10										4	13	20	82	121:50
170	30	2:00									1	11	16	46	92	168:50
170	40	2:00									10	23	40	69	95	239:50
170	50	1:50								9	20	36	55	69	196	387:50
170	60	1:40							4	17	32	46	55	82	297	535:50
limit line																
170	70	1:40							12	28	39	46	55	147	334	663:50
170	90	1:30						11	30	35	39	45	107	213	441	923:50
170	120	1:20					14	27	31	34	49	92	165	275	551	1240:50
170	180	1:10				15	25	27	53	69	89	143	247	415	555	1640:50
170	240	1:00			1	23	40	55	62	84	128	206	326	415	555	1897:50
170	360	1:00		18	46	52	82	92	135	211	276	331	416	555		2216:50
170	480	1:00	35	64	75	98	128	192	236	276	332	415	556			2409:50
180	10	3:00													0	3:00

13: 9 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
180	15	2:40												8	19	30:00
180	20	2:30											11	17	46	77:00
180	25	2:20										10	14	24	88	139:00
180	30	2:10									7	11	21	50	93	185:00
180	40	2:00								6	15	23	45	69	134	295:00
180	50	1:50							3	17	19	42	55	70	240	449:00
180	60	1:50							14	17	39	46	55	115	309	598:00
190	5	3:10													0	3:10
190	10	3:00													5	8:10
190	15	2:40											4	8	23	38:10
190	20	2:30										4	14	17	54	92:10
190	25	2:20									5	11	14	30	93	156:10
190	30	2:10								3	10	11	26	56	92	201:10
190	40	2:00							3	8	20	23	50	69	170	346:10
limit line																
190	50	2:00							12	17	22	46	55	81	279	515:10
190	60	1:50						8	16	22	39	46	55	150	334	673:10
200	5	3:20													0	3:20
200	10	3:10													10	13:20
200	15	2:40											1	7	11	22	44:20
200	20	2:30										2	8	14	16	66	109:20
200	25	2:20									1	10	11	14	39	92	170:20
200	30	2:20									9	9	14	27	62	100	224:20
200	40	2:00							1	7	12	20	24	55	69	203	394:20
200	50	2:00							6	15	17	27	46	55	105	301	575:20
200	60	1:50						4	13	15	28	40	45	60	180	357	745:20

13: 9 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
200	90	1:40				7	23	28	30	34	40	85	166	261	542	1219:20
200	120	1:30			13	23	24	28	30	53	78	138	201	381	555	1527:20
200	180	1:20		18	21	23	31	55	61	89	124	202	322	416	555	1920:20
200	240	1:10	7	19	31	45	50	55	90	122	178	269	332	415	555	2171:20
200	360	1:10	25	40	42	63	75	96	133	194	236	276	332	416	555	2486:20

Appendix B-2

VVAL18-1 Air Decompression Tables

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TABLE OF MAXIMUM PERMISSIBLE TISSUE TENSIONS

{VVAL18-1.DAT(NITROGEN)}

TISSUE HALF-TIMES

DEPTH	5 MIN 1.00 SDR	10 MIN 1.00 SDR	20 MIN 1.00 SDR	35 MIN 1.00 SDR	45 MIN 1.00 SDR	80 MIN 1.00 SDR	120 MIN 1.00 SDR	255 MIN 1.00 SDR	
10 FSW	120.000	90.000	71.500	59.200	55.600	50.550	47.600	40.400	
20 FSW	130.000	100.000	81.500	69.200	65.600	60.550	57.600	50.400	
30 FSW	140.000	110.000	91.500	79.200	75.600	70.550	67.600	60.400	
40 FSW	150.000	120.000	101.500	89.200	85.600	80.550	77.600	70.400	
50 FSW	160.000	130.000	111.500	99.200	95.600	90.550	87.600	80.400	
60 FSW	170.000	140.000	121.500	109.200	105.600	100.550	97.600	90.400	
70 FSW	180.000	150.000	131.500	119.200	115.600	110.550	107.600	100.400	
80 FSW	190.000	160.000	141.500	129.200	125.600	120.550	117.600	110.400	
90 FSW	200.000	170.000	151.500	139.200	135.600	130.550	127.600	120.400	
100 FSW	210.000	180.000	161.500	149.200	145.600	140.550	137.600	130.400	
110 FSW	220.000	190.000	171.500	159.200	155.600	150.550	147.600	140.400	
120 FSW	230.000	200.000	181.500	169.200	165.600	160.550	157.600	150.400	
130 FSW	240.000	210.000	191.500	179.200	175.600	170.550	167.600	160.400	
140 FSW	250.000	220.000	201.500	189.200	185.600	180.550	177.600	170.400	
150 FSW	260.000	230.000	211.500	199.200	195.600	190.550	187.600	180.400	
160 FSW	270.000	240.000	221.500	209.200	205.600	200.550	197.600	190.400	
170 FSW	280.000	250.000	231.500	219.200	215.600	210.550	207.600	200.400	
180 FSW	290.000	260.000	241.500	229.200	225.600	220.550	217.600	210.400	
190 FSW	300.000	270.000	251.500	239.200	235.600	230.550	227.600	220.400	
200 FSW	310.000	280.000	261.500	249.200	245.600	240.550	237.600	230.400	
210 FSW	320.000	290.000	271.500	259.200	255.600	250.550	247.600	240.400	
220 FSW	330.000	300.000	281.500	269.200	265.600	260.550	257.600	250.400	
230 FSW	340.000	310.000	291.500	279.200	275.600	270.550	267.600	260.400	
240 FSW	350.000	320.000	301.500	289.200	285.600	280.550	277.600	270.400	
250 FSW	360.000	330.000	311.500	299.200	295.600	290.550	287.600	280.400	
260 FSW	370.000	340.000	321.500	309.200	305.600	300.550	297.600	290.400	
270 FSW	380.000	350.000	331.500	319.200	315.600	310.550	307.600	300.400	
280 FSW	390.000	360.000	341.500	329.200	325.600	320.550	317.600	310.400	
290 FSW	400.000	370.000	351.500	339.200	335.600	330.550	327.600	320.400	
300 FSW	410.000	380.000	361.500	349.200	345.600	340.550	337.600	330.400	

BLOOD PARAMETERS

(PRESSURE IN FSW; 33 FSW ATA)

PACO2	PH2O	PVCO2	PVO2	AMBAO2	PBOVP
1.50	.00	2.30	2.00	.00	.000

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
35	310	0:35													0	0:35
40	200	0:40													0	0:40
40	210	0:30													9	9:40
40	230	0:30													24	24:40
40	250	0:30													37	37:40
40	270	0:30													53	53:40
40	300	0:30													105	105:40
limit line																
40	360	0:30													230	230:40
40	480	0:30													425	425:40
40	720	0:20												58	590	648:40
50	100	0:50													0	0:50
50	110	0:40													12	12:50
50	120	0:40													23	23:50
50	140	0:40													40	40:50
50	160	0:40													67	67:50
50	180	0:40													96	96:50
50	200	0:40													120	120:50
50	220	0:40													149	149:50
50	240	0:40													183	183:50
60	60	1:00													0	1:00
60	70	0:50													6	7:00
60	80	0:50													25	26:00
60	100	0:50													64	65:00
60	120	0:50													92	93:00
60	140	0:40												6	127	134:00

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
60	160	0:40												18	152	171:00
60	180	0:40												26	176	203:00
60	200	0:40												42	212	255:00
60	240	0:40												76	330	407:00
60	360	0:40												175	577	753:00
60	480	0:30											23	356	590	970:00
60	720	0:30											172	441	590	1204:00
70	50	1:10													0	1:10
70	60	1:00													29	30:10
70	70	1:00													55	56:10
70	80	1:00													83	84:10
70	90	0:50												7	98	106:10
70	100	0:50												18	104	123:10
70	110	0:50												31	105	137:10
70	120	0:50												42	123	166:10
70	130	0:50												52	140	193:10
70	140	0:50												60	157	218:10
70	150	0:50												68	171	240:10
70	160	0:50												75	185	261:10
70	170	0:40											1	90	214	306:10
80	40	1:20													0	1:20
80	50	1:10													39	40:20
80	60	1:10													73	74:20
80	70	1:00												15	89	105:20
80	80	1:00												33	97	131:20

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
80	90	1:00												48	104	153:20
80	100	1:00												66	107	174:20
80	110	0:50											6	73	128	208:20
80	120	0:50											13	78	147	239:20
80	130	0:50											22	77	168	268:20
80	140	0:50											29	79	211	320:20
80	150	0:50											36	92	255	384:20
limit line																
80	180	0:50											51	128	354	534:20
80	240	0:40										3	99	169	535	807:20
80	360	0:40										40	155	370	591	1157:20
80	480	0:40										86	258	441	591	1377:20
80	720	0:40										247	353	441	591	1633:20
90	30	1:30													0	1:30
90	40	1:20													32	33:30
90	50	1:10												4	73	78:30
90	60	1:10												27	85	113:30
90	70	1:10												51	94	146:30
90	80	1:00											8	61	104	174:30
90	90	1:00											21	68	103	193:30
90	100	1:00											31	75	127	234:30
90	110	1:00											42	78	151	272:30
90	120	1:00											54	78	213	346:30
90	130	0:50										4	59	86	270	420:30
100	25	1:40													0	1:40
100	30	1:30													15	16:40

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
100	40	1:20												5	59	65:40
100	50	1:20												28	81	110:40
100	60	1:10											5	54	89	149:40
100	70	1:10											21	60	101	183:40
100	80	1:10											38	66	104	209:40
100	90	1:00										3	48	75	122	249:40
100	100	1:00										13	51	78	189	332:40
100	110	1:00										21	57	78	266	423:40
100	120	1:00										28	61	88	325	503:40
limit line																
100	180	0:50									13	51	101	152	586	904:40
100	240	0:50									26	90	123	322	590	1152:40
100	360	0:50									75	134	251	442	590	1493:40
100	480	0:40								12	116	201	352	442	590	1714:40
100	720	0:40								49	245	294	352	442	590	1973:40
110	20	1:50													0	1:50
110	25	1:40													11	12:50
110	30	1:40													38	39:50
110	40	1:30												25	67	93:50
110	50	1:20											11	44	82	138:50
110	60	1:20											26	60	95	182:50
110	70	1:10										4	44	63	104	216:50
110	80	1:10										16	49	72	122	260:50
110	90	1:10										29	51	78	213	372:50
110	100	1:10										40	57	78	297	473:50
120	15	2:00													0	2:00

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
120	20	1:50													7	9:00
120	25	1:40												1	30	33:00
120	30	1:40												11	46	59:00
120	40	1:30											9	34	74	119:00
120	50	1:20										1	27	52	86	168:00
120	60	1:20										12	37	61	100	212:00
120	70	1:20										24	48	68	113	255:00
120	80	1:10									3	38	48	78	218	387:00
120	90	1:10									13	40	56	78	317	506:00
120	100	1:10									23	41	62	82	399	609:00
120	120	1:00								3	35	51	62	126	520	799:00
120	180	1:00								30	44	81	110	334	590	1191:00
120	240	0:50							5	42	78	95	203	441	591	1457:00
120	360	0:50							28	70	118	189	353	441	591	1792:00
120	480	0:50							53	104	169	293	353	441	590	2005:00
120	720	0:40						2	106	220	251	294	352	442	590	2259:00
130	15	2:10													0	2:10
130	20	2:00													20	22:10
130	25	1:50												11	37	50:10
130	30	1:40											3	24	50	79:10
130	40	1:40											24	36	80	142:10
130	50	1:30										15	28	59	90	194:10
130	60	1:20									4	23	45	61	104	239:10
130	70	1:20									12	33	49	72	207	375:10
130	80	1:20									22	40	53	78	315	510:10

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
limit line																
130	90	1:10								1	34	40	61	78	413	629:10
140	10	2:20													0	2:20
140	15	2:10													6	8:20
140	20	2:00												7	23	32:20
140	25	1:50											4	17	43	66:20
140	30	1:50											12	30	54	98:20
140	40	1:40										11	27	41	81	162:20
140	50	1:30									6	23	32	61	94	218:20
140	60	1:30									17	27	48	65	169	328:20
140	70	1:20								5	21	40	48	77	294	487:20
140	80	1:20								10	32	40	57	78	409	628:20
limit line																
140	90	1:20								21	34	43	62	97	503	762:20
140	120	1:10							14	30	44	51	88	242	590	1061:20
140	180	1:00						8	34	38	68	92	183	441	590	1456:20
140	240	1:00						21	42	68	79	134	342	441	590	1719:20
140	360	1:00						53	66	104	144	293	353	441	590	2046:20
140	480	0:50					14	72	92	147	251	294	352	442	590	2256:20
140	720	0:50					44	113	195	220	251	293	353	441	590	2502:20
150	10	2:30													0	2:30
150	15	2:20													16	18:30
150	20	2:10												17	26	45:30
150	25	2:00											12	20	45	79:30
150	30	1:50										6	15	34	60	117:30
150	40	1:40									3	20	28	47	81	181:30
150	50	1:40									18	23	39	60	102	244:30

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
150	60	1:30								10	19	33	48	69	254	435:30
150	70	1:30								17	27	40	51	78	382	597:30
150	80	1:20							5	21	34	41	61	92	493	749:30
160	10	2:40													0	2:40
160	15	2:20												3	23	28:40
160	20	2:10											7	18	30	57:40
160	25	2:00										6	13	24	47	92:40
160	30	1:50									2	11	20	34	65	134:40
160	40	1:40								1	11	23	27	53	85	202:40
160	50	1:40								10	19	23	45	60	178	337:40
160	60	1:30							4	17	19	39	48	73	333	535:40
limit line																
160	70	1:30							11	17	33	40	55	88	461	707:40
170	10	2:50													0	2:50
170	15	2:30												11	23	36:50
170	20	2:10											1	14	17	36 70:50
170	25	2:00										1	12	13	29	50 107:50
170	30	2:00										8	12	23	35	70 150:50
170	40	1:50									7	15	23	28	58	99 232:50
170	50	1:40								3	17	20	25	48	63	254 432:50
170	60	1:40								14	17	24	39	49	83	403 631:50
limit line																
170	70	1:30							6	15	21	35	40	58	117	523 817:50
170	90	1:20						1	14	27	30	38	51	80	261	590 1094:50
170	120	1:20						15	23	30	39	44	78	149	427	590 1397:50
170	180	1:10					12	28	30	37	69	80	146	353	441	590 1788:50
170	240	1:10					25	29	55	61	76	123	293	353	441	590 2048:50

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
170	360	1:00			10	45	50	79	92	167	251	293	353	441	591	2374:50
170	480	1:00			26	60	75	82	186	220	251	293	353	441	590	2579:50
180	5	3:00													0	3:00
180	10	2:50													1	4:00
180	15	2:30											2	17	22	44:00
180	20	2:20										7	14	17	40	81:00
180	25	2:10									7	12	13	33	54	122:00
180	30	2:00								5	9	12	27	35	80	171:00
180	40	1:50							4	9	19	23	30	61	126	275:00
180	50	1:50							13	17	19	30	48	67	327	524:00
180	60	1:40						8	15	17	29	40	51	103	464	730:00
190	5	3:10													0	3:10
190	10	3:00													8	11:10
190	15	2:40											8	17	23	51:10
190	20	2:20									2	11	14	17	45	92:10
190	25	2:10								3	10	11	16	35	61	139:10
190	30	2:00							2	8	9	16	28	36	90	192:10
190	40	1:50						2	7	13	19	23	35	61	197	360:10
limit line																
190	50	1:50						6	16	17	19	35	48	87	380	611:10
190	60	1:40					4	13	15	17	34	40	56	127	521	830:10
200	5	3:20													0	3:20
200	10	3:10													16	19:20
200	15	2:40											1	13	17	23	57:20
200	20	2:30										7	11	14	20	46	101:20
200	25	2:20									8	10	11	20	34	75	161:20

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

21.00% FIXED FO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
200	30	2:10							6	9	9	20	27	42	97	213:20
200	40	2:00						6	8	16	20	22	40	67	259	441:20
200	50	1:50					3	12	15	17	19	40	49	108	427	693:20
200	60	1:50					12	13	16	21	34	40	63	159	564	925:20
200	90	1:30			3	11	19	24	26	34	44	74	147	404	590	1379:20
200	120	1:30			15	20	21	30	34	39	76	125	280	441	591	1675:20
200	180	1:20		15	23	26	28	44	61	81	118	289	353	441	590	2072:20
200	240	1:10	6	22	23	42	50	55	82	116	252	293	352	442	590	2328:20
200	360	1:10	18	39	42	58	75	83	186	220	251	294	352	442	590	2653:20

APPENDIX C

CONSTANT 0.7 ATA PO2 IN N2 DECOMPRESSION TABLES

Appendix C-1

P07'80 (VVAL18)
CONSTANT 0.7 ATA PO2 IN N2 DECOMPRESSION TABLES

TABLE OF MAXIMUM PERMISSIBLE TISSUE TENSIONS

{VVAL18.dat (NITROGEN)}

TISSUE HALF-TIMES

DEPTH	5 MIN 1.00 SDR	10 MIN 1.00 SDR	20 MIN 1.00 SDR	40 MIN 1.00 SDR	80 MIN 1.00 SDR	120 MIN 1.00 SDR	160 MIN 1.00 SDR	200 MIN 1.00 SDR	240 MIN 1.00 SDR
10 FSW	120.000	98.000	78.000	56.000	48.500	45.500	44.500	44.000	43.500
20 FSW	130.000	108.000	88.000	66.000	58.500	55.500	54.500	54.000	53.500
30 FSW	140.000	118.000	98.000	76.000	68.500	65.500	64.500	64.000	63.500
40 FSW	150.000	128.000	108.000	86.000	78.500	75.500	74.500	74.000	73.500
50 FSW	160.000	138.000	118.000	96.000	88.500	85.500	84.500	84.000	83.500
60 FSW	170.000	148.000	128.000	106.000	98.500	95.500	94.500	94.000	93.500
70 FSW	180.000	158.000	138.000	116.000	108.500	105.500	104.500	104.000	103.500
80 FSW	190.000	168.000	148.000	126.000	118.500	115.500	114.500	114.000	113.500
90 FSW	200.000	178.000	158.000	136.000	128.500	125.500	124.500	124.000	123.500
100 FSW	210.000	188.000	168.000	146.000	138.500	135.500	134.500	134.000	133.500
110 FSW	220.000	198.000	178.000	156.000	148.500	145.500	144.500	144.000	143.500
120 FSW	230.000	208.000	188.000	166.000	158.500	155.500	154.500	154.000	153.500
130 FSW	240.000	218.000	198.000	176.000	168.500	165.500	164.500	164.000	163.500
140 FSW	250.000	228.000	208.000	186.000	178.500	175.500	174.500	174.000	173.500
150 FSW	260.000	238.000	218.000	196.000	188.500	185.500	184.500	184.000	183.500
160 FSW	270.000	248.000	228.000	206.000	198.500	195.500	194.500	194.000	193.500
170 FSW	280.000	258.000	238.000	216.000	208.500	205.500	204.500	204.000	203.500
180 FSW	290.000	268.000	248.000	226.000	218.500	215.500	214.500	214.000	213.500
190 FSW	300.000	278.000	258.000	236.000	228.500	225.500	224.500	224.000	223.500
200 FSW	310.000	288.000	268.000	246.000	238.500	235.500	234.500	234.000	233.500
210 FSW	320.000	298.000	278.000	256.000	248.500	245.500	244.500	244.000	243.500
220 FSW	330.000	308.000	288.000	266.000	258.500	255.500	254.500	254.000	253.500
230 FSW	340.000	318.000	298.000	276.000	268.500	265.500	264.500	264.000	263.500
240 FSW	350.000	328.000	308.000	286.000	278.500	275.500	274.500	274.000	273.500
250 FSW	360.000	338.000	318.000	296.000	288.500	285.500	284.500	284.000	283.500
260 FSW	370.000	348.000	328.000	306.000	298.500	295.500	294.500	294.000	293.500
270 FSW	380.000	358.000	338.000	316.000	308.500	305.500	304.500	304.000	303.500
280 FSW	390.000	368.000	348.000	326.000	318.500	315.500	314.500	314.000	313.500
290 FSW	400.000	378.000	358.000	336.000	328.500	325.500	324.500	324.000	323.500
300 FSW	410.000	388.000	368.000	346.000	338.500	335.500	334.500	334.000	333.500

BLOOD PARAMETERS

(PRESSURE IN FSW; 33 FSW ATA)

PACO2	PH2O	PVCO2	PVO2	AMBAO2	PBOVP
1.50	.00	2.30	2.00	.00	.000

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.dat (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130 120 110 100 90 80 70 60 50 40 30 20 10	TOTAL ASCNT TIME (M:S)
40	367	0:40	0	0:40
limit line				
40	370	0:30	1	1:40
40	380	0:30	2	2:40
40	390	0:30	3	3:40
50	143	0:50	0	0:50
50	150	0:40	4	4:50
50	160	0:40	8	8:50
50	170	0:40	12	12:50
50	180	0:40	16	16:50
50	190	0:40	19	19:50
50	200	0:40	22	22:50
50	210	0:40	25	25:50
50	220	0:40	29	29:50
50	230	0:40	33	33:50
50	240	0:40	38	38:50
50	250	0:40	42	42:50
50	260	0:40	46	46:50
50	270	0:40	49	49:50
50	280	0:40	53	53:50
50	290	0:40	56	56:50
50	300	0:40	59	59:50
50	310	0:40	62	62:50
50	320	0:40	64	64:50
50	330	0:40	67	67:50
limit line				
50	340	0:40	70	70:50

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.dat (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW) (M)	BTM TM (FSW)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
50	350	0:40													73	73:50
50	360	0:40													77	77:50
50	370	0:40													80	80:50
50	380	0:40													84	84:50
50	390	0:40													87	87:50
60	74	1:00													0	1:00
60	80	0:50													4	5:00
60	90	0:50													9	10:00
60	100	0:50													13	14:00
60	110	0:50													17	18:00
60	120	0:50													25	26:00
60	130	0:50													32	33:00
60	140	0:50													39	40:00
60	150	0:50													45	46:00
60	160	0:50													50	51:00
60	170	0:50													56	57:00
60	180	0:40												4	59	64:00
60	190	0:40												8	62	71:00
60	200	0:40												12	65	78:00
60	210	0:40												16	68	85:00
60	220	0:40												19	71	91:00
60	230	0:40												22	74	97:00
60	240	0:40												25	76	102:00
60	250	0:40												28	79	108:00
60	260	0:40												30	82	113:00

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.dat (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
60	270	0:40												32	85	118:00
60	280	0:40												36	87	124:00
limit line																
60	290	0:40												40	89	130:00
60	300	0:40												44	91	136:00
60	310	0:40												47	94	142:00
60	320	0:40												51	96	148:00
60	330	0:40												54	98	153:00
60	340	0:40												57	100	158:00
60	350	0:40												60	102	163:00
60	360	0:40												63	104	168:00
60	370	0:40												66	108	175:00
60	380	0:40												68	111	180:00
60	390	0:40												71	114	186:00
70	51	1:10													0	1:10
70	60	1:00													9	10:10
70	70	1:00													18	19:10
70	80	1:00													25	26:10
70	90	0:50												3	28	32:10
70	100	0:50												8	33	42:10
70	110	0:50												12	39	52:10
70	120	0:50												16	45	62:10
70	130	0:50												19	51	71:10
70	140	0:50												22	56	79:10
70	150	0:50												29	58	88:10
70	160	0:50												36	62	99:10

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.dat (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
70	170	0:50												43	65	109:10
limit line																
70	180	0:50												48	70	119:10
70	190	0:40											1	53	73	128:10
70	200	0:40											2	57	76	136:10
70	210	0:40											6	57	80	144:10
70	220	0:40											11	56	84	152:10
70	230	0:40											14	59	86	160:10
70	240	0:40											18	62	89	170:10
70	250	0:40											21	66	91	179:10
70	260	0:40											24	69	93	187:10
70	270	0:40											27	71	97	196:10
70	280	0:40											29	75	99	204:10
70	290	0:40											31	78	102	212:10
70	300	0:40											33	81	105	220:10
70	310	0:40											35	83	109	228:10
70	320	0:40											37	86	113	237:10
70	330	0:40											42	85	118	246:10
70	340	0:40											45	86	124	256:10
70	350	0:40											49	88	127	265:10
80	39	1:20													0	1:20
80	40	1:10													1	2:20
80	50	1:10													15	16:20
80	60	1:10													27	28:20
80	70	1:00												9	28	38:20
80	80	1:00												18	28	47:20

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.dat (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 PPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
80	90	1:00												25	34	60:20
limit line																
80	100	0:50											3	28	42	74:20
80	110	0:50											8	28	50	87:20
80	120	0:50											12	29	57	99:20
80	130	0:50											16	36	57	110:20
80	140	0:50											19	42	62	124:20
80	150	0:50											21	49	66	137:20
80	160	0:50											24	55	70	150:20
80	170	0:50											29	57	75	162:20
80	180	0:50											36	57	79	173:20
80	190	0:50											43	56	84	184:20
80	200	0:40										1	48	59	86	195:20
80	210	0:40										2	52	64	89	208:20
80	220	0:40										3	56	68	92	220:20
80	230	0:40										7	56	73	96	233:20
80	240	0:40										11	56	77	99	244:20
80	250	0:40										14	57	80	104	256:20
80	260	0:40										18	57	84	109	269:20
80	270	0:40										21	59	85	116	282:20
80	280	0:40										24	63	85	123	296:20
80	290	0:40										27	66	85	130	309:20
80	300	0:40										29	70	88	133	321:20
80	310	0:40										31	73	91	137	333:20
80	320	0:40										33	76	94	141	345:20
90	32	1:30													0	1:30

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.dat (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
90	40	1:20													14	15:30
90	50	1:10												3	28	32:30
90	60	1:10												17	28	46:30
90	70	1:00											1	28	28	58:30
limit line																
90	80	1:00											10	29	34	74:30
90	90	1:00											19	28	43	91:30
90	100	1:00											26	28	52	107:30
90	110	0:50										4	28	32	57	122:30
90	120	0:50										9	28	40	62	140:30
90	130	0:50										13	28	49	66	157:30
90	140	0:50										16	29	56	72	174:30
90	150	0:50										19	36	56	76	188:30
90	160	0:50										22	42	57	81	203:30
90	170	0:50										24	49	57	88	219:30
90	180	0:50										26	55	61	91	234:30
90	190	0:50										32	56	67	94	250:30
100	27	1:40													0	1:40
100	30	1:30													6	7:40
100	35	1:30													17	18:40
100	40	1:30													28	29:40
100	45	1:20												10	28	39:40
100	50	1:20												19	28	48:40
100	55	1:20												27	29	57:40
100	60	1:10											7	28	28	64:40
100	65	1:10											14	28	28	71:40

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.dat (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
limit line																
100	70	1:10											20	28	31	80:40
100	75	1:10											26	28	36	91:40
100	80	1:00										3	28	29	41	102:40
100	90	1:00										13	28	28	52	122:40
100	100	1:00										21	28	33	61	144:40
100	110	1:00										27	29	43	65	165:40
110	24	1:50													0	1:50
110	25	1:40													3	4:50
110	30	1:40													17	18:50
110	35	1:30												2	28	31:50
110	40	1:30												14	28	43:50
110	45	1:30												25	28	54:50
limit line																
110	50	1:20											7	28	28	64:50
110	55	1:20											16	28	29	74:50
110	60	1:20											25	28	28	82:50
110	65	1:10										4	29	28	32	94:50
110	70	1:10										12	28	28	38	107:50
110	80	1:10										24	28	29	50	132:50
110	90	1:00									7	28	28	33	65	162:50
120	19	2:00													0	2:00
120	20	1:50													1	3:00
120	25	1:50													12	14:00
120	30	1:40												4	24	30:00
120	35	1:40												14	29	45:00
120	40	1:30											5	23	28	58:00

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.dat (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
limit line																
120	45	1:30											12	28	28	70:00
120	50	1:20										2	21	28	28	81:00
120	55	1:20										6	27	29	28	92:00
120	60	1:20										14	29	28	32	105:00
120	70	1:10									3	28	28	29	48	138:00
120	80	1:10									17	28	28	30	68	173:00
130	16	2:10													0	2:10
130	20	2:00													6	8:10
130	25	1:50												5	17	24:10
130	30	1:40											3	9	27	41:10
130	35	1:40											7	20	28	57:10
130	40	1:30										1	14	27	28	72:10
limit line																
130	45	1:30										7	20	28	28	85:10
130	50	1:30										13	26	28	29	98:10
130	60	1:20									7	26	28	28	42	133:10
130	70	1:20									23	28	28	28	66	175:10
140	13	2:20													0	2:20
140	15	2:10													2	4:20
140	20	2:00												4	7	13:20
140	25	1:50											4	7	21	34:20
140	30	1:40										2	7	13	28	52:20
limit line																
140	35	1:40										5	12	23	28	70:20
140	40	1:30									1	10	16	28	29	86:20
140	45	1:30									4	14	24	28	28	100:20
140	50	1:30									10	17	28	28	34	119:20

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.dat (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
140	60	1:20								6	16	29	28	28	59	168:20
140	70	1:20								14	28	28	29	34	79	214:20
150	11	2:30													0	2:30
150	15	2:10												2	4	8:30
150	20	2:00											2	7	10	21:30
150	25	1:50										3	6	8	24	43:30
150	30	1:40									1	7	8	17	29	64:30
limit line																
150	35	1:40									4	8	14	26	28	82:30
150	40	1:40									7	15	19	28	28	99:30
150	45	1:30								2	13	14	28	28	34	121:30
150	50	1:30								8	14	21	28	28	48	149:30
150	60	1:20							4	14	22	28	29	30	75	204:30
150	70	1:20							11	22	29	28	28	50	91	261:30
160	9	2:40													0	2:40
160	10	2:30													1	3:40
160	15	2:10											1	4	5	12:40
160	20	2:00										1	6	7	13	29:40
160	25	1:50									1	7	7	10	26	53:40
160	30	1:50									7	7	10	20	29	75:40
160	40	1:40								7	11	14	23	28	35	120:40
160	50	1:30							5	14	14	26	28	29	63	181:40
170	8	2:50													0	2:50
170	10	2:40													3	5:50
170	15	2:10											1	3	3	7	16:50
170	20	2:00									1	4	7	7	17	38:50

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18.dat (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
170	25	2:00									7	7	6	13	28	63:50
170	30	1:50								6	7	7	13	24	28	87:50
170	40	1:40							6	8	14	14	27	28	44	143:50
170	50	1:30						3	13	14	17	28	28	35	75	215:50

Appendix C-2

VVAL18-1

CONSTANT 0.7 ATA PO2 IN N2 DECOMPRESSION TABLES

TABLE OF MAXIMUM PERMISSIBLE TISSUE TENSIONS

{VVAL18-1.DAT(NITROGEN)}

TISSUE HALF-TIMES

DEPTH	5 MIN 1.00 SDR	10 MIN 1.00 SDR	20 MIN 1.00 SDR	35 MIN 1.00 SDR	45 MIN 1.00 SDR	80 MIN 1.00 SDR	120 MIN 1.00 SDR	255 MIN 1.00 SDR	
10 FSW	120.000	90.000	71.500	59.200	55.600	50.550	47.600	40.400	
20 FSW	130.000	100.000	81.500	69.200	65.600	60.550	57.600	50.400	
30 FSW	140.000	110.000	91.500	79.200	75.600	70.550	67.600	60.400	
40 FSW	150.000	120.000	101.500	89.200	85.600	80.550	77.600	70.400	
50 FSW	160.000	130.000	111.500	99.200	95.600	90.550	87.600	80.400	
60 FSW	170.000	140.000	121.500	109.200	105.600	100.550	97.600	90.400	
70 FSW	180.000	150.000	131.500	119.200	115.600	110.550	107.600	100.400	
80 FSW	190.000	160.000	141.500	129.200	125.600	120.550	117.600	110.400	
90 FSW	200.000	170.000	151.500	139.200	135.600	130.550	127.600	120.400	
100 FSW	210.000	180.000	161.500	149.200	145.600	140.550	137.600	130.400	
110 FSW	220.000	190.000	171.500	159.200	155.600	150.550	147.600	140.400	
120 FSW	230.000	200.000	181.500	169.200	165.600	160.550	157.600	150.400	
130 FSW	240.000	210.000	191.500	179.200	175.600	170.550	167.600	160.400	
140 FSW	250.000	220.000	201.500	189.200	185.600	180.550	177.600	170.400	
150 FSW	260.000	230.000	211.500	199.200	195.600	190.550	187.600	180.400	
160 FSW	270.000	240.000	221.500	209.200	205.600	200.550	197.600	190.400	
170 FSW	280.000	250.000	231.500	219.200	215.600	210.550	207.600	200.400	
180 FSW	290.000	260.000	241.500	229.200	225.600	220.550	217.600	210.400	
190 FSW	300.000	270.000	251.500	239.200	235.600	230.550	227.600	220.400	
200 FSW	310.000	280.000	261.500	249.200	245.600	240.550	237.600	230.400	
210 FSW	320.000	290.000	271.500	259.200	255.600	250.550	247.600	240.400	
220 FSW	330.000	300.000	281.500	269.200	265.600	260.550	257.600	250.400	
230 FSW	340.000	310.000	291.500	279.200	275.600	270.550	267.600	260.400	
240 FSW	350.000	320.000	301.500	289.200	285.600	280.550	277.600	270.400	
250 FSW	360.000	330.000	311.500	299.200	295.600	290.550	287.600	280.400	
260 FSW	370.000	340.000	321.500	309.200	305.600	300.550	297.600	290.400	
270 FSW	380.000	350.000	331.500	319.200	315.600	310.550	307.600	300.400	
280 FSW	390.000	360.000	341.500	329.200	325.600	320.550	317.600	310.400	
290 FSW	400.000	370.000	351.500	339.200	335.600	330.550	327.600	320.400	
300 FSW	410.000	380.000	361.500	349.200	345.600	340.550	337.600	330.400	

BLOOD PARAMETERS

(PRESSURE IN FSW; 33 FSW ATA)

PACO2	PH2O	PVCO2	PVO2	AMBAO2	PBOVP
1.50	.00	2.30	2.00	.00	.000

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
40	367	0:40													0	0:40
limit line																
40	370	0:40													0	0:40
40	390	0:40													0	0:40
50	160	0:50													0	0:50
50	170	0:40													1	1:50
50	180	0:40													4	4:50
50	190	0:40													7	7:50
50	200	0:40													10	10:50
50	210	0:40													13	13:50
50	220	0:40													16	16:50
50	230	0:40													18	18:50
50	240	0:40													20	20:50
50	250	0:40													24	24:50
50	260	0:40													28	28:50
50	270	0:40													32	32:50
50	280	0:40													40	40:50
50	290	0:40													47	47:50
50	300	0:40													55	55:50
50	310	0:40													62	62:50
50	320	0:40													69	69:50
50	330	0:40													76	76:50
limit line																
50	340	0:40													83	83:50
50	350	0:40													89	89:50
50	360	0:40													96	96:50
50	370	0:40													102	102:50

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW) (M)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
50	380	0:40													108	108:50
50	390	0:40													114	114:50
60	80	1:00													0	1:00
60	90	0:50													5	6:00
60	100	0:50													11	12:00
60	110	0:50													15	16:00
60	120	0:50													18	19:00
60	130	0:50													22	23:00
60	140	0:50													27	28:00
60	150	0:50													33	34:00
60	160	0:50													39	40:00
60	170	0:50													44	45:00
60	180	0:50													49	50:00
60	190	0:40												1	52	54:00
60	200	0:40												2	57	60:00
60	210	0:40												4	62	67:00
60	220	0:40												7	65	73:00
60	230	0:40												10	74	85:00
60	240	0:40												13	83	97:00
60	250	0:40												16	91	108:00
60	260	0:40												18	99	118:00
60	270	0:40												20	108	129:00
60	280	0:40												22	115	138:00
limit line																
60	290	0:40												24	123	148:00
60	300	0:40												26	130	157:00

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
60	310	0:40												30	135	166:00
60	320	0:40												33	141	175:00
60	330	0:40												36	147	184:00
60	340	0:40												39	153	193:00
60	350	0:40												42	158	201:00
60	360	0:40												45	163	209:00
60	370	0:40												48	168	217:00
60	380	0:40												50	174	225:00
60	390	0:40												53	179	233:00
70	51	1:10													0	1:10
70	60	1:00													6	7:10
70	70	1:00													14	15:10
70	80	1:00													22	23:10
70	90	1:00													29	30:10
70	100	0:50												4	31	36:10
70	110	0:50												9	32	42:10
70	120	0:50												13	36	50:10
70	130	0:50												17	41	59:10
70	140	0:50												21	46	68:10
70	150	0:50												23	51	75:10
70	160	0:50												26	55	82:10
70	170	0:50												31	59	91:10
limit line																
70	180	0:50												37	63	101:10
70	190	0:50												42	71	114:10
70	200	0:40											1	46	81	129:10

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM TO FIRST STOP (M)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN)												TOTAL ASCNT TIME
		(M:S)	130	120	110	100	90	80	70	60	50	40	30	20	10	(M:S)
70	210	0:40											2	49	92	144:10
70	220	0:40											3	53	101	158:10
70	230	0:40											4	55	111	171:10
70	240	0:40											6	57	121	185:10
70	250	0:40											9	60	129	199:10
70	260	0:40											12	63	136	212:10
70	270	0:40											15	65	145	226:10
70	280	0:40											17	69	151	238:10
70	290	0:40											20	71	159	251:10
70	300	0:40											22	74	165	262:10
70	310	0:40											24	76	173	274:10
70	320	0:40											25	80	178	284:10
70	330	0:40											27	86	181	295:10
70	340	0:40											28	95	181	305:10
70	350	0:40											31	102	181	315:10
80	39	1:20													0	1:20
80	40	1:10													1	2:20
80	50	1:10													13	14:20
80	60	1:10													23	24:20
80	70	1:00												7	28	36:20
80	80	1:00												15	29	45:20
80	90	1:00												21	32	54:20
limit line																
80	100	0:50											1	27	34	63:20
80	110	0:50											4	31	39	75:20
80	120	0:50											8	32	46	87:20

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
80	130	0:50											13	32	52	98:20
80	140	0:50											17	33	56	107:20
80	150	0:50											20	39	61	121:20
80	160	0:50											23	44	74	142:20
80	170	0:50											26	48	86	161:20
80	180	0:50											28	53	97	179:20
80	190	0:50											31	57	107	196:20
80	200	0:50											37	57	119	214:20
80	210	0:40										1	41	58	131	232:20
80	220	0:40										2	45	62	140	250:20
80	230	0:40										3	49	66	147	266:20
80	240	0:40										4	52	70	155	282:20
80	250	0:40										4	55	75	162	297:20
80	260	0:40										6	57	78	170	312:20
80	270	0:40										9	57	82	178	327:20
80	280	0:40										12	57	90	181	341:20
80	290	0:40										15	60	98	181	355:20
80	300	0:40										17	64	106	181	369:20
80	310	0:40										20	66	114	181	382:20
80	320	0:40										22	69	121	182	395:20
90	32	1:20													2	3:30
90	40	1:20													13	14:30
90	50	1:10												5	23	29:30
90	60	1:10												16	26	43:30
90	70	1:00											1	25	29	56:30

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
limit line																
90	80	1:00											9	26	32	68:30
90	90	1:00											16	29	33	79:30
90	100	1:00											22	31	41	95:30
90	110	0:50										2	27	32	48	110:30
90	120	0:50										5	30	32	55	123:30
90	130	0:50										9	31	38	68	147:30
90	140	0:50										13	32	44	83	173:30
90	150	0:50										17	32	51	96	197:30
90	160	0:50										20	33	56	110	220:30
90	170	0:50										23	38	57	124	243:30
90	180	0:50										26	43	57	138	265:30
90	190	0:50										28	49	60	149	287:30
100	27	1:30													4	5:40
100	30	1:30													9	10:40
100	35	1:20												2	15	18:40
100	40	1:20												7	19	27:40
100	45	1:20												12	23	36:40
100	50	1:10											2	17	24	44:40
100	55	1:10											5	21	26	53:40
100	60	1:10											8	25	28	62:40
100	65	1:10											14	25	30	70:40
limit line																
100	70	1:10											19	25	32	77:40
100	75	1:10											24	27	32	84:40
100	80	1:00										4	25	28	33	91:40
100	90	1:00										12	25	32	40	110:40

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
100	100	1:00										18	28	32	49	128:40
100	110	1:00										23	32	32	69	157:40
110	24	1:40													7	8:50
110	25	1:40													9	10:50
110	30	1:30												4	14	19:50
110	35	1:30												11	18	30:50
110	40	1:20											4	14	22	41:50
110	45	1:20											9	16	25	51:50
limit line																
110	50	1:20											13	21	26	61:50
110	55	1:10										3	14	25	28	71:50
110	60	1:10										6	19	25	30	81:50
110	65	1:10										9	23	25	32	90:50
110	70	1:10										13	25	27	32	98:50
110	80	1:00									1	23	24	32	38	119:50
110	90	1:00									8	24	28	32	56	149:50
120	19	1:50													5	7:00
120	20	1:50													7	9:00
120	25	1:40												5	12	19:00
120	30	1:30											2	10	15	29:00
120	35	1:30											7	14	20	43:00
120	40	1:30											14	14	25	55:00
limit line																
120	45	1:20										6	14	19	26	67:00
120	50	1:20										11	14	24	28	79:00
120	55	1:10									1	14	19	24	30	90:00
120	60	1:10									5	14	23	25	32	101:00

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
120	70	1:10									10	21	25	30	37	125:00
120	80	1:10									18	25	27	32	60	164:00
130	16	2:00													5	7:10
130	20	1:50												5	7	14:10
130	25	1:40											4	7	13	26:10
130	30	1:30										1	7	13	17	40:10
130	35	1:30										5	11	14	23	55:10
130	40	1:30										10	14	17	25	68:10
limit line																
130	45	1:20									3	14	14	23	26	82:10
130	50	1:20									8	14	18	25	29	96:10
130	60	1:10								3	14	17	25	27	36	124:10
130	70	1:10								9	16	25	25	32	60	169:10
140	13	2:10													3	5:20
140	15	2:00												1	6	9:20
140	20	1:50											3	7	8	20:20
140	25	1:40										3	7	8	14	34:20
140	30	1:30									1	6	9	14	19	51:20
limit line																
140	35	1:30									4	8	14	14	25	67:20
140	40	1:30									6	14	15	20	25	82:20
140	45	1:20								1	13	14	15	25	28	98:20
140	50	1:20								5	15	14	21	25	33	115:20
140	60	1:10							1	14	14	22	25	29	51	158:20
140	70	1:10							7	14	22	25	28	31	97	226:20
150	11	2:20													1	3:30
150	15	2:10												5	7	14:30

13:10 DUKE/DAN 23 FEB 1997 TBLP7I VVAL18-1.DAT (FEET)

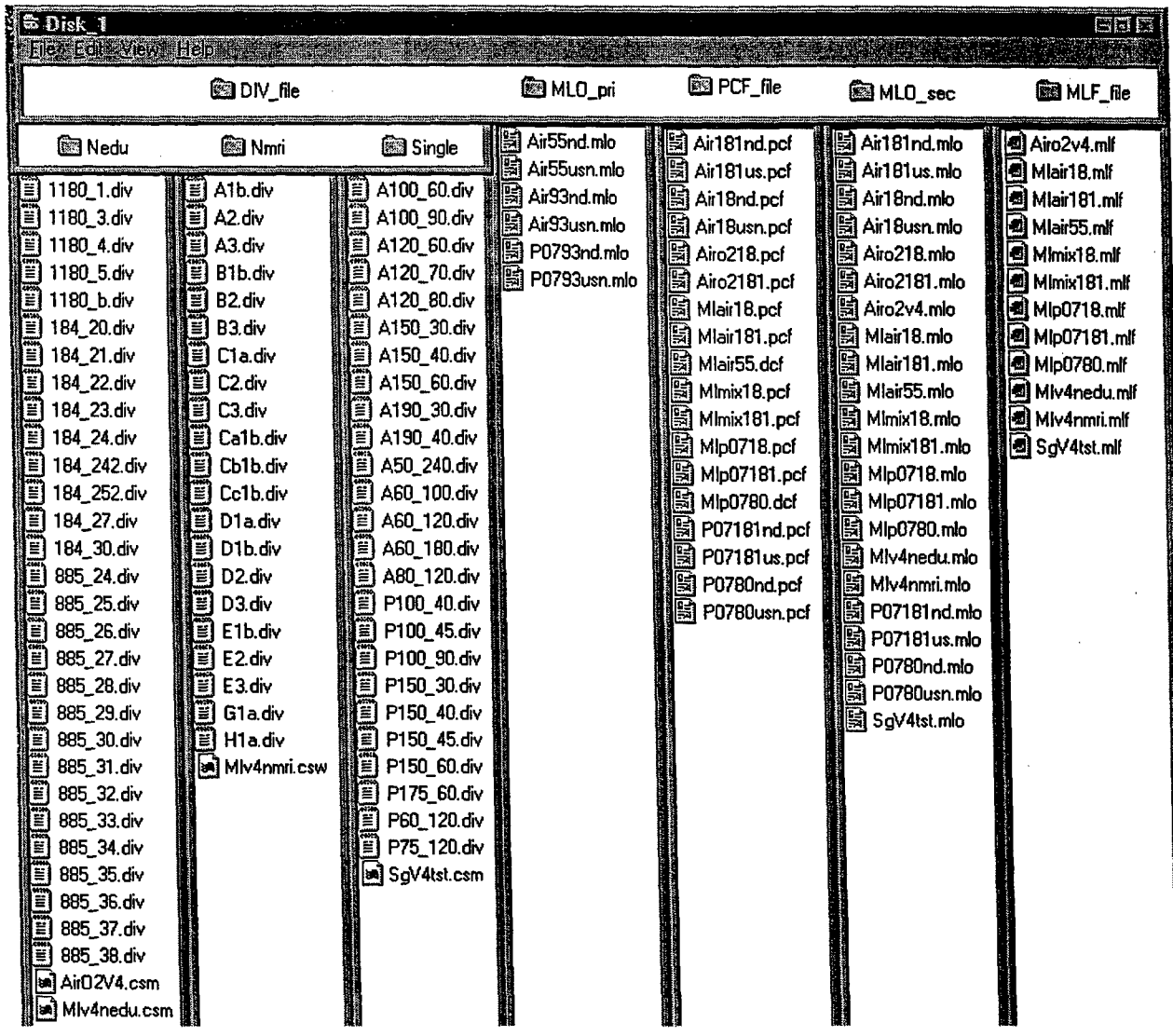
.70 ATA FIXED PO2 IN NITROGEN RATES: DESCENT 60 FPM; ASCENT 60 FPM

DEPTH (FSW)	BTM TM (M)	TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
150	20	1:50										1	7	7	10	27:30
150	25	1:40									1	7	7	11	15	43:30
150	30	1:40									6	7	12	14	21	62:30
limit line																
150	35	1:30								3	7	12	14	16	26	80:30
150	40	1:30								6	11	14	14	23	28	98:30
150	45	1:20							1	9	14	14	19	25	34	118:30
150	50	1:20							3	14	14	15	24	26	43	141:30
150	60	1:20							13	14	16	25	25	31	86	212:30
150	70	1:10						6	14	17	25	24	30	44	125	287:30
160	9	2:40													0	2:40
160	10	2:30													1	3:40
160	15	2:10											2	7	7	18:40
160	20	2:00										6	7	7	12	34:40
160	25	1:50									7	7	7	13	16	52:40
160	30	1:40								5	7	8	14	14	24	74:40
160	40	1:30							5	8	14	14	15	25	35	118:40
160	50	1:20						2	12	14	14	19	25	27	65	180:40
170	8	2:50													0	2:50
170	10	2:40													4	6:50
170	15	2:10										1	5	7	7	22:50
170	20	2:00									4	7	7	7	13	40:50
170	25	1:50								5	7	7	9	14	19	63:50
170	30	1:40							4	7	7	10	14	16	28	88:50
170	40	1:30						5	7	11	14	14	19	27	44	143:50
170	50	1:20					1	11	14	14	14	22	25	38	91	232:50

Appendix D

Contents of Diskettes

Contents of Diskette 1



File naming Conventions

File extensions are described in the text.

Nedu folder: Numbers before the underscore denote the NEDU report number where the profiles are described (2,3,8). Numbers after the underscore are the profile numbers as used in that report. File *Mlv4nedu.CSM* contains the decompression profiles for all of the "*.div*" in the folder as computed by *Planv4* using the batch file *Doplanv4.bat* (Diskette 3, folder *V4stuff*).

Nmri folder: Filenames are those used as the profile names in the report describing the dives series (24). File *Mlv4nmri.CSM* contains the decompression profiles for all of the "*.div*" in the folder as computed by *PlanV4* using the batch file *Doplanv4.bat* (Diskette 3, folder *V4stuff*).

Single folder: These are all the single depth test dive profiles from Appendix H. Those beginning with *"A"* are air dives, those with *"P"* constant PO2 dives. File *SgV4tst.csm* contains the decompression profiles for all these dives as computed by *PlanV4*.

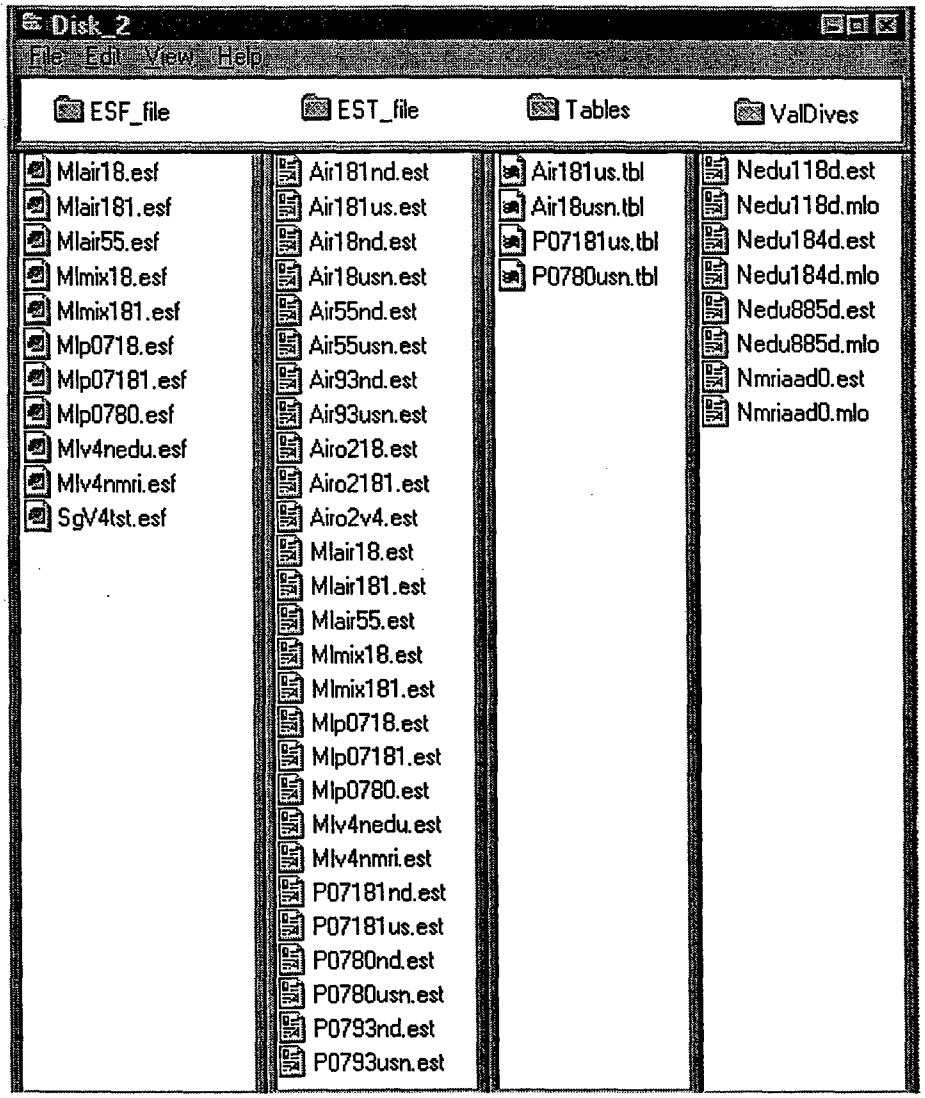
All other folders:

Filenames beginning with *"Air"* denote single depth air dives, with *"Airo2"* single depth dives breathing air at depth and 0.7 ata PO2 during decompression, with *"P07"* constant 0.7 ata PO2 in N2 single depth dives, with *"Mlair"* multiple level air dives, with *"MlP07"* multiple level constant 0.7 ata PO2 dives, and *"Mlimx"* multi-level and repet dives involving gas switches between air and a constant 0.7 ata PO2 breathing gas.

Filenames ending with *"nd"* denote no-decompression dives, and those ending with *"us"* or *"usn"* decompression dives.

Filenames containing *"55"* denote the USN'55 table, those containing *"93"* the NMRI'93 tables, those containing *"18"* profiles computed with parameter set VVAL18, those containing *"181"* profiles computed with parameter set VVAL18-1, and those containing *"80"* the published constant 0.7 ata PO2 tables (P07'80) computed with VVAL18.

Contents of Diskette 2



File extensions are described in the text.

For other naming conventions see the Contents of Diskette 1.

ValDives folder: These are the dive profiles for all the dives found in Appendix H.

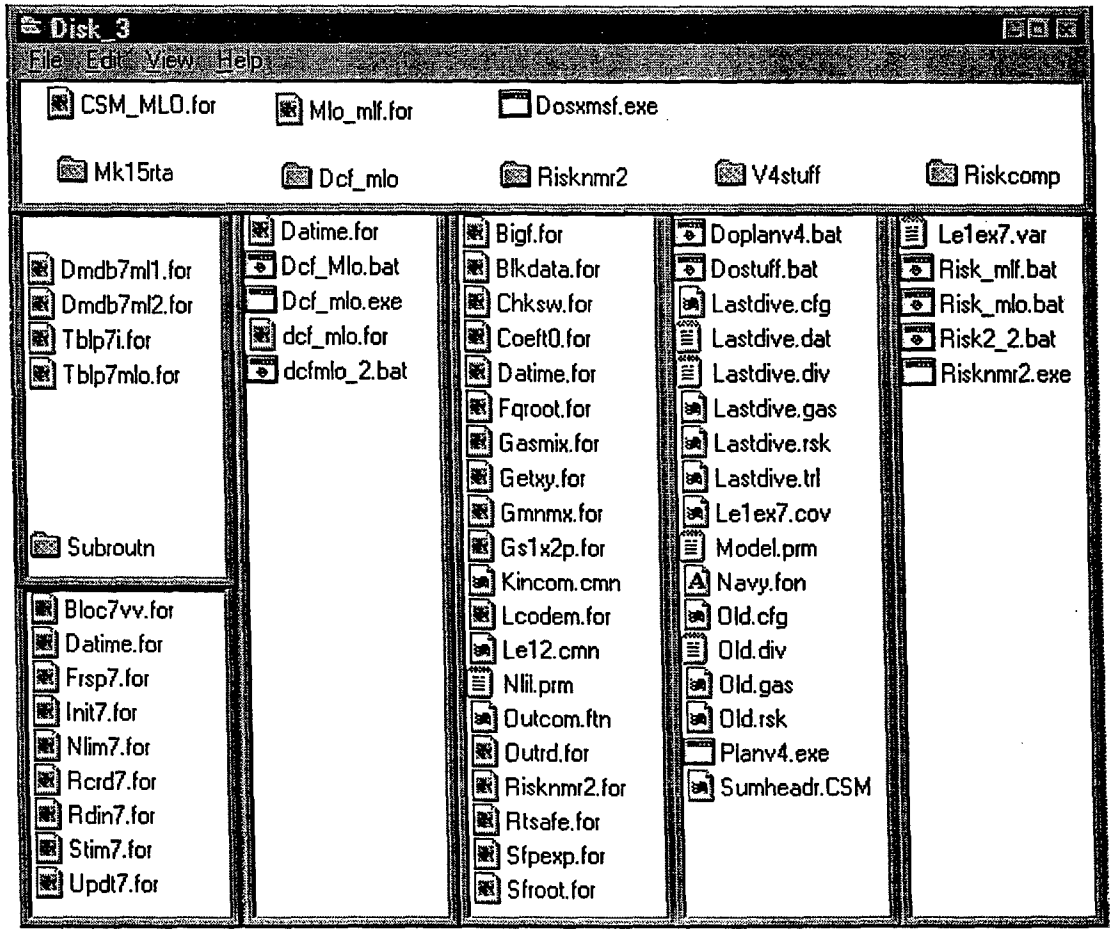
NEDU118d - profiles labeled as *11-80.1* and *11-80.2*. These are dives reported in NEDU Report 11-80 (2), *"80.1"* are Phase 1 profiles, *"80.2"* Phase 2 profiles.

NEDU184 - profiles labeled *1-84* which are reported in NEDU Report 1-84 (3).

NEDU885d - profiles labeled *8-85* which are reported in NEDU Report 8-85 (8).

Nmriaad0 - profiles labeled *1-93* from the NMRI/NEDU prospective dive trial conducted between Mar '91 - Feb '92.

Contents of Diskette 3



Notes on FORTRAN Programs

All program development was done using Microsoft FORTRAN PowerStation V1.0. To run executables supplied in these diskettes on machines where Microsoft FORTRAN has not been installed put program *Dosxmsf.exe* in the directory of the executable or in a directory in the PATH.

Some FORTRAN sources contain Microsoft FORTRAN specific operating system calls and *Include* files and will only function as written when compiled and linked with Microsoft FORTRAN components.

The single source files listed in Disk_3 have no associated subroutines.

Folder *Mk15rta* contains source files for the 4 main programs listed. All of these programs use the subroutines in folder *Subroutn.*

Folder *Dcf-mlo* contains source and executable files plus a batch program for running the program with multiple input files. To use the batch file append this folder to that containing the input files the execute program *Dcf-Mlo.bat.*

All source file in folders *Pcf_mlo* and *Risknmr2* should be compiled and linked together.

All of the above programs can be used in conjunction with the batch files on Diskette 4.

Folder *V4stuff* Notes:

Folder *V4stuff* contains all data and executable files needed for running *Planv4*. It also contains some useful batch files. Appending this folder to another target folder and executing *Doplanv4.bat* will compute decompression schedules for all files of the type "**.div*" in the target folder and create a single output file *SUMFILE.CSM* in the target folder containing all of the

Planv4 ".sum" output files. (*Doplanv4.bat* calls the batch program *Dostuff.bat)* The parameter values used by *Planv4* are placed at the

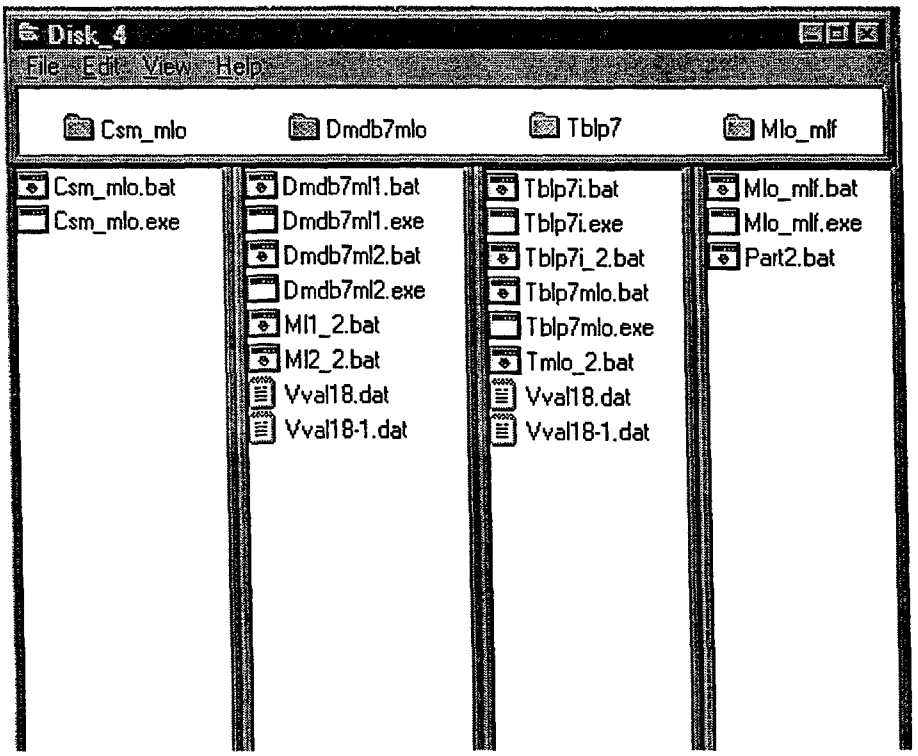
Contents of Diskette 3 (con't)

beginning of the output file and the individual *".div"* filenames are placed before each of the *".sum"* file listing. Make sure program *Dosxmsf.exe* is in the correct directory if needed, see *Notes on FORTRAN Programs* above.

Notes on Riskcomp folder:

Risk_mlo.bat and *Risk_mlf.bat* both execute *Risknmr2.exe* but the input and output file extentions are different (*".mlo"* or *".mlf"*). If the target folder contains both *".mlo"* and *".mlf"* input files then execute *Risk_mlf.bat* first since it renames all *".est"* output files in the target folder to *".esf"* .

Contents of Diskette 4



These folders contain *MSDOS* batch files and data files used for executing the *".exe"* files where there are multiple inputs files. Make sure program *Dosxmsf.exe* is in the correct directory if needed, see *Notes on FORTRAN Programs* in *Contents of Diskette 3*. Some of these files use the environment variable *FILENAME*. This environment variable must either be created at bootup in the *AUTOEXEC.BAT* file or set in *MSDOS* before starting *Windows*. It must be set to a size large enough to accomodate any size path. In developing these batch programs this variable was initially created using:

SET FILENAME=C:\DIRECT01\DIRECT02\DIRECT03\DIRECT04\DIRECT05\DIRECT06\DIRECT07\DIRECT08\FILENAME.EXT

The batch files in these folders are written for execution where there are multiple input files or file renaming is required. To use these programs append the entire folder to the target folder containing the input files, then execute the desired batch program.

Where a folder contains more than one *".exe"* file then there is a batch file with the same name to execute that program. Batch filenames ending with *"_2"* are called from the primary batch file.

Note on Program *Mlo-mlf*: If the program is used for single depth dive profiles then the output file will have *T0 = 0.00* and *T1=9999.0* and *TASC* will also be computed. This was used for the single depth test dive decompressions computed by *Planv4*. The *SgV4tst.mlo* file was input into program *Mlo-mlf* with the resulting output file *SgV4tst.mlf.* this allowed computation of the total ascent times for these profiles to be computed and put in the risk file *SgV4tst.esf.*

Appendix E

Risk Estimates for Single Bounce Dive Air Tables

Table E-1

USN'55 Air Decompression Schedules Risk Estimates

INPUT FILE AIR55USN.MLO OUTPUT FILE AIR55USN.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

	PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	[35.0 / 310.0] USNAIR55 NO-D	35	310	.00	9999.00	.60	5.42	4.14	6.69
2	[40.0 / 200.0] USNAIR55 NO-D	40	200	.00	9999.00	.70	3.96	2.94	4.97
3	[40.0 / 210.0]USNAIR55 STD	40	210	.00	9999.00	2.70	4.17	3.11	5.21
4	[40.0 / 230.0]USNAIR55 STD	40	230	.00	9999.00	7.70	4.68	3.54	5.80
5	[40.0 / 250.0]USNAIR55 STD	40	250	.00	9999.00	11.70	5.26	4.05	6.45
6	[40.0 / 270.0]USNAIR55 STD	40	270	.00	9999.00	15.70	5.83	4.55	7.10
7	[40.0 / 300.0]USNAIR55 STD	40	300	.00	9999.00	19.70	6.69	5.29	8.07
8	[40.0 / 360.0] USNAIR55 EX. EXP.	40	360	.00	9999.00	23.70	8.40	6.71	10.05
9	[40.0 / 480.0] USNAIR55 EX. EXP.	40	480	.00	9999.00	41.70	11.30	9.09	13.45
10	[40.0 / 720.0] USNAIR55 EX. EXP.	40	720	.00	9999.00	69.70	15.53	12.50	18.46
11	[50.0 / 100.0] USNAIR55 NO-D	50	100	.00	9999.00	.80	2.53	1.78	3.27
12	[50.0 / 110.0]USNAIR55 STD	50	110	.00	9999.00	3.80	2.75	1.95	3.54
13	[50.0 / 120.0]USNAIR55 STD	50	120	.00	9999.00	5.80	3.11	2.23	3.97
14	[50.0 / 140.0]USNAIR55 STD	50	140	.00	9999.00	10.80	3.93	2.90	4.94
15	[50.0 / 160.0]USNAIR55 STD	50	160	.00	9999.00	21.80	4.71	3.55	5.85
16	[50.0 / 180.0]USNAIR55 STD	50	180	.00	9999.00	29.80	5.51	4.25	6.76
17	[50.0 / 200.0]USNAIR55 STD	50	200	.00	9999.00	35.80	6.32	4.95	7.66
18	[50.0 / 220.0]USNAIR55 STD	50	220	.00	9999.00	40.80	7.12	5.66	8.55
19	[50.0 / 240.0]USNAIR55 STD	50	240	.00	9999.00	47.80	7.84	6.29	9.36
20	[60.0 / 60.0] USNAIR55 NO-D	60	60	.00	9999.00	1.00	2.13	1.45	2.81
21	[60.0 / 70.0]USNAIR55 STD	60	70	.00	9999.00	3.00	2.37	1.63	3.11
22	[60.0 / 80.0]USNAIR55 STD	60	80	.00	9999.00	8.00	2.69	1.94	3.45
23	[60.0 / 100.0]USNAIR55 STD	60	100	.00	9999.00	15.00	3.77	2.80	4.73
24	[60.0 / 120.0]USNAIR55 STD	60	120	.00	9999.00	27.00	4.89	3.70	6.06
25	[60.0 / 140.0]USNAIR55 STD	60	140	.00	9999.00	40.00	5.97	4.58	7.34
26	[60.0 / 160.0]USNAIR55 STD	60	160	.00	9999.00	49.00	7.06	5.47	8.62
27	[60.0 / 180.0]USNAIR55 STD	60	180	.00	9999.00	57.00	8.10	6.34	9.82
28	[60.0 / 200.0]USNAIR55 STD	60	200	.00	9999.00	71.00	8.91	7.01	10.76
29	[60.0 / 240.0] USNAIR55 EX. EXP.	60	240	.00	9999.00	82.00	10.94	8.80	13.03
30	[60.0 / 360.0] USNAIR55 EX. EXP.	60	360	.00	9999.00	140.00	15.75	12.88	18.52
31	[60.0 / 480.0] USNAIR55 EX. EXP.	60	480	.00	9999.00	193.00	19.21	15.61	22.65
32	[60.0 / 720.0] USNAIR55 EX. EXP.	60	720	.00	9999.00	266.00	24.14	19.30	28.69
33	[70.0 / 50.0] USNAIR55 NO-D	70	50	.00	9999.00	1.20	2.37	1.65	3.08
34	[70.0 / 60.0]USNAIR55 STD	70	60	.00	9999.00	9.20	2.60	1.84	3.35
35	[70.0 / 70.0]USNAIR55 STD	70	70	.00	9999.00	15.20	3.21	2.38	4.04
36	[70.0 / 80.0]USNAIR55 STD	70	80	.00	9999.00	19.20	3.95	2.98	4.91
37	[70.0 / 90.0]USNAIR55 STD	70	90	.00	9999.00	24.20	4.72	3.60	5.83
38	[70.0 / 100.0]USNAIR55 STD	70	100	.00	9999.00	34.20	5.45	4.18	6.69
39	[70.0 / 110.0]USNAIR55 STD	70	110	.00	9999.00	44.20	6.08	4.68	7.46
40	[70.0 / 120.0]USNAIR55 STD	70	120	.00	9999.00	52.20	6.74	5.19	8.27
41	[70.0 / 130.0]USNAIR55 STD	70	130	.00	9999.00	59.20	7.43	5.72	9.11
42	[70.0 / 140.0]USNAIR55 STD	70	140	.00	9999.00	65.20	8.11	6.25	9.94
43	[70.0 / 150.0]USNAIR55 STD	70	150	.00	9999.00	71.20	8.76	6.75	10.74
44	[70.0 / 160.0]USNAIR55 STD	70	160	.00	9999.00	86.20	9.20	7.07	11.27
45	[70.0 / 170.0]USNAIR55 STD	70	170	.00	9999.00	99.20	9.63	7.40	11.80
46	[80.0 / 40.0] USNAIR55 NO-D	80	40	.00	9999.00	1.30	2.37	1.68	3.07
47	[80.0 / 50.0]USNAIR55 STD	80	50	.00	9999.00	11.30	2.72	1.92	3.52
48	[80.0 / 60.0]USNAIR55 STD	80	60	.00	9999.00	18.30	3.50	2.62	4.38
49	[80.0 / 70.0]USNAIR55 STD	80	70	.00	9999.00	24.30	4.45	3.41	5.48
50	[80.0 / 80.0]USNAIR55 STD	80	80	.00	9999.00	34.30	5.33	4.13	6.52
51	[80.0 / 90.0]USNAIR55 STD	80	90	.00	9999.00	47.30	6.17	4.81	7.52
52	[80.0 / 100.0]USNAIR55 STD	80	100	.00	9999.00	58.30	7.09	5.52	8.62
53	[80.0 / 110.0]USNAIR55 STD	80	110	.00	9999.00	67.30	7.99	6.19	9.74
54	[80.0 / 120.0]USNAIR55 STD	80	120	.00	9999.00	74.30	8.87	6.85	10.85
55	[80.0 / 130.0]USNAIR55 STD	80	130	.00	9999.00	83.30	9.67	7.42	11.87
56	[80.0 / 140.0]USNAIR55 STD	80	140	.00	9999.00	96.30	10.33	7.88	12.71
57	[80.0 / 150.0]USNAIR55 STD	80	150	.00	9999.00	110.30	10.90	8.31	13.41
58	[80.0 / 180.0] USNAIR55 EX. EXP.	80	180	.00	9999.00	121.30	13.41	10.38	16.34
59	[80.0 / 240.0] USNAIR55 EX. EXP.	80	240	.00	9999.00	179.30	16.66	13.05	20.11
60	[80.0 / 360.0] USNAIR55 EX. EXP.	80	360	.00	9999.00	280.30	21.44	17.25	25.42
61	[80.0 / 480.0] USNAIR55 EX. EXP.	80	480	.00	9999.00	354.30	25.07	20.14	29.69
62	[80.0 / 720.0] USNAIR55 EX. EXP.	80	720	.00	9999.00	455.30	29.89	23.59	35.66
63	[90.0 / 30.0] USNAIR55 NO-D	90	30	.00	9999.00	1.50	2.11	1.47	2.74
64	[90.0 / 40.0]USNAIR55 STD	90	40	.00	9999.00	8.50	2.64	1.84	3.43
65	[90.0 / 50.0]USNAIR55 STD	90	50	.00	9999.00	19.50	3.48	2.58	4.38
66	[90.0 / 60.0]USNAIR55 STD	90	60	.00	9999.00	26.50	4.63	3.55	5.70
67	[90.0 / 70.0]USNAIR55 STD	90	70	.00	9999.00	38.50	5.66	4.42	6.88
68	[90.0 / 80.0]USNAIR55 STD	90	80	.00	9999.00	54.50	6.79	5.36	8.20
69	[90.0 / 90.0]USNAIR55 STD	90	90	.00	9999.00	67.50	7.93	6.25	9.57
70	[90.0 / 100.0]USNAIR55 STD	90	100	.00	9999.00	76.50	9.07	7.09	11.00
71	[90.0 / 110.0]USNAIR55 STD	90	110	.00	9999.00	86.50	10.12	7.82	12.35
72	[90.0 / 120.0]USNAIR55 STD	90	120	.00	9999.00	101.50	10.97	8.39	13.49

73	[90.0 / 130.0]USNAIR55 STD	90	130	.00	9999.00	116.50	11.65	8.85	14.37
74	[100.0 / 25.0] USNAIR55 NO-D	100	25	.00	9999.00	1.70	2.05	1.41	2.69
75	[100.0 / 30.0]USNAIR55 STD	100	30	.00	9999.00	4.70	2.34	1.64	3.04
76	[100.0 / 40.0]USNAIR55 STD	100	40	.00	9999.00	16.70	3.17	2.26	4.08
77	[100.0 / 50.0]USNAIR55 STD	100	50	.00	9999.00	27.70	4.32	3.26	5.37
78	[100.0 / 60.0]USNAIR55 STD	100	60	.00	9999.00	38.70	5.68	4.43	6.92
79	[100.0 / 70.0]USNAIR55 STD	100	70	.00	9999.00	57.70	7.07	5.62	8.49
80	[100.0 / 80.0]USNAIR55 STD	100	80	.00	9999.00	72.70	8.46	6.74	10.15
81	[100.0 / 90.0]USNAIR55 STD	100	90	.00	9999.00	84.70	9.74	7.67	11.76
82	[100.0 / 100.0]USNAIR55 STD	100	100	.00	9999.00	97.70	10.95	8.51	13.34
83	[100.0 / 110.0]USNAIR55 STD	100	110	.00	9999.00	117.70	11.91	9.12	14.62
84	[100.0 / 120.0]USNAIR55 STD	100	120	.00	9999.00	132.70	12.91	9.87	15.84
85	[100.0 / 180.0] USNAIR55 EX. EXP.	100	180	.00	9999.00	202.70	18.38	13.69	22.82
86	[100.0 / 240.0] USNAIR55 EX. EXP.	100	240	.00	9999.00	283.70	21.45	16.37	26.22
87	[100.0 / 360.0] USNAIR55 EX. EXP.	100	360	.00	9999.00	416.70	25.93	20.55	30.94
88	[100.0 / 480.0] USNAIR55 EX. EXP.	100	480	.00	9999.00	503.70	29.55	23.57	35.07
89	[100.0 / 720.0] USNAIR55 EX. EXP.	100	720	.00	9999.00	613.70	34.90	27.38	41.63
90	[110.0 / 20.0] USNAIR55 NO-D	110	20	.00	9999.00	1.80	1.88	1.24	2.50
91	[110.0 / 25.0]USNAIR55 STD	110	25	.00	9999.00	4.80	2.21	1.53	2.89
92	[110.0 / 30.0]USNAIR55 STD	110	30	.00	9999.00	8.80	2.67	1.86	3.47
93	[110.0 / 40.0]USNAIR55 STD	110	40	.00	9999.00	24.80	3.75	2.74	4.75
94	[110.0 / 50.0]USNAIR55 STD	110	50	.00	9999.00	35.80	5.28	4.04	6.50
95	[110.0 / 60.0]USNAIR55 STD	110	60	.00	9999.00	55.80	6.94	5.51	8.35
96	[110.0 / 70.0]USNAIR55 STD	110	70	.00	9999.00	73.80	8.59	6.89	10.26
97	[110.0 / 80.0]USNAIR55 STD	110	80	.00	9999.00	88.80	10.13	8.07	12.14
98	[110.0 / 90.0]USNAIR55 STD	110	90	.00	9999.00	107.80	11.53	9.07	13.92
99	[110.0 / 100.0]USNAIR55 STD	110	100	.00	9999.00	125.80	12.79	9.86	15.63
100	[120.0 / 15.0] USNAIR55 NO-D 10	120	15	.00	9999.00	2.00	1.60	1.00	2.21
101	[120.0 / 20.0]USNAIR55 STD	120	20	.00	9999.00	4.00	2.01	1.35	2.65
102	[120.0 / 25.0]USNAIR55 STD	120	25	.00	9999.00	8.00	2.48	1.71	3.23
103	[120.0 / 30.0]USNAIR55 STD	120	30	.00	9999.00	16.00	3.08	2.14	4.00
104	[120.0 / 40.0]USNAIR55 STD	120	40	.00	9999.00	32.00	4.44	3.27	5.59
105	[120.0 / 50.0]USNAIR55 STD	120	50	.00	9999.00	48.00	6.37	4.96	7.77
106	[120.0 / 60.0]USNAIR55 STD	120	60	.00	9999.00	71.00	8.25	6.61	9.86
107	[120.0 / 70.0]USNAIR55 STD	120	70	.00	9999.00	89.00	10.12	8.15	12.05
108	[120.0 / 80.0]USNAIR55 STD	120	80	.00	9999.00	107.00	11.90	9.47	14.26
109	[120.0 / 90.0]USNAIR55 STD	120	90	.00	9999.00	132.00	13.31	10.37	16.16
110	[120.0 / 100.0]USNAIR.55DAT 100	120	100	.00	9999.00	150.00	14.79	11.48	17.98
111	[120.0 / 120.0] USNAIR55 EX. EXP.	120	120	.00	9999.00	176.00	17.73	13.31	21.93
112	[120.0 / 180.0] USNAIR55 EX. EXP.	120	180	.00	9999.00	284.00	22.78	16.52	28.57
113	[120.0 / 240.0] USNAIR55 EX. EXP.	120	240	.00	9999.00	396.00	25.46	18.83	31.55
114	[120.0 / 360.0] USNAIR55 EX. EXP.	120	360	.00	9999.00	551.00	29.37	23.43	34.85
115	[120.0 / 480.0] USNAIR55 EX. EXP.	120	480	.00	9999.00	654.00	33.20	26.20	39.53
116	[120.0 / 720.0] USNAIR55 EX. EXP.	120	720	.00	9999.00	773.00	38.80	30.28	46.28
117	[130.0 / 10.0] USNAIR55 NO-D 11	130	10	.00	9999.00	2.20	1.29	.70	1.89
118	[130.0 / 15.0]USNAIR.55DAT 101	130	15	.00	9999.00	3.20	1.72	1.10	2.35
119	[130.0 / 20.0]USNAIR.55DAT 102	130	20	.00	9999.00	6.20	2.19	1.48	2.89
120	[130.0 / 25.0]USNAIR.55DAT 103	130	25	.00	9999.00	12.20	2.82	1.95	3.68
121	[130.0 / 30.0]USNAIR.55DAT 104	130	30	.00	9999.00	23.20	3.38	2.36	4.39
122	[130.0 / 40.0]USNAIR.55DAT 105	130	40	.00	9999.00	37.20	5.31	3.96	6.63
123	[130.0 / 50.0]USNAIR.55DAT 106	130	50	.00	9999.00	63.20	7.40	5.84	8.94
124	[130.0 / 60.0]USNAIR.55DAT 107	130	60	.00	9999.00	86.20	9.61	7.76	11.42
125	[130.0 / 70.0]USNAIR.55DAT 108	130	70	.00	9999.00	103.20	11.81	9.52	14.05
126	[130.0 / 80.0]USNAIR.55DAT 109	130	80	.00	9999.00	131.20	13.46	10.65	16.19
127	[130.0 / 90.0]USNAIR.55DAT 110	130	90	.00	9999.00	154.20	15.12	11.88	18.25
128	[140.0 / 10.0] USNAIR55 NO-D 12	140	10	.00	9999.00	2.30	1.41	.78	2.04
129	[140.0 / 15.0]USNAIR.55DAT 111	140	15	.00	9999.00	4.30	1.85	1.20	2.50
130	[140.0 / 20.0]USNAIR.55DAT 112	140	20	.00	9999.00	8.30	2.43	1.66	3.19
131	[140.0 / 25.0]USNAIR.55DAT 113	140	25	.00	9999.00	18.30	3.08	2.11	4.03
132	[140.0 / 30.0]USNAIR.55DAT 114	140	30	.00	9999.00	28.30	3.86	2.73	4.98
133	[140.0 / 40.0]USNAIR.55DAT 115	140	40	.00	9999.00	46.30	6.15	4.65	7.62
134	[140.0 / 50.0]USNAIR.55DAT 116	140	50	.00	9999.00	76.30	8.58	6.84	10.30
135	[140.0 / 60.0]USNAIR.55DAT 117	140	60	.00	9999.00	97.30	11.15	9.04	13.20
136	[140.0 / 70.0]USNAIR.55DAT 118	140	70	.00	9999.00	125.30	13.24	10.65	15.76
137	[140.0 / 80.0]USNAIR.55DAT 119	140	80	.00	9999.00	155.30	15.09	12.01	18.06
138	[140.0 / 90.0] USNAIR55 EX. EXP.	140	90	.00	9999.00	166.30	17.38	13.58	21.02
139	[140.0 / 120.0] USNAIR55 EX. EXP.	140	120	.00	9999.00	240.30	21.75	15.88	27.21
140	[140.0 / 180.0] USNAIR55 EX. EXP.	140	180	.00	9999.00	386.30	26.16	18.35	33.22
141	[140.0 / 240.0] USNAIR55 EX. EXP.	140	240	.00	9999.00	511.30	28.27	20.92	34.94
142	[140.0 / 360.0] USNAIR55 EX. EXP.	140	360	.00	9999.00	684.30	32.53	25.77	38.67
143	[140.0 / 480.0] USNAIR55 EX. EXP.	140	480	.00	9999.00	801.30	36.51	28.61	43.54
144	[140.0 / 720.0] USNAIR55 EX. EXP.	140	720	.00	9999.00	924.30	42.06	32.67	50.14
145	[150.0 / 5.0] USNAIR55 NO-D 13	150	5	.00	9999.00	2.50	1.03	.43	1.63
146	[150.0 / 10.0]USNAIR.55DAT 120	150	10	.00	9999.00	3.50	1.46	.83	2.08
147	[150.0 / 15.0]USNAIR.55DAT 121	150	15	.00	9999.00	5.50	2.00	1.30	2.69
148	[150.0 / 20.0]USNAIR.55DAT 122	150	20	.00	9999.00	11.50	2.60	1.76	3.43
149	[150.0 / 25.0]USNAIR.55DAT 123	150	25	.00	9999.00	23.50	3.38	2.31	4.43
150	[150.0 / 30.0]USNAIR.55DAT 124	150	30	.00	9999.00	34.50	4.43	3.15	5.69
151	[150.0 / 40.0]USNAIR.55DAT 125	150	40	.00	9999.00	59.50	7.00	5.35	8.62
152	[150.0 / 50.0]USNAIR.55DAT 126	150	50	.00	9999.00	88.50	9.85	7.92	11.75
153	[150.0 / 60.0]USNAIR.55DAT 127	150	60	.00	9999.00	112.50	12.56	10.20	14.85
154	[150.0 / 70.0]USNAIR.55DAT 128	150	70	.00	9999.00	146.50	14.76	11.83	17.59
155	[150.0 / 80.0]USNAIR.55DAT 129	150	80	.00	9999.00	173.50	16.98	13.51	20.31
156	[160.0 / 5.0] USNAIR55 NO-D 14	160	5	.00	9999.00	2.70	1.09	.47	1.70
157	[160.0 / 10.0]USNAIR.55DAT 130	160	10	.00	9999.00	3.70	1.58	.91	2.24
158	[160.0 / 15.0]USNAIR.55DAT 131	160	15	.00	9999.00	7.70	2.08	1.36	2.79
159	[160.0 / 20.0]USNAIR.55DAT 132	160	20	.00	9999.00	16.70	2.83	1.91	3.74

160	[160.0 / 25.0]USNAIR.55DAT 133	160	25	.00	9999.00	29.70	3.75	2.59	4.89
161	[160.0 / 30.0]USNAIR.55DAT 134	160	30	.00	9999.00	40.70	4.99	3.57	6.40
162	[160.0 / 40.0]USNAIR.55DAT 135	160	40	.00	9999.00	71.70	7.98	6.17	9.75
163	[160.0 / 50.0]USNAIR.55DAT 136	160	50	.00	9999.00	98.70	11.15	9.01	13.23
164	[160.0 / 60.0]USNAIR.55DAT 137	160	60	.00	9999.00	132.70	13.90	11.30	16.43
165	[160.0 / 70.0] USNAIR55 EX. EXP.	160	70	.00	9999.00	166.70	16.34	13.22	19.34
166	[170.0 / 5.0] USNAIR55 NO-D 15	170	5	.00	9999.00	2.80	1.14	.50	1.77
167	[170.0 / 10.0]USNAIR.55DAT 138	170	10	.00	9999.00	4.80	1.62	.95	2.28
168	[170.0 / 15.0]USNAIR.55DAT 139	170	15	.00	9999.00	9.80	2.20	1.45	2.94
169	[170.0 / 20.0]USNAIR.55DAT 140	170	20	.00	9999.00	21.80	3.08	2.07	4.09
170	[170.0 / 25.0]USNAIR.55DAT 141	170	25	.00	9999.00	34.80	4.14	2.86	5.41
171	[170.0 / 30.0]USNAIR.55DAT 142	170	30	.00	9999.00	45.80	5.64	4.06	7.20
172	[170.0 / 40.0]USNAIR.55DAT 143	170	40	.00	9999.00	81.80	9.00	7.04	10.93
173	[170.0 / 50.0]USNAIR.55DAT 144	170	50	.00	9999.00	109.80	12.46	10.09	14.76
174	[170.0 / 60.0]USNAIR.55DAT 145	170	60	.00	9999.00	152.80	15.19	12.36	17.93
175	[170.0 / 70.0] USNAIR55 EX. EXP.	170	70	.00	9999.00	183.80	18.04	14.57	21.37
176	[170.0 / 90.0] USNAIR55 EX. EXP.	170	90	.00	9999.00	246.80	22.70	17.32	27.72
177	[170.0 / 120.0] USNAIR55 EX. EXP.	170	120	.00	9999.00	356.80	26.40	18.77	33.32
178	[170.0 / 180.0] USNAIR55 EX. EXP.	170	180	.00	9999.00	535.80	29.75	20.69	37.77
179	[170.0 / 240.0] USNAIR55 EX. EXP.	170	240	.00	9999.00	681.80	31.50	24.76	37.63
180	[170.0 / 360.0] USNAIR55 EX. EXP.	170	360	.00	9999.00	873.80	37.01	29.04	44.08
181	[170.0 / 480.0] USNAIR55 EX. EXP.	170	480	.00	9999.00	1007.80	40.91	31.84	48.77
182	[180.0 / 5.0] USNAIR55 NO-D 16	180	5	.00	9999.00	3.00	1.19	.54	1.83
183	[180.0 / 10.0]USNAIR.55DAT 146	180	10	.00	9999.00	6.00	1.68	1.00	2.36
184	[180.0 / 15.0]USNAIR.55DAT 147	180	15	.00	9999.00	12.00	2.35	1.55	3.15
185	[180.0 / 20.0]USNAIR.55DAT 148	180	20	.00	9999.00	26.00	3.32	2.22	4.40
186	[180.0 / 25.0]USNAIR.55DAT 149	180	25	.00	9999.00	40.00	4.62	3.20	6.02
187	[180.0 / 30.0]USNAIR.55DAT 150	180	30	.00	9999.00	53.00	6.35	4.61	8.05
188	[180.0 / 40.0]USNAIR.55DAT 151	180	40	.00	9999.00	93.00	10.00	7.88	12.06
189	[180.0 / 50.0]USNAIR.55DAT 152	180	50	.00	9999.00	128.00	13.59	11.08	16.04
190	[180.0 / 60.0]USNAIR.55DAT 153	180	60	.00	9999.00	168.00	16.69	13.62	19.64
191	[190.0 / 5.0] USNAIR55 NO-D 17	190	5	.00	9999.00	3.20	1.24	.57	1.89
192	[190.0 / 10.0]USNAIR.55DAT 154	190	10	.00	9999.00	7.20	1.72	1.03	2.41
193	[190.0 / 15.0]USNAIR.55DAT 155	190	15	.00	9999.00	14.20	2.53	1.66	3.38
194	[190.0 / 20.0]USNAIR.55DAT 156	190	20	.00	9999.00	31.20	3.58	2.40	4.74
195	[190.0 / 25.0]USNAIR.55DAT 157	190	25	.00	9999.00	44.20	5.15	3.58	6.69
196	[190.0 / 30.0]USNAIR.55DAT 158	190	30	.00	9999.00	63.20	7.04	5.17	8.88
197	[190.0 / 40.0]USNAIR.55DAT 159	190	40	.00	9999.00	103.20	11.07	8.79	13.28
198	[190.0 / 50.0] USNAIR55 EX. EXP.	190	50	.00	9999.00	147.20	14.71	12.03	17.30
199	[190.0 / 60.0] USNAIR55 EX. EXP.	190	60	.00	9999.00	183.20	18.26	14.96	21.44
200	[200.0 / 5.0] USNAIR55 EX. EXP.	200	5	.00	9999.00	4.30	1.22	.58	1.85
201	[200.0 / 10.0] USNAIR55 EX. EXP.	200	10	.00	9999.00	8.30	1.81	1.10	2.51
202	[200.0 / 15.0] USNAIR55 EX. EXP.	200	15	.00	9999.00	18.30	2.67	1.78	3.56
203	[200.0 / 20.0] USNAIR55 EX. EXP.	200	20	.00	9999.00	40.30	3.85	2.58	5.10
204	[200.0 / 25.0] USNAIR55 EX. EXP.	200	25	.00	9999.00	49.30	5.73	4.02	7.41
205	[200.0 / 30.0] USNAIR55 EX. EXP.	200	30	.00	9999.00	73.30	7.77	5.76	9.73
206	[200.0 / 40.0] USNAIR55 EX. EXP.	200	40	.00	9999.00	112.30	12.16	9.72	14.54
207	[200.0 / 50.0] USNAIR55 EX. EXP.	200	50	.00	9999.00	161.30	15.97	13.08	18.77
208	[200.0 / 60.0] USNAIR55 EX. EXP.	200	60	.00	9999.00	199.30	19.77	16.17	23.22
209	[200.0 / 90.0] USNAIR55 EX. EXP.	200	90	.00	9999.00	324.30	27.30	20.54	33.48
210	[200.0 / 120.0] USNAIR55 EX. EXP.	200	120	.00	9999.00	473.30	29.95	20.63	38.18
211	[200.0 / 180.0] USNAIR55 EX. EXP.	200	180	.00	9999.00	685.30	31.95	23.17	39.73
212	[200.0 / 240.0] USNAIR55 EX. EXP.	200	240	.00	9999.00	842.30	35.02	27.74	41.56
213	[200.0 / 360.0] USNAIR55 EX. EXP.	200	360	.00	9999.00	1058.30	40.87	31.86	48.69

Table E-2

VVAL18 Air Decompression Schedules Risk Estimates

INPUT FILE AIR18USN.MLO OUTPUT FILE AIR18USN .est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

1 19:19 DUKE/DAN 2 FEB 1997
PROGRAM TBLP7MLO1 USING 10 FSW STOPS
VVAL18.DAT (NITROGEN)

	PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	35/310	35	310	.00	9999.00	58.58	4.43	3.25	5.59
2	40/200	40	200	.00	9999.00	38.67	3.36	2.42	4.29
3	40/210	40	210	.00	9999.00	47.67	3.55	2.58	4.51
4	40/230	40	230	.00	9999.00	64.67	3.93	2.90	4.94
5	40/250	40	250	.00	9999.00	89.67	4.17	3.10	5.22
6	40/270	40	270	.00	9999.00	112.67	4.40	3.30	5.48
7	40/300	40	300	.00	9999.00	141.67	4.74	3.59	5.87
8	40/360	40	360	.00	9999.00	187.67	5.41	4.08	6.72
9	40/480	40	480	.00	9999.00	286.67	6.88	4.80	8.91
10	40/720	40	720	.00	9999.00	482.67	8.83	6.57	11.03
11	50/100	50	100	.00	9999.00	9.83	2.26	1.57	2.95
12	50/110	50	110	.00	9999.00	20.83	2.54	1.79	3.28
13	50/120	50	120	.00	9999.00	29.83	2.85	2.04	3.66
14	50/140	50	140	.00	9999.00	70.83	3.27	2.37	4.16
15	50/160	50	160	.00	9999.00	105.83	3.69	2.72	4.65
16	50/180	50	180	.00	9999.00	134.83	4.11	3.08	5.13
17	50/200	50	200	.00	9999.00	170.83	4.38	3.33	5.42
18	50/220	50	220	.00	9999.00	207.83	4.57	3.52	5.61
19	50/240	50	240	.00	9999.00	238.83	4.68	3.65	5.70
20	60/60	60	60	.00	9999.00	1.00	2.14	1.46	2.83
21	60/70	60	70	.00	9999.00	17.00	2.14	1.47	2.81
22	60/80	60	80	.00	9999.00	38.00	2.42	1.75	3.08
23	60/100	60	100	.00	9999.00	70.00	3.20	2.38	4.03
24	60/120	60	120	.00	9999.00	124.00	3.76	2.80	4.70
25	60/140	60	140	.00	9999.00	170.00	4.14	3.10	5.17
26	60/160	60	160	.00	9999.00	208.00	4.61	3.49	5.73
27	60/180	60	180	.00	9999.00	254.00	4.90	3.77	6.02
28	60/200	60	200	.00	9999.00	297.00	5.16	4.10	6.21
29	60/240	60	240	.00	9999.00	371.00	5.89	4.48	7.28
30	60/360	60	360	.00	9999.00	589.00	7.72	5.80	9.60
31	60/480	60	480	.00	9999.00	802.00	8.57	6.34	10.74
32	60/720	60	720	.00	9999.00	1047.00	10.17	7.80	12.48
33	70/50	70	50	.00	9999.00	5.17	2.15	1.49	2.80
34	70/60	70	60	.00	9999.00	39.17	2.32	1.67	2.97
35	70/70	70	70	.00	9999.00	68.17	2.72	2.04	3.39
36	70/80	70	80	.00	9999.00	92.17	3.21	2.44	3.98
37	70/90	70	90	.00	9999.00	108.17	3.62	2.77	4.47
38	70/100	70	100	.00	9999.00	141.17	4.00	3.07	4.91
39	70/110	70	110	.00	9999.00	173.17	4.33	3.34	5.31
40	70/120	70	120	.00	9999.00	203.17	4.63	3.56	5.68
41	70/130	70	130	.00	9999.00	230.17	4.91	3.77	6.03
42	70/140	70	140	.00	9999.00	253.17	5.19	3.98	6.38
43	70/150	70	150	.00	9999.00	280.17	5.39	4.16	6.60
44	70/160	70	160	.00	9999.00	310.17	5.45	4.22	6.66
45	70/170	70	170	.00	9999.00	338.17	5.56	4.45	6.65
46	80/40	80	40	.00	9999.00	1.33	2.39	1.69	3.10
47	80/50	80	50	.00	9999.00	47.33	2.39	1.71	3.05
48	80/60	80	60	.00	9999.00	86.33	2.86	2.17	3.55
49	80/70	80	70	.00	9999.00	113.33	3.32	2.57	4.07
50	80/80	80	80	.00	9999.00	133.33	4.04	3.18	4.89
51	80/90	80	90	.00	9999.00	170.33	4.55	3.61	5.48
52	80/100	80	100	.00	9999.00	209.33	4.88	3.86	5.90
53	80/110	80	110	.00	9999.00	244.33	5.20	4.08	6.30
54	80/120	80	120	.00	9999.00	275.33	5.52	4.31	6.72
55	80/130	80	130	.00	9999.00	304.33	5.82	4.54	7.08
56	80/140	80	140	.00	9999.00	336.33	6.02	4.71	7.32
57	80/150	80	150	.00	9999.00	370.33	6.21	4.97	7.42
58	80/180	80	180	.00	9999.00	462.33	7.09	5.57	8.59
59	80/240	80	240	.00	9999.00	644.33	8.44	6.57	10.27
60	80/360	80	360	.00	9999.00	998.33	9.38	7.17	11.53
61	80/480	80	480	.00	9999.00	1216.33	10.25	7.90	12.53
62	80/720	80	720	.00	9999.00	1472.33	11.57	8.99	14.09
63	90/30	90	30	.00	9999.00	1.50	2.13	1.48	2.78
64	90/40	90	40	.00	9999.00	36.50	2.36	1.65	3.07
65	90/50	90	50	.00	9999.00	88.50	2.84	2.13	3.54
66	90/60	90	60	.00	9999.00	123.50	3.38	2.61	4.13
67	90/70	90	70	.00	9999.00	150.50	4.24	3.38	5.09
68	90/80	90	80	.00	9999.00	185.50	4.87	3.93	5.79

69	90/90	90	90	.00	9999.00	228.50	5.39	4.36	6.41
70	90/100	90	100	.00	9999.00	270.50	5.80	4.66	6.93
71	90/110	90	110	.00	9999.00	307.50	6.16	4.89	7.41
72	90/120	90	120	.00	9999.00	343.50	6.40	5.06	7.73
73	90/130	90	130	.00	9999.00	386.50	6.59	5.28	7.89
74	100/25	100	25	.00	9999.00	1.67	2.08	1.42	2.74
75	100/30	100	30	.00	9999.00	3.67	2.40	1.68	3.10
76	100/40	100	40	.00	9999.00	72.67	2.65	1.92	3.37
77	100/50	100	50	.00	9999.00	121.67	3.20	2.42	3.97
78	100/60	100	60	.00	9999.00	158.67	4.17	3.31	5.03
79	100/70	100	70	.00	9999.00	183.67	5.16	4.20	6.10
80	100/80	100	80	.00	9999.00	235.67	5.80	4.77	6.81
81	100/90	100	90	.00	9999.00	284.67	6.22	5.08	7.35
82	100/100	100	100	.00	9999.00	339.67	6.45	5.19	7.69
83	100/110	100	110	.00	9999.00	387.67	6.74	5.40	8.07
84	100/120	100	120	.00	9999.00	433.67	7.14	5.75	8.50
85	100/180	100	180	.00	9999.00	737.67	8.69	6.91	10.44
86	100/240	100	240	.00	9999.00	1005.67	9.45	7.32	11.54
87	100/360	100	360	.00	9999.00	1344.67	10.73	8.34	13.05
88	100/480	100	480	.00	9999.00	1561.67	11.67	9.10	14.17
89	100/720	100	720	.00	9999.00	1806.67	13.25	10.28	16.13
90	110/20	110	20	.00	9999.00	1.83	1.91	1.26	2.55
91	110/25	110	25	.00	9999.00	1.83	2.44	1.69	3.19
92	110/30	110	30	.00	9999.00	32.83	2.44	1.69	3.17
93	110/40	110	40	.00	9999.00	104.83	2.84	2.07	3.61
94	110/50	110	50	.00	9999.00	152.83	3.86	2.96	4.74
95	110/60	110	60	.00	9999.00	186.83	4.98	4.02	5.94
96	110/70	110	70	.00	9999.00	229.83	6.03	5.00	7.05
97	110/80	110	80	.00	9999.00	294.83	6.45	5.34	7.54
98	110/90	110	90	.00	9999.00	361.83	6.67	5.46	7.87
99	110/100	110	100	.00	9999.00	415.83	7.09	5.75	8.42
100	120/15	120	15	.00	9999.00	2.00	1.64	1.01	2.26
101	120/20	120	20	.00	9999.00	2.00	2.19	1.47	2.90
102	120/25	120	25	.00	9999.00	15.00	2.39	1.65	3.13
103	120/30	120	30	.00	9999.00	62.00	2.63	1.82	3.44
104	120/40	120	40	.00	9999.00	132.00	3.29	2.40	4.17
105	120/50	120	50	.00	9999.00	180.00	4.48	3.48	5.47
106	120/60	120	60	.00	9999.00	215.00	5.95	4.89	7.00
107	120/70	120	70	.00	9999.00	289.00	6.55	5.46	7.62
108	120/80	120	80	.00	9999.00	365.00	6.88	5.71	8.05
109	120/90	120	90	.00	9999.00	442.00	7.13	5.80	8.44
110	120/100	120	100	.00	9999.00	515.00	7.62	6.12	9.10
111	120/120	120	120	.00	9999.00	648.00	8.49	6.84	10.11
112	120/180	120	180	.00	9999.00	1044.00	9.50	7.47	11.49
113	120/240	120	240	.00	9999.00	1311.00	10.34	8.13	12.49
114	120/360	120	360	.00	9999.00	1643.00	11.89	9.30	14.41
115	120/480	120	480	.00	9999.00	1847.00	13.09	10.18	15.90
116	120/720	120	720	.00	9999.00	2088.00	14.79	11.31	18.14
117	130/10	130	10	.00	9999.00	2.17	1.33	.72	1.95
118	130/15	130	15	.00	9999.00	2.17	1.84	1.16	2.51
119	130/20	130	20	.00	9999.00	3.17	2.37	1.62	3.13
120	130/25	130	25	.00	9999.00	40.17	2.55	1.76	3.35
121	130/30	130	30	.00	9999.00	89.17	2.66	1.85	3.47
122	130/40	130	40	.00	9999.00	157.17	3.70	2.69	4.71
123	130/50	130	50	.00	9999.00	205.17	5.30	4.20	6.38
124	130/60	130	60	.00	9999.00	260.17	6.57	5.44	7.67
125	130/70	130	70	.00	9999.00	355.17	6.92	5.79	8.03
126	130/80	130	80	.00	9999.00	448.17	7.15	5.82	8.45
127	130/90	130	90	.00	9999.00	532.17	7.73	6.20	9.24
128	140/10	140	10	.00	9999.00	2.33	1.45	.80	2.10
129	140/15	140	15	.00	9999.00	2.33	2.04	1.31	2.77
130	140/20	140	20	.00	9999.00	16.33	2.34	1.59	3.08
131	140/25	140	25	.00	9999.00	63.33	2.49	1.68	3.29
132	140/30	140	30	.00	9999.00	113.33	2.90	2.00	3.79
133	140/40	140	40	.00	9999.00	180.33	4.31	3.18	5.44
134	140/50	140	50	.00	9999.00	227.33	6.08	4.89	7.26
135	140/60	140	60	.00	9999.00	327.33	6.77	5.63	7.90
136	140/70	140	70	.00	9999.00	428.33	7.16	5.85	8.44
137	140/80	140	80	.00	9999.00	534.33	7.63	6.07	9.17
138	140/90	140	90	.00	9999.00	620.33	8.33	6.68	9.96
139	140/120	140	120	.00	9999.00	892.33	9.11	7.35	10.84
140	140/180	140	180	.00	9999.00	1307.33	10.26	8.16	12.31
141	140/240	140	240	.00	9999.00	1572.33	11.22	8.83	13.55
142	140/360	140	360	.00	9999.00	1896.33	13.01	10.15	15.79
143	140/480	140	480	.00	9999.00	2095.33	14.34	11.04	17.52
144	140/720	140	720	.00	9999.00	2325.33	16.37	12.26	20.28
145	150/5	150	5	.00	9999.00	2.50	1.08	.44	1.71
146	150/10	150	10	.00	9999.00	2.50	1.58	.89	2.26
147	150/15	150	15	.00	9999.00	4.50	2.06	1.35	2.77
148	150/20	150	20	.00	9999.00	28.50	2.39	1.60	3.17
149	150/25	150	25	.00	9999.00	84.50	2.62	1.76	3.46
150	150/30	150	30	.00	9999.00	133.50	3.14	2.11	4.15
151	150/40	150	40	.00	9999.00	201.50	4.89	3.64	6.11
152	150/50	150	50	.00	9999.00	269.50	6.58	5.33	7.81
153	150/60	150	60	.00	9999.00	386.50	7.09	5.85	8.31
154	150/70	150	70	.00	9999.00	512.50	7.46	5.89	8.99
155	150/80	150	80	.00	9999.00	611.50	8.30	6.60	9.97

156	160/5	160	5	.00	9999.00	2.67	1.13	.48	1.78
157	160/10	160	10	.00	9999.00	2.67	1.70	.98	2.41
158	160/15	160	15	.00	9999.00	10.67	2.06	1.37	2.75
159	160/20	160	20	.00	9999.00	44.67	2.42	1.61	3.23
160	160/25	160	25	.00	9999.00	104.67	2.72	1.78	3.66
161	160/30	160	30	.00	9999.00	151.67	3.45	2.29	4.60
162	160/40	160	40	.00	9999.00	219.67	5.57	4.23	6.90
163	160/50	160	50	.00	9999.00	330.67	6.78	5.52	8.02
164	160/60	160	60	.00	9999.00	463.67	7.17	5.70	8.63
165	160/70	160	70	.00	9999.00	583.67	8.07	6.32	9.79
166	170/5	170	5	.00	9999.00	2.83	1.19	.52	1.85
167	170/10	170	10	.00	9999.00	2.83	1.83	1.07	2.57
168	170/15	170	15	.00	9999.00	20.83	2.04	1.34	2.74
169	170/20	170	20	.00	9999.00	60.83	2.37	1.54	3.20
170	170/25	170	25	.00	9999.00	121.83	2.91	1.92	3.90
171	170/30	170	30	.00	9999.00	168.83	3.91	2.67	5.13
172	170/40	170	40	.00	9999.00	239.83	6.27	4.83	7.68
173	170/50	170	50	.00	9999.00	387.83	6.91	5.56	8.24
174	170/60	170	60	.00	9999.00	535.83	7.55	5.81	9.27
175	170/70	170	70	.00	9999.00	663.83	8.48	6.67	10.25
176	170/90	170	90	.00	9999.00	923.83	9.18	7.33	11.00
177	170/120	170	120	.00	9999.00	1240.83	10.16	8.11	12.17
178	170/180	170	180	.00	9999.00	1640.83	11.46	9.09	13.77
179	170/240	170	240	.00	9999.00	1897.83	12.58	9.89	15.20
180	170/360	170	360	.00	9999.00	2216.83	14.55	11.19	17.78
181	170/480	170	480	.00	9999.00	2409.83	16.17	12.18	19.98
182	180/5	180	5	.00	9999.00	3.00	1.24	.55	1.92
183	180/10	180	10	.00	9999.00	3.00	1.96	1.17	2.74
184	180/15	180	15	.00	9999.00	30.00	2.08	1.36	2.79
185	180/20	180	20	.00	9999.00	77.00	2.48	1.59	3.36
186	180/25	180	25	.00	9999.00	139.00	3.24	2.04	4.42
187	180/30	180	30	.00	9999.00	185.00	4.37	3.20	5.52
188	180/40	180	40	.00	9999.00	295.00	6.37	4.91	7.80
189	180/50	180	50	.00	9999.00	449.00	7.05	5.48	8.60
190	180/60	180	60	.00	9999.00	598.00	8.14	6.23	10.00
191	190/5	190	5	.00	9999.00	3.17	1.29	.59	1.98
192	190/10	190	10	.00	9999.00	8.17	1.72	1.04	2.39
193	190/15	190	15	.00	9999.00	38.17	2.07	1.39	2.75
194	190/20	190	20	.00	9999.00	92.17	2.58	1.73	3.43
195	190/25	190	25	.00	9999.00	156.17	3.59	2.49	4.67
196	190/30	190	30	.00	9999.00	201.17	4.91	3.55	6.25
197	190/40	190	40	.00	9999.00	346.17	6.50	5.19	7.80
198	190/50	190	50	.00	9999.00	515.17	7.36	5.50	9.17
199	190/60	190	60	.00	9999.00	673.17	8.45	6.50	10.35
200	200/5	200	5	.00	9999.00	3.33	1.34	.63	2.05
201	200/10	200	10	.00	9999.00	13.33	1.77	1.11	2.42
202	200/15	200	15	.00	9999.00	44.33	2.14	1.48	2.80
203	200/20	200	20	.00	9999.00	109.33	2.80	2.02	3.57
204	200/25	200	25	.00	9999.00	170.33	4.04	3.07	5.00
205	200/30	200	30	.00	9999.00	224.33	5.43	4.27	6.58
206	200/40	200	40	.00	9999.00	394.33	6.66	5.36	7.94
207	200/50	200	50	.00	9999.00	575.33	7.77	5.75	9.76
208	200/60	200	60	.00	9999.00	745.33	8.72	6.76	10.64
209	200/90	200	90	.00	9999.00	1219.33	10.08	7.95	12.17
210	200/120	200	120	.00	9999.00	1527.33	11.05	8.78	13.26
211	200/180	200	180	.00	9999.00	1920.33	12.62	9.96	15.20
212	200/240	200	240	.00	9999.00	2171.33	13.94	10.84	16.94
213	200/360	200	360	.00	9999.00	2486.33	16.14	12.17	19.93
214	210/5	210	5	.00	9999.00	3.50	1.39	.66	2.11
215	210/10	210	10	.00	9999.00	18.50	1.71	1.06	2.35
216	210/15	210	15	.00	9999.00	50.50	2.20	1.48	2.92
217	210/20	210	20	.00	9999.00	125.50	3.05	2.20	3.89
218	210/25	210	25	.00	9999.00	186.50	4.50	3.56	5.43
219	210/30	210	30	.00	9999.00	260.50	5.74	4.67	6.81
220	210/40	210	40	.00	9999.00	444.50	6.86	5.32	8.37
221	210/50	210	50	.00	9999.00	631.50	8.21	6.17	10.20
222	220/5	220	5	.00	9999.00	3.67	1.44	.70	2.17
223	220/10	220	10	.00	9999.00	21.67	1.71	1.08	2.34
224	220/15	220	15	.00	9999.00	62.67	2.29	1.58	3.00
225	220/20	220	20	.00	9999.00	144.67	3.35	2.37	4.32
226	220/25	220	25	.00	9999.00	207.67	4.95	3.88	6.01
227	220/30	220	30	.00	9999.00	296.67	6.05	4.97	7.12
228	220/40	220	40	.00	9999.00	500.67	7.14	5.50	8.75
229	220/50	220	50	.00	9999.00	699.67	8.46	6.47	10.41
230	230/5	230	5	.00	9999.00	3.83	1.49	.73	2.23
231	230/10	230	10	.00	9999.00	25.83	1.73	1.11	2.35
232	230/15	230	15	.00	9999.00	78.83	2.40	1.71	3.09
233	230/20	230	20	.00	9999.00	160.83	3.75	2.83	4.65
234	230/25	230	25	.00	9999.00	236.83	5.32	4.27	6.36
235	230/30	230	30	.00	9999.00	340.83	6.25	5.14	7.35
236	230/40	230	40	.00	9999.00	553.83	7.51	5.77	9.23
237	230/50	230	50	.00	9999.00	770.83	8.71	6.69	10.70
238	240/5	240	5	.00	9999.00	4.00	1.53	.77	2.29
239	240/10	240	10	.00	9999.00	29.00	1.76	1.17	2.35
240	240/15	240	15	.00	9999.00	94.00	2.56	1.86	3.26
241	240/20	240	20	.00	9999.00	175.00	4.12	3.23	5.01
242	240/25	240	25	.00	9999.00	269.00	5.65	4.65	6.65

243	240/30	240	30	.00	9999.00	382.00	6.42	5.34	7.49
244	240/40	240	40	.00	9999.00	606.00	7.33	6.05	9.77
245	240/50	240	50	.00	9999.00	846.00	8.86	6.95	10.74
246	250/5	250	5	.00	9999.00	4.17	1.58	.81	2.35
247	250/10	250	10	.00	9999.00	32.17	1.85	1.26	2.43
248	250/15	250	15	.00	9999.00	109.17	2.76	2.04	3.48
249	250/20	250	20	.00	9999.00	191.17	4.56	3.66	5.46
250	250/25	250	25	.00	9999.00	299.17	5.98	4.94	7.00
251	250/30	250	30	.00	9999.00	421.17	6.64	5.47	7.80
252	250/40	250	40	.00	9999.00	662.17	8.28	6.45	10.07
253	250/60	250	60	.00	9999.00	1146.17	9.75	7.49	11.95
254	250/90	250	90	.00	9999.00	1626.17	11.34	8.90	13.71
255	250/120	250	120	.00	9999.00	1928.17	12.55	9.91	15.12
256	250/180	250	180	.00	9999.00	2307.17	14.45	11.17	17.62
257	250/240	250	240	.00	9999.00	2551.17	16.09	12.15	19.85
258	260/5	260	5	.00	9999.00	4.33	1.63	.84	2.41
259	260/10	260	10	.00	9999.00	36.33	1.89	1.30	2.48
260	260/15	260	15	.00	9999.00	125.33	2.97	2.23	3.70
261	260/20	260	20	.00	9999.00	216.33	4.86	3.90	5.80
262	260/25	260	25	.00	9999.00	336.33	6.19	5.13	7.24
263	260/30	260	30	.00	9999.00	462.33	6.90	5.54	8.25
264	260/40	260	40	.00	9999.00	723.33	8.55	6.71	10.36
265	270/5	270	5	.00	9999.00	4.50	1.68	.88	2.47
266	270/10	270	10	.00	9999.00	42.50	1.97	1.37	2.57
267	270/15	270	15	.00	9999.00	141.50	3.24	2.35	4.12
268	270/20	270	20	.00	9999.00	244.50	5.16	4.17	6.14
269	270/25	270	25	.00	9999.00	370.50	6.40	5.33	7.47
270	270/30	270	30	.00	9999.00	510.50	7.18	5.66	8.68
271	270/40	270	40	.00	9999.00	790.50	8.73	6.82	10.59
272	280/5	280	5	.00	9999.00	4.67	1.72	.91	2.53
273	280/10	280	10	.00	9999.00	46.67	2.04	1.40	2.68
274	280/15	280	15	.00	9999.00	156.67	3.50	2.58	4.41
275	280/20	280	20	.00	9999.00	270.67	5.49	4.50	6.47
276	280/25	280	25	.00	9999.00	405.67	6.58	5.46	7.69
277	280/30	280	30	.00	9999.00	555.67	7.52	5.93	9.09
278	280/40	280	40	.00	9999.00	854.67	8.88	7.01	10.72
279	290/5	290	5	.00	9999.00	4.83	1.77	.95	2.59
280	290/10	290	10	.00	9999.00	50.83	2.14	1.49	2.80
281	290/15	290	15	.00	9999.00	168.83	3.84	2.93	4.74
282	290/20	290	20	.00	9999.00	294.83	5.79	4.78	6.80
283	290/25	290	25	.00	9999.00	442.83	6.77	5.54	7.99
284	290/30	290	30	.00	9999.00	601.83	7.85	6.16	9.50
285	290/40	290	40	.00	9999.00	917.83	9.03	7.15	10.86
286	300/5	10	9	.00	9999.00	.17	1.82	.99	2.65
287	300/10	300	10	.00	9999.00	56.00	2.24	1.56	2.91
288	300/15	300	15	.00	9999.00	182.00	4.17	3.27	5.06
289	300/20	300	20	.00	9999.00	319.00	6.10	5.05	7.14
290	300/25	300	25	.00	9999.00	482.00	7.02	5.63	8.40
291	300/30	300	30	.00	9999.00	648.00	8.18	6.44	9.88
292	300/40	300	40	.00	9999.00	985.00	9.16	7.16	11.12
293	300/60	300	60	.00	9999.00	1488.00	10.80	8.49	13.05
294	300/90	300	90	.00	9999.00	1955.00	12.60	9.89	15.23
295	300/120	300	120	.00	9999.00	2250.00	14.09	10.98	17.08
296	300/180	300	180	.00	9999.00	2623.00	16.33	12.31	20.16

Table E-3

VVAL18-1 Air Decompression Schedules Risk Estimates

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INPUT FILE AIR181US.MLO OUTPUT FILE AIR181US.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

1 19:18 DUKE/DAN 2 FEB 1997
PROGRAM TBLP7MLO1 USING 10 FSW STOPS
VVAL18-1.DAT(NITROGEN)

	PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	35/310	35	310	.00	9999.00	.58	5.43	4.14	6.70
2	40/200	40	200	.00	9999.00	.67	3.96	2.94	4.98
3	40/210	40	210	.00	9999.00	9.67	4.01	2.97	5.03
4	40/230	40	230	.00	9999.00	24.67	4.44	3.34	5.52
5	40/250	40	250	.00	9999.00	37.67	4.87	3.71	6.01
6	40/270	40	270	.00	9999.00	53.67	5.22	4.02	6.41
7	40/300	40	300	.00	9999.00	105.67	5.25	4.04	6.44
8	40/360	40	360	.00	9999.00	230.67	4.94	3.65	6.21
9	40/480	40	480	.00	9999.00	425.67	5.47	3.69	7.21
10	40/720	40	720	.00	9999.00	648.67	6.88	4.97	8.76
11	50/100	50	100	.00	9999.00	.83	2.54	1.79	3.29
12	50/110	50	110	.00	9999.00	12.83	2.61	1.84	3.37
13	50/120	50	120	.00	9999.00	23.83	2.91	2.08	3.73
14	50/140	50	140	.00	9999.00	40.83	3.58	2.62	4.54
15	50/160	50	160	.00	9999.00	67.83	4.12	3.08	5.16
16	50/180	50	180	.00	9999.00	96.83	4.57	3.46	5.67
17	50/200	50	200	.00	9999.00	120.83	5.01	3.86	6.16
18	50/220	50	220	.00	9999.00	149.83	5.32	4.14	6.49
19	50/240	50	240	.00	9999.00	183.83	5.49	4.30	6.65
20	60/60	60	60	.00	9999.00	1.00	2.14	1.46	2.83
21	60/70	60	70	.00	9999.00	7.00	2.24	1.53	2.95
22	60/80	60	80	.00	9999.00	26.00	2.52	1.82	3.22
23	60/100	60	100	.00	9999.00	65.00	3.25	2.41	4.08
24	60/120	60	120	.00	9999.00	93.00	4.09	3.06	5.10
25	60/140	60	140	.00	9999.00	134.00	4.56	3.42	5.68
26	60/160	60	160	.00	9999.00	171.00	5.08	3.85	6.29
27	60/180	60	180	.00	9999.00	203.00	5.54	4.24	6.83
28	60/200	60	200	.00	9999.00	255.00	5.63	4.36	6.89
29	60/240	60	240	.00	9999.00	407.00	5.48	4.17	6.77
30	60/360	60	360	.00	9999.00	753.00	6.23	4.67	7.77
31	60/480	60	480	.00	9999.00	970.00	6.76	4.88	8.60
32	60/720	60	720	.00	9999.00	1204.00	8.23	6.25	10.16
33	70/50	70	50	.00	9999.00	1.17	2.39	1.66	3.10
34	70/60	70	60	.00	9999.00	30.17	2.40	1.72	3.08
35	70/70	70	70	.00	9999.00	56.17	2.82	2.12	3.53
36	70/80	70	80	.00	9999.00	84.17	3.29	2.50	4.07
37	70/90	70	90	.00	9999.00	106.17	3.66	2.79	4.52
38	70/100	70	100	.00	9999.00	123.17	4.20	3.22	5.16
39	70/110	70	110	.00	9999.00	137.17	4.75	3.67	5.83
40	70/120	70	120	.00	9999.00	166.17	5.08	3.92	6.23
41	70/130	70	130	.00	9999.00	193.17	5.38	4.14	6.60
42	70/140	70	140	.00	9999.00	218.17	5.65	4.33	6.94
43	70/150	70	150	.00	9999.00	240.17	5.91	4.52	7.27
44	70/160	70	160	.00	9999.00	261.17	6.13	4.69	7.55
45	70/170	70	170	.00	9999.00	305.17	5.97	4.59	7.33
46	80/40	80	40	.00	9999.00	1.33	2.39	1.69	3.10
47	80/50	80	50	.00	9999.00	40.33	2.45	1.75	3.14
48	80/60	80	60	.00	9999.00	74.33	2.97	2.25	3.68
49	80/70	80	70	.00	9999.00	105.33	3.41	2.63	4.17
50	80/80	80	80	.00	9999.00	131.33	4.07	3.20	4.93
51	80/90	80	90	.00	9999.00	153.33	4.75	3.76	5.72
52	80/100	80	100	.00	9999.00	174.33	5.39	4.27	6.49
53	80/110	80	110	.00	9999.00	208.33	5.68	4.47	6.88
54	80/120	80	120	.00	9999.00	239.33	6.03	4.70	7.33
55	80/130	80	130	.00	9999.00	268.33	6.32	4.89	7.72
56	80/140	80	140	.00	9999.00	320.33	6.19	4.76	7.60
57	80/150	80	150	.00	9999.00	384.33	5.95	4.77	7.12
58	80/180	80	180	.00	9999.00	534.33	6.22	4.91	7.52
59	80/240	80	240	.00	9999.00	807.33	6.60	5.14	8.03
60	80/360	80	360	.00	9999.00	1157.33	7.37	5.57	9.14
61	80/480	80	480	.00	9999.00	1377.33	8.14	6.23	10.02
62	80/720	80	720	.00	9999.00	1633.33	9.50	7.35	11.59
63	90/30	90	30	.00	9999.00	1.50	2.13	1.48	2.78
64	90/40	90	40	.00	9999.00	33.50	2.39	1.67	3.11
65	90/50	90	50	.00	9999.00	78.50	2.76	2.06	3.46
66	90/60	90	60	.00	9999.00	113.50	3.48	2.69	4.25
67	90/70	90	70	.00	9999.00	146.50	4.28	3.42	5.14
68	90/80	90	80	.00	9999.00	174.50	5.00	4.03	5.95

69	90/90	90	90	.00	9999.00	193.50	5.87	4.76	6.97
70	90/100	90	100	.00	9999.00	234.50	6.32	5.08	7.55
71	90/110	90	110	.00	9999.00	272.50	6.69	5.31	8.05
72	90/120	90	120	.00	9999.00	346.50	6.38	5.00	7.75
73	90/130	90	130	.00	9999.00	420.50	6.10	4.92	7.25
74	100/25	100	25	.00	9999.00	1.67	2.08	1.42	2.74
75	100/30	100	30	.00	9999.00	16.67	2.14	1.49	2.79
76	100/40	100	40	.00	9999.00	65.67	2.52	1.81	3.22
77	100/50	100	50	.00	9999.00	110.67	3.30	2.50	4.09
78	100/60	100	60	.00	9999.00	149.67	4.15	3.28	5.02
79	100/70	100	70	.00	9999.00	183.67	5.15	4.20	6.09
80	100/80	100	80	.00	9999.00	209.67	6.16	5.08	7.23
81	100/90	100	90	.00	9999.00	249.67	6.76	5.52	7.98
82	100/100	100	100	.00	9999.00	332.67	6.55	5.27	7.82
83	100/110	100	110	.00	9999.00	423.67	6.21	5.06	7.35
84	100/120	100	120	.00	9999.00	503.67	6.28	5.07	7.48
85	100/180	100	180	.00	9999.00	904.67	6.97	5.55	8.36
86	100/240	100	240	.00	9999.00	1152.67	7.51	5.83	9.15
87	100/360	100	360	.00	9999.00	1493.67	8.60	6.67	10.49
88	100/480	100	480	.00	9999.00	1714.67	9.41	7.32	11.45
89	100/720	100	720	.00	9999.00	1973.67	10.85	8.41	13.24
90	110/20	110	20	.00	9999.00	1.83	1.91	1.26	2.55
91	110/25	110	25	.00	9999.00	12.83	2.04	1.40	2.67
92	110/30	110	30	.00	9999.00	39.83	2.37	1.65	3.09
93	110/40	110	40	.00	9999.00	93.83	2.87	2.09	3.65
94	110/50	110	50	.00	9999.00	138.83	3.86	2.95	4.77
95	110/60	110	60	.00	9999.00	182.83	5.03	4.06	5.98
96	110/70	110	70	.00	9999.00	216.83	6.12	5.07	7.16
97	110/80	110	80	.00	9999.00	260.83	6.98	5.79	8.15
98	110/90	110	90	.00	9999.00	372.83	6.51	5.32	7.67
99	110/100	110	100	.00	9999.00	473.83	6.33	5.18	7.47
100	120/15	120	15	.00	9999.00	2.00	1.64	1.01	2.26
101	120/20	120	20	.00	9999.00	9.00	1.82	1.23	2.41
102	120/25	120	25	.00	9999.00	33.00	2.18	1.50	2.87
103	120/30	120	30	.00	9999.00	59.00	2.39	1.64	3.13
104	120/40	120	40	.00	9999.00	119.00	3.24	2.33	4.14
105	120/50	120	50	.00	9999.00	168.00	4.59	3.57	5.59
106	120/60	120	60	.00	9999.00	212.00	5.89	4.84	6.93
107	120/70	120	70	.00	9999.00	255.00	7.08	5.93	8.22
108	120/80	120	80	.00	9999.00	386.00	6.49	5.38	7.59
109	120/90	120	90	.00	9999.00	506.00	6.35	5.15	7.53
110	120/100	120	100	.00	9999.00	609.00	6.62	5.32	7.91
111	120/120	120	120	.00	9999.00	799.00	6.99	5.64	8.32
112	120/180	120	180	.00	9999.00	1191.00	7.62	6.04	9.17
113	120/240	120	240	.00	9999.00	1457.00	8.28	6.54	9.97
114	120/360	120	360	.00	9999.00	1792.00	9.61	7.52	11.65
115	120/480	120	480	.00	9999.00	2005.00	10.64	8.26	12.95
116	120/720	120	720	.00	9999.00	2259.00	12.15	9.26	14.94
117	130/10	130	10	.00	9999.00	2.17	1.33	.72	1.95
118	130/15	130	15	.00	9999.00	2.17	1.84	1.16	2.51
119	130/20	130	20	.00	9999.00	22.17	1.99	1.34	2.63
120	130/25	130	25	.00	9999.00	50.17	2.19	1.47	2.90
121	130/30	130	30	.00	9999.00	79.17	2.51	1.72	3.30
122	130/40	130	40	.00	9999.00	142.17	3.83	2.78	4.87
123	130/50	130	50	.00	9999.00	194.17	5.34	4.22	6.45
124	130/60	130	60	.00	9999.00	239.17	6.81	5.66	7.95
125	130/70	130	70	.00	9999.00	375.17	6.54	5.47	7.61
126	130/80	130	80	.00	9999.00	510.17	6.40	5.17	7.61
127	130/90	130	90	.00	9999.00	629.17	6.71	5.38	8.02
128	140/10	140	10	.00	9999.00	2.33	1.45	.80	2.10
129	140/15	140	15	.00	9999.00	8.33	1.68	1.09	2.26
130	140/20	140	20	.00	9999.00	32.33	1.96	1.30	2.61
131	140/25	140	25	.00	9999.00	66.33	2.21	1.47	2.95
132	140/30	140	30	.00	9999.00	98.33	2.80	1.87	3.72
133	140/40	140	40	.00	9999.00	162.33	4.41	3.23	5.57
134	140/50	140	50	.00	9999.00	218.33	6.14	4.93	7.34
135	140/60	140	60	.00	9999.00	328.33	6.73	5.60	7.85
136	140/70	140	70	.00	9999.00	487.33	6.33	5.10	7.54
137	140/80	140	80	.00	9999.00	628.33	6.67	5.29	8.02
138	140/90	140	90	.00	9999.00	762.33	7.00	5.63	8.35
139	140/120	140	120	.00	9999.00	1061.33	7.34	5.94	8.73
140	140/180	140	180	.00	9999.00	1456.33	8.28	6.63	9.90
141	140/240	140	240	.00	9999.00	1719.33	9.05	7.13	10.93
142	140/360	140	360	.00	9999.00	2046.33	10.64	8.30	12.92
143	140/480	140	480	.00	9999.00	2256.33	11.75	9.03	14.40
144	140/720	140	720	.00	9999.00	2502.33	13.51	10.07	16.82
145	150/5	150	5	.00	9999.00	2.50	1.08	.44	1.71
146	150/10	150	10	.00	9999.00	2.50	1.58	.89	2.26
147	150/15	150	15	.00	9999.00	18.50	1.78	1.17	2.40
148	150/20	150	20	.00	9999.00	45.50	2.07	1.36	2.76
149	150/25	150	25	.00	9999.00	79.50	2.42	1.58	3.25
150	150/30	150	30	.00	9999.00	117.50	3.10	2.02	4.17
151	150/40	150	40	.00	9999.00	181.50	5.07	3.77	6.35
152	150/50	150	50	.00	9999.00	244.50	6.97	5.68	8.25
153	150/60	150	60	.00	9999.00	435.50	6.29	5.11	7.46
154	150/70	150	70	.00	9999.00	597.50	6.56	5.14	7.96
155	150/80	150	80	.00	9999.00	749.50	6.95	5.53	8.35

156	160/5	160	5	.00	9999.00	2.67	1.13	.48	1.78
157	160/10	160	10	.00	9999.00	2.67	1.70	.98	2.41
158	160/15	160	15	.00	9999.00	28.67	1.76	1.13	2.39
159	160/20	160	20	.00	9999.00	57.67	2.02	1.35	2.68
160	160/25	160	25	.00	9999.00	92.67	2.65	1.86	3.42
161	160/30	160	30	.00	9999.00	134.67	3.56	2.41	4.69
162	160/40	160	40	.00	9999.00	202.67	5.79	4.44	7.12
163	160/50	160	50	.00	9999.00	337.67	6.59	5.35	7.81
164	160/60	160	60	.00	9999.00	535.67	6.32	4.86	7.75
165	160/70	160	70	.00	9999.00	707.67	6.83	5.33	8.31
166	170/5	170	5	.00	9999.00	2.83	1.19	.52	1.85
167	170/10	170	10	.00	9999.00	2.83	1.83	1.07	2.57
168	170/15	170	15	.00	9999.00	36.83	1.78	1.15	2.41
169	170/20	170	20	.00	9999.00	70.83	2.12	1.37	2.87
170	170/25	170	25	.00	9999.00	107.83	2.98	2.20	3.75
171	170/30	170	30	.00	9999.00	150.83	4.10	3.07	5.12
172	170/40	170	40	.00	9999.00	232.83	6.34	5.16	7.52
173	170/50	170	50	.00	9999.00	432.83	6.19	4.93	7.44
174	170/60	170	60	.00	9999.00	631.83	6.59	5.00	8.16
175	170/70	170	70	.00	9999.00	817.83	7.02	5.52	8.50
176	170/90	170	90	.00	9999.00	1094.83	7.38	5.89	8.85
177	170/120	170	120	.00	9999.00	1397.83	8.10	6.48	9.69
178	170/180	170	180	.00	9999.00	1788.83	9.25	7.36	11.10
179	170/240	170	240	.00	9999.00	2048.83	10.23	8.04	12.36
180	170/360	170	360	.00	9999.00	2374.83	12.01	9.21	14.73
181	170/480	170	480	.00	9999.00	2579.83	13.27	9.96	16.46
182	180/5	180	5	.00	9999.00	3.00	1.24	.55	1.92
183	180/10	180	10	.00	9999.00	4.00	1.83	1.09	2.56
184	180/15	180	15	.00	9999.00	44.00	1.82	1.19	2.45
185	180/20	180	20	.00	9999.00	81.00	2.31	1.62	3.00
186	180/25	180	25	.00	9999.00	122.00	3.41	2.45	4.36
187	180/30	180	30	.00	9999.00	171.00	4.64	3.68	5.60
188	180/40	180	40	.00	9999.00	275.00	6.71	5.39	8.01
189	180/50	180	50	.00	9999.00	524.00	6.20	4.61	7.78
190	180/60	180	60	.00	9999.00	730.00	6.81	5.17	8.42
191	190/5	190	5	.00	9999.00	3.17	1.29	.59	1.98
192	190/10	190	10	.00	9999.00	11.17	1.66	1.03	2.28
193	190/15	190	15	.00	9999.00	51.17	1.85	1.28	2.42
194	190/20	190	20	.00	9999.00	92.17	2.58	1.91	3.25
195	190/25	190	25	.00	9999.00	139.17	3.88	2.95	4.81
196	190/30	190	30	.00	9999.00	192.17	5.20	4.13	6.27
197	190/40	190	40	.00	9999.00	360.17	6.36	5.24	7.47
198	190/50	190	50	.00	9999.00	611.17	6.40	4.84	7.92
199	190/60	190	60	.00	9999.00	830.17	6.97	5.44	8.47
200	200/5	200	5	.00	9999.00	3.33	1.34	.63	2.05
201	200/10	200	10	.00	9999.00	19.33	1.72	1.07	2.37
202	200/15	200	15	.00	9999.00	57.33	1.93	1.35	2.51
203	200/20	200	20	.00	9999.00	101.33	2.93	2.24	3.63
204	200/25	200	25	.00	9999.00	161.33	4.35	3.44	5.25
205	200/30	200	30	.00	9999.00	213.33	5.81	4.74	6.88
206	200/40	200	40	.00	9999.00	441.33	6.11	5.00	7.21
207	200/50	200	50	.00	9999.00	693.33	6.63	5.05	8.18
208	200/60	200	60	.00	9999.00	925.33	7.07	5.49	8.62
209	200/90	200	90	.00	9999.00	1379.33	8.04	6.34	9.71
210	200/120	200	120	.00	9999.00	1675.33	8.94	7.13	10.72
211	200/180	200	180	.00	9999.00	2072.33	10.24	8.10	12.33
212	200/240	200	240	.00	9999.00	2328.33	11.41	8.87	13.88
213	200/360	200	360	.00	9999.00	2653.33	13.28	9.97	16.46
214	210/5	210	5	.00	9999.00	3.50	1.39	.66	2.11
215	210/10	210	10	.00	9999.00	26.50	1.65	1.01	2.28
216	210/15	210	15	.00	9999.00	63.50	2.00	1.44	2.56
217	210/20	210	20	.00	9999.00	113.50	3.30	2.54	4.06
218	210/25	210	25	.00	9999.00	183.50	4.81	3.88	5.73
219	210/30	210	30	.00	9999.00	249.50	6.17	5.11	7.23
220	210/40	210	40	.00	9999.00	522.50	6.14	4.79	7.48
221	210/50	210	50	.00	9999.00	783.50	6.81	5.27	8.32
222	220/5	220	5	.00	9999.00	3.67	1.44	.70	2.17
223	220/10	220	10	.00	9999.00	32.67	1.63	1.01	2.25
224	220/15	220	15	.00	9999.00	72.67	2.14	1.53	2.75
225	220/20	220	20	.00	9999.00	131.67	3.69	2.81	4.55
226	220/25	220	25	.00	9999.00	204.67	5.32	4.32	6.30
227	220/30	220	30	.00	9999.00	285.67	6.53	5.43	7.62
228	220/40	220	40	.00	9999.00	598.67	6.32	4.88	7.74
229	220/50	220	50	.00	9999.00	871.67	6.94	5.50	8.36
230	230/5	230	5	.00	9999.00	3.83	1.49	.73	2.23
231	230/10	230	10	.00	9999.00	38.83	1.63	1.02	2.23
232	230/15	230	15	.00	9999.00	79.83	2.38	1.76	2.99
233	230/20	230	20	.00	9999.00	152.83	4.07	3.20	4.93
234	230/25	230	25	.00	9999.00	226.83	5.82	4.79	6.84
235	230/30	230	30	.00	9999.00	344.83	6.50	5.41	7.58
236	230/40	230	40	.00	9999.00	674.83	6.55	5.13	7.96
237	230/50	230	50	.00	9999.00	962.83	7.06	5.62	8.48
238	240/5	240	5	.00	9999.00	4.00	1.53	.77	2.29
239	240/10	240	10	.00	9999.00	43.00	1.64	1.07	2.20
240	240/15	240	15	.00	9999.00	88.00	2.63	1.98	3.28
241	240/20	240	20	.00	9999.00	174.00	4.47	3.58	5.35
242	240/25	240	25	.00	9999.00	258.00	6.18	5.11	7.24

243	240/30	240	30	.00	9999.00	416.00	6.25	5.17	7.31
244	240/40	240	40	.00	9999.00	753.00	6.74	5.28	8.18
245	240/50	240	50	.00	9999.00	1040.00	7.15	5.69	8.59
246	250/5	250	5	.00	9999.00	4.17	1.58	.81	2.35
247	250/10	250	10	.00	9999.00	48.17	1.69	1.13	2.24
248	250/15	250	15	.00	9999.00	97.17	2.95	2.26	3.64
249	250/20	250	20	.00	9999.00	193.17	4.85	3.92	5.78
250	250/25	250	25	.00	9999.00	286.17	6.56	5.42	7.68
251	250/30	250	30	.00	9999.00	483.17	6.15	5.03	7.26
252	250/40	250	40	.00	9999.00	831.17	6.87	5.44	8.28
253	250/60	250	60	.00	9999.00	1321.17	7.81	6.13	9.47
254	250/90	250	90	.00	9999.00	1778.17	9.15	7.19	11.06
255	250/120	250	120	.00	9999.00	2079.17	10.23	8.09	12.33
256	250/180	250	180	.00	9999.00	2464.17	11.96	9.23	14.61
257	250/240	250	240	.00	9999.00	2717.17	13.20	9.94	16.35
258	260/5	260	5	.00	9999.00	4.33	1.63	.84	2.41
259	260/10	260	10	.00	9999.00	53.33	1.70	1.15	2.25
260	260/15	260	15	.00	9999.00	111.33	3.21	2.47	3.94
261	260/20	260	20	.00	9999.00	210.33	5.30	4.33	6.27
262	260/25	260	25	.00	9999.00	333.33	6.60	5.49	7.70
263	260/30	260	30	.00	9999.00	550.33	6.23	4.93	7.52
264	260/40	260	40	.00	9999.00	916.33	6.99	5.60	8.36
265	270/5	270	5	.00	9999.00	4.50	1.68	.88	2.47
266	270/10	270	10	.00	9999.00	57.50	1.78	1.23	2.33
267	270/15	270	15	.00	9999.00	128.50	3.49	2.71	4.26
268	270/20	270	20	.00	9999.00	230.50	5.74	4.72	6.74
269	270/25	270	25	.00	9999.00	399.50	6.37	5.28	7.46
270	270/30	270	30	.00	9999.00	619.50	6.41	5.04	7.76
271	270/40	270	40	.00	9999.00	992.50	7.09	5.67	8.50
272	280/5	280	5	.00	9999.00	4.67	1.72	.91	2.53
273	280/10	280	10	.00	9999.00	60.67	1.84	1.25	2.43
274	280/15	280	15	.00	9999.00	145.67	3.78	2.94	4.62
275	280/20	280	20	.00	9999.00	256.67	6.06	5.00	7.12
276	280/25	280	25	.00	9999.00	458.67	6.23	5.13	7.32
277	280/30	280	30	.00	9999.00	683.67	6.61	5.23	7.96
278	280/40	280	40	.00	9999.00	1057.67	7.19	5.75	8.61
279	290/5	290	5	.00	9999.00	4.83	1.77	.95	2.59
280	290/10	290	10	.00	9999.00	64.83	1.93	1.35	2.51
281	290/15	290	15	.00	9999.00	162.83	4.12	3.26	4.97
282	290/20	290	20	.00	9999.00	280.83	6.39	5.25	7.52
283	290/25	290	25	.00	9999.00	519.83	6.20	5.03	7.36
284	290/30	290	30	.00	9999.00	745.83	6.77	5.34	8.17
285	290/40	290	40	.00	9999.00	1117.83	7.31	5.81	8.78
286	300/5	10	9	.00	9999.00	.17	1.82	.99	2.65
287	300/10	300	10	.00	9999.00	68.00	2.04	1.47	2.61
288	300/15	300	15	.00	9999.00	179.00	4.42	3.54	5.30
289	300/20	300	20	.00	9999.00	305.00	6.71	5.55	7.86
290	300/25	300	25	.00	9999.00	581.00	6.34	5.04	7.62
291	300/30	300	30	.00	9999.00	817.00	6.90	5.50	8.29
292	300/40	300	40	.00	9999.00	1174.00	7.47	5.90	9.02
293	300/60	300	60	.00	9999.00	1657.00	8.72	6.90	10.51
294	300/90	300	90	.00	9999.00	2114.00	10.24	8.05	12.38
295	300/120	300	120	.00	9999.00	2408.00	11.55	9.00	14.02
296	300/180	300	180	.00	9999.00	2790.00	13.45	10.11	16.66

Table E-4

AIR'93 Decompression Schedules Risk Estimates

INPUT FILE AIR93USN.MLO OUTPUT FILE AIR93USN.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	35	310	.00	9999.00	55.58	4.43	3.23	5.62
2	40	200	.00	9999.00	35.67	3.33	2.38	4.27
3	40	210	.00	9999.00	40.67	3.57	2.58	4.55
4	40	230	.00	9999.00	50.67	4.04	2.98	5.08
5	40	250	.00	9999.00	55.67	4.56	3.42	5.67
6	40	270	.00	9999.00	65.67	4.98	3.80	6.16
7	40	300	.00	9999.00	120.67	4.97	3.77	6.15
8	40	360	.00	9999.00	185.67	5.38	4.03	6.71
9	40	480	.00	9999.00	215.67	7.79	5.54	9.98
10	40	720	.00	9999.00	370.67	10.00	7.51	12.42
11	50	100	.00	9999.00	5.83	2.27	1.58	2.95
12	50	110	.00	9999.00	25.83	2.33	1.59	3.06
13	50	120	.00	9999.00	30.83	2.69	1.87	3.50
14	50	140	.00	9999.00	40.83	3.44	2.50	4.38
15	50	160	.00	9999.00	50.83	4.22	3.15	5.28
16	50	180	.00	9999.00	60.83	4.96	3.78	6.12
17	50	200	.00	9999.00	115.83	4.97	3.80	6.11
18	50	220	.00	9999.00	165.83	4.97	3.83	6.10
19	50	240	.00	9999.00	185.83	5.33	4.16	6.50
20	60	60	.00	9999.00	1.00	2.13	1.45	2.81
21	60	70	.00	9999.00	6.00	2.18	1.50	2.86
22	60	80	.00	9999.00	21.00	2.31	1.64	2.97
23	60	100	.00	9999.00	36.00	3.34	2.49	4.18
24	60	120	.00	9999.00	51.00	4.41	3.34	5.46
25	60	140	.00	9999.00	91.00	5.06	3.85	6.26
26	60	160	.00	9999.00	166.00	5.08	3.84	6.29
27	60	180	.00	9999.00	196.00	5.57	4.26	6.87
28	60	200	.00	9999.00	196.00	6.43	4.97	7.86
29	60	240	.00	9999.00	211.00	8.05	6.30	9.78
30	60	360	.00	9999.00	391.00	10.34	8.03	12.59
31	60	480	.00	9999.00	616.00	10.72	8.18	13.20
32	60	720	.00	9999.00	921.00	11.41	8.86	13.88
33	70	50	.00	9999.00	6.17	2.02	1.39	2.65
34	70	60	.00	9999.00	11.17	2.35	1.66	3.03
35	70	70	.00	9999.00	26.17	2.79	2.09	3.48
36	70	80	.00	9999.00	36.17	3.50	2.67	4.32
37	70	90	.00	9999.00	46.17	4.24	3.28	5.18
38	70	100	.00	9999.00	56.17	4.96	3.84	6.05
39	70	110	.00	9999.00	106.17	5.05	3.93	6.16
40	70	120	.00	9999.00	161.17	5.03	3.87	6.18
41	70	130	.00	9999.00	181.17	5.42	4.15	6.67
42	70	140	.00	9999.00	196.17	5.82	4.44	7.19
43	70	150	.00	9999.00	196.17	6.42	4.88	7.94
44	70	160	.00	9999.00	196.17	7.01	5.31	8.68
45	70	170	.00	9999.00	196.17	7.59	5.77	9.37
46	80	40	.00	9999.00	6.33	2.01	1.39	2.62
47	80	50	.00	9999.00	16.33	2.35	1.67	3.03
48	80	60	.00	9999.00	31.33	3.04	2.31	3.78
49	80	70	.00	9999.00	41.33	3.93	3.03	4.81
50	80	80	.00	9999.00	56.33	4.83	3.82	5.83
51	80	90	.00	9999.00	116.33	5.07	4.02	6.11
52	80	100	.00	9999.00	176.33	5.21	4.11	6.29
53	80	110	.00	9999.00	196.33	5.79	4.44	7.12
54	80	120	.00	9999.00	196.33	6.59	5.01	8.14
55	80	130	.00	9999.00	196.33	7.37	5.65	9.07
56	80	140	.00	9999.00	211.33	8.17	6.46	9.84
57	80	150	.00	9999.00	211.33	8.64	6.54	10.68
58	80	180	.00	9999.00	241.33	10.43	8.04	12.75
59	80	240	.00	9999.00	411.33	10.94	8.89	12.94
60	80	360	.00	9999.00	781.33	11.38	9.02	13.69
61	90	30	.00	9999.00	1.50	2.11	1.47	2.74
62	90	40	.00	9999.00	11.50	2.31	1.57	3.05
63	90	50	.00	9999.00	26.50	2.99	2.22	3.75
64	90	60	.00	9999.00	36.50	4.09	3.16	5.02
65	90	70	.00	9999.00	61.50	5.15	4.09	6.19
66	90	80	.00	9999.00	151.50	5.22	4.20	6.23
67	90	90	.00	9999.00	186.50	5.84	4.64	7.03
68	90	100	.00	9999.00	186.50	6.92	5.48	8.34
69	90	110	.00	9999.00	201.50	7.70	5.96	9.40
70	90	120	.00	9999.00	201.50	8.68	6.60	10.72
71	90	130	.00	9999.00	221.50	9.24	7.00	11.44
72	100	25	.00	9999.00	1.67	2.05	1.41	2.69

73	100	30	.00	9999.00	6.67	2.13	1.48	2.78
74	100	40	.00	9999.00	21.67	2.67	1.92	3.42
75	100	50	.00	9999.00	36.67	3.82	2.93	4.71
76	100	60	.00	9999.00	56.67	5.20	4.11	6.28
77	100	70	.00	9999.00	171.67	5.19	4.18	6.19
78	100	80	.00	9999.00	186.67	6.34	5.17	7.50
79	100	90	.00	9999.00	186.67	7.68	6.15	9.19
80	100	100	.00	9999.00	206.67	9.18	7.02	11.30
81	100	110	.00	9999.00	236.67	9.18	7.13	11.18
82	100	120	.00	9999.00	236.67	10.41	8.04	12.71
83	100	180	.00	9999.00	456.67	11.53	8.84	14.14
84	110	20	.00	9999.00	1.83	1.98	1.24	2.50
85	110	25	.00	9999.00	6.83	1.99	1.37	2.62
86	110	30	.00	9999.00	11.83	2.32	1.61	3.03
87	110	40	.00	9999.00	31.83	3.22	2.40	4.04
88	110	50	.00	9999.00	46.83	4.85	3.73	5.95
89	110	60	.00	9999.00	156.83	5.22	4.23	6.21
90	110	70	.00	9999.00	181.83	6.55	5.41	7.68
91	110	80	.00	9999.00	181.83	8.19	6.68	9.68
92	110	90	.00	9999.00	216.83	9.04	7.22	10.83
93	110	100	.00	9999.00	216.83	10.51	8.24	12.73
94	120	15	.00	9999.00	2.00	1.60	1.00	2.21
95	120	20	.00	9999.00	2.00	2.15	1.45	2.85
96	120	25	.00	9999.00	7.00	2.33	1.64	3.01
97	120	30	.00	9999.00	22.00	2.49	1.73	3.26
98	120	40	.00	9999.00	37.00	3.99	2.92	5.06
99	120	50	.00	9999.00	107.00	5.25	4.20	6.29
100	120	60	.00	9999.00	177.00	6.31	5.19	7.41
101	120	70	.00	9999.00	192.00	7.98	6.53	9.40
102	120	80	.00	9999.00	207.00	9.54	7.75	11.29
103	120	90	.00	9999.00	237.00	10.64	8.45	12.78
104	120	100	.00	9999.00	402.00	8.98	7.17	10.76
105	120	120	.00	9999.00	402.00	11.63	8.82	14.35
106	130	10	.00	9999.00	2.17	1.29	.70	1.89
107	130	15	.00	9999.00	2.17	1.80	1.14	2.45
108	130	20	.00	9999.00	7.17	2.01	1.36	2.66
109	130	25	.00	9999.00	17.17	2.35	1.62	3.07
110	130	30	.00	9999.00	22.17	3.00	2.13	3.86
111	130	40	.00	9999.00	42.17	4.90	3.65	6.14
112	130	50	.00	9999.00	157.17	5.76	4.60	6.90
113	130	60	.00	9999.00	187.17	7.57	6.26	8.85
114	130	70	.00	9999.00	207.17	9.38	7.79	10.94
115	130	80	.00	9999.00	247.17	10.57	8.48	12.61
116	130	90	.00	9999.00	317.17	10.97	8.77	13.13
117	140	10	.00	9999.00	2.33	1.41	.78	2.04
118	140	15	.00	9999.00	2.33	2.00	1.29	2.71
119	140	20	.00	9999.00	7.33	2.28	1.60	2.95
120	140	25	.00	9999.00	17.33	2.72	1.88	3.55
121	140	30	.00	9999.00	27.33	3.48	2.53	4.42
122	140	40	.00	9999.00	92.33	5.23	4.10	6.35
123	140	50	.00	9999.00	177.33	6.71	5.55	7.86
124	140	60	.00	9999.00	197.33	8.88	7.45	10.29
125	140	70	.00	9999.00	232.33	10.56	8.68	12.40
126	140	80	.00	9999.00	382.33	9.67	7.94	11.36
127	140	90	.00	9999.00	382.33	11.59	9.23	13.89
128	140	120	.00	9999.00	557.33	12.53	9.38	15.57
129	150	5	.00	9999.00	2.50	1.03	.43	1.63
130	150	10	.00	9999.00	2.50	1.53	.87	2.19
131	150	15	.00	9999.00	7.50	1.77	1.21	2.32
132	150	20	.00	9999.00	7.50	2.57	1.80	3.33
133	150	25	.00	9999.00	22.50	3.00	2.11	3.89
134	150	30	.00	9999.00	32.50	4.05	2.83	5.26
135	150	40	.00	9999.00	152.50	5.42	4.12	6.71
136	150	50	.00	9999.00	187.50	7.78	6.43	9.11
137	150	60	.00	9999.00	247.50	9.56	7.86	11.22
138	150	70	.00	9999.00	452.50	8.21	6.83	9.56
139	150	80	.00	9999.00	452.50	10.06	8.33	11.76
140	160	5	.00	9999.00	2.67	1.09	.47	1.70
141	160	10	.00	9999.00	2.67	1.65	.96	2.34
142	160	15	.00	9999.00	7.67	1.97	1.30	2.64
143	160	20	.00	9999.00	17.67	2.51	1.74	3.27
144	160	25	.00	9999.00	22.67	3.51	2.52	4.48
145	160	30	.00	9999.00	37.67	4.71	3.33	6.08
146	160	40	.00	9999.00	157.67	6.38	4.97	7.77
147	160	50	.00	9999.00	197.67	8.98	7.54	10.39
148	160	60	.00	9999.00	257.67	10.70	9.01	12.36
149	160	70	.00	9999.00	512.67	8.63	7.28	9.96
150	170	5	.00	9999.00	2.83	1.14	.50	1.77
151	170	10	.00	9999.00	2.83	1.78	1.05	2.50
152	170	15	.00	9999.00	7.83	2.19	1.45	2.93
153	170	20	.00	9999.00	17.83	2.82	1.94	3.69
154	170	25	.00	9999.00	27.83	3.91	2.75	5.05
155	170	30	.00	9999.00	52.83	5.27	3.97	6.55
156	170	40	.00	9999.00	167.83	7.27	5.95	8.56
157	170	50	.00	9999.00	197.83	10.28	8.64	11.90
158	170	60	.00	9999.00	312.83	11.09	9.36	12.78
159	170	70	.00	9999.00	577.83	9.13	7.70	10.54

170	90	.00	9999.00	577.83	12.84	10.06	15.53
170	120	.00	9999.00	822.83	13.28	10.94	15.57
180	5	.00	9999.00	3.00	1.19	.54	1.83
180	10	.00	9999.00	3.00	1.90	1.14	2.66
180	15	.00	9999.00	8.00	2.38	1.65	3.11
180	20	.00	9999.00	18.00	3.15	2.20	4.10
180	25	.00	9999.00	33.00	4.41	3.01	5.78
180	30	.00	9999.00	98.00	5.43	4.04	6.81
180	40	.00	9999.00	178.00	8.20	6.60	9.77
180	50	.00	9999.00	243.00	10.69	9.03	12.32
180	60	.00	9999.00	363.00	11.52	9.73	13.28
190	5	.00	9999.00	3.17	1.24	.57	1.89
190	10	.00	9999.00	3.17	2.03	1.23	2.82
190	15	.00	9999.00	8.17	2.60	1.80	3.39
190	20	.00	9999.00	23.17	3.39	2.37	4.40
190	25	.00	9999.00	43.17	4.88	3.57	6.18
190	30	.00	9999.00	148.17	5.57	4.00	7.11
190	40	.00	9999.00	183.17	9.25	7.54	10.93
190	50	.00	9999.00	418.17	8.65	7.28	10.01
190	60	.00	9999.00	418.17	11.86	10.04	13.65
200	5	.00	9999.00	23.33	.77	.42	1.13
200	10	.00	9999.00	23.33	1.46	1.00	1.91
200	15	.00	9999.00	23.33	2.35	1.65	3.05
200	20	.00	9999.00	23.33	3.82	2.72	4.91
200	25	.00	9999.00	58.33	5.32	3.93	6.69
200	30	.00	9999.00	153.33	6.31	4.64	7.95
200	40	.00	9999.00	193.33	10.19	8.46	11.89
200	50	.00	9999.00	473.33	8.97	7.50	10.43
200	60	.00	9999.00	473.33	12.11	10.25	13.94
200	90	.00	9999.00	793.33	13.42	11.25	15.54

Appendix F

Risk Estimates for Single Bounce Dive Constant 0.7 ATA PO2 in N2 Tables

Table F-1

P07'80 Constant 0.7 ATA PO2 in N2 Decompression Schedule Risk Estimates

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INPUT FILE P0780USN.MLO OUTPUT FILE P0780USN.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

1 19:14 DUKE/DAN 2 FEB 1997
PROGRAM TBLP7MLO1 USING 10 FSW STOPS
VVAL18.dat (NITROGEN)

	PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	40/367	40	367	.00	9999.00	.67	4.76	3.46	6.05
2	40/370	40	370	.00	9999.00	1.67	4.68	3.37	5.97
3	40/380	40	380	.00	9999.00	2.67	4.81	3.47	6.14
4	40/390	40	390	.00	9999.00	3.67	4.95	3.58	6.30
5	50/143	50	143	.00	9999.00	.83	2.71	1.90	3.51
6	50/150	50	150	.00	9999.00	4.83	2.57	1.75	3.39
7	50/160	50	160	.00	9999.00	8.83	2.70	1.84	3.55
8	50/170	50	170	.00	9999.00	12.83	2.83	1.93	3.72
9	50/180	50	180	.00	9999.00	16.83	2.96	2.02	3.89
10	50/190	50	190	.00	9999.00	19.83	3.14	2.16	4.11
11	50/200	50	200	.00	9999.00	22.83	3.32	2.31	4.32
12	50/210	50	210	.00	9999.00	25.83	3.50	2.45	4.54
13	50/220	50	220	.00	9999.00	29.83	3.63	2.54	4.70
14	50/230	50	230	.00	9999.00	33.83	3.75	2.63	4.85
15	50/240	50	240	.00	9999.00	38.83	3.82	2.68	4.96
16	50/250	50	250	.00	9999.00	42.83	3.95	2.77	5.11
17	50/260	50	260	.00	9999.00	46.83	4.07	2.85	5.27
18	50/270	50	270	.00	9999.00	49.83	4.23	2.98	5.47
19	50/280	50	280	.00	9999.00	53.83	4.35	3.05	5.62
20	50/290	50	290	.00	9999.00	56.83	4.51	3.18	5.82
21	50/300	50	300	.00	9999.00	59.83	4.66	3.29	6.02
22	50/310	50	310	.00	9999.00	62.83	4.82	3.40	6.21
23	50/320	50	320	.00	9999.00	64.83	5.02	3.54	6.47
24	50/330	50	330	.00	9999.00	67.83	5.17	3.61	6.71
25	50/340	50	340	.00	9999.00	70.83	5.33	3.68	6.95
26	50/350	50	350	.00	9999.00	73.83	5.50	3.76	7.20
27	50/360	50	360	.00	9999.00	77.83	5.62	3.80	7.40
28	50/370	50	370	.00	9999.00	80.83	5.79	3.90	7.64
29	50/380	50	380	.00	9999.00	84.83	5.92	3.96	7.84
30	50/390	50	390	.00	9999.00	87.83	6.09	4.06	8.07
31	60/74	60	74	.00	9999.00	1.00	2.10	1.37	2.82
32	60/80	60	80	.00	9999.00	5.00	1.93	1.25	2.60
33	60/90	60	90	.00	9999.00	10.00	2.11	1.41	2.80
34	60/100	60	100	.00	9999.00	14.00	2.36	1.59	3.11
35	60/110	60	110	.00	9999.00	18.00	2.63	1.79	3.46
36	60/120	60	120	.00	9999.00	26.00	2.71	1.82	3.59
37	60/130	60	130	.00	9999.00	33.00	2.84	1.89	3.77
38	60/140	60	140	.00	9999.00	40.00	2.96	1.97	3.94
39	60/150	60	150	.00	9999.00	46.00	3.13	2.10	4.16
40	60/160	60	160	.00	9999.00	51.00	3.35	2.27	4.42
41	60/170	60	170	.00	9999.00	57.00	3.51	2.41	4.61
42	60/180	60	180	.00	9999.00	64.00	3.60	2.47	4.71
43	60/190	60	190	.00	9999.00	71.00	3.74	2.60	4.88
44	60/200	60	200	.00	9999.00	78.00	3.89	2.72	5.05
45	60/210	60	210	.00	9999.00	85.00	4.05	2.84	5.24
46	60/220	60	220	.00	9999.00	91.00	4.23	2.98	5.47
47	60/230	60	230	.00	9999.00	97.00	4.43	3.11	5.73
48	60/240	60	240	.00	9999.00	102.00	4.66	3.26	6.05
49	60/250	60	250	.00	9999.00	108.00	4.87	3.33	6.38
50	60/260	60	260	.00	9999.00	113.00	5.11	3.45	6.74
51	60/270	60	270	.00	9999.00	118.00	5.36	3.58	7.09
52	60/280	60	280	.00	9999.00	124.00	5.59	3.71	7.42
53	60/290	60	290	.00	9999.00	130.00	5.82	3.85	7.74
54	60/300	60	300	.00	9999.00	136.00	6.04	4.00	8.04
55	60/310	60	310	.00	9999.00	142.00	6.26	4.16	8.31
56	60/320	60	320	.00	9999.00	148.00	6.47	4.34	8.55
57	60/330	60	330	.00	9999.00	153.00	6.70	4.54	8.82

58	60/340	60	340	.00	9999.00	158.00	6.93	4.74	9.07
59	60/350	60	350	.00	9999.00	163.00	7.15	4.93	9.32
60	60/360	60	360	.00	9999.00	168.00	7.36	5.11	9.55
61	60/370	60	370	.00	9999.00	175.00	7.48	5.22	9.68
62	60/380	60	380	.00	9999.00	180.00	7.66	5.39	9.88
63	60/390	60	390	.00	9999.00	186.00	7.81	5.53	10.03
64	70/51	70	51	.00	9999.00	1.17	2.15	1.49	2.80
65	70/60	70	60	.00	9999.00	10.17	1.97	1.26	2.68
66	70/70	70	70	.00	9999.00	19.17	2.12	1.44	2.79
67	70/80	70	80	.00	9999.00	26.17	2.39	1.65	3.13
68	70/90	70	90	.00	9999.00	32.17	2.67	1.83	3.50
69	70/100	70	100	.00	9999.00	42.17	2.86	1.93	3.77
70	70/110	70	110	.00	9999.00	52.17	3.04	2.04	4.03
71	70/120	70	120	.00	9999.00	62.17	3.21	2.15	4.26
72	70/130	70	130	.00	9999.00	71.17	3.42	2.30	4.53
73	70/140	70	140	.00	9999.00	79.17	3.67	2.50	4.82
74	70/150	70	150	.00	9999.00	88.17	3.89	2.70	5.07
75	70/160	70	160	.00	9999.00	99.17	4.02	2.83	5.20
76	70/170	70	170	.00	9999.00	109.17	4.20	3.00	5.39
77	70/180	70	180	.00	9999.00	119.17	4.37	3.14	5.58
78	70/190	70	190	.00	9999.00	128.17	4.58	3.28	5.86
79	70/200	70	200	.00	9999.00	136.17	4.84	3.42	6.24
80	70/210	70	210	.00	9999.00	144.17	5.16	3.57	6.71
81	70/220	70	220	.00	9999.00	152.17	5.50	3.76	7.20
82	70/230	70	230	.00	9999.00	160.17	5.83	3.96	7.67
83	70/240	70	240	.00	9999.00	170.17	6.12	4.16	8.05
84	70/250	70	250	.00	9999.00	179.17	6.42	4.40	8.39
85	70/260	70	260	.00	9999.00	187.17	6.73	4.65	8.77
86	70/270	70	270	.00	9999.00	196.17	6.99	4.86	9.06
87	70/280	70	280	.00	9999.00	204.17	7.26	5.09	9.38
88	70/290	70	290	.00	9999.00	212.17	7.51	5.31	9.66
89	70/300	70	300	.00	9999.00	220.17	7.75	5.53	9.92
90	70/310	70	310	.00	9999.00	228.17	7.97	5.73	10.15
91	70/320	70	320	.00	9999.00	237.17	8.13	5.89	10.32
92	70/330	70	330	.00	9999.00	246.17	8.32	6.07	10.52
93	70/340	70	340	.00	9999.00	256.17	8.43	6.18	10.62
94	70/350	70	350	.00	9999.00	265.17	8.59	6.34	10.78
95	80/39	80	39	.00	9999.00	1.33	2.19	1.55	2.84
96	80/40	80	40	.00	9999.00	2.33	2.06	1.41	2.70
97	80/50	80	50	.00	9999.00	16.33	2.07	1.37	2.76
98	80/60	80	60	.00	9999.00	28.33	2.26	1.58	2.94
99	80/70	80	70	.00	9999.00	38.33	2.52	1.79	3.24
100	80/80	80	80	.00	9999.00	47.33	2.98	2.13	3.83
101	80/90	80	90	.00	9999.00	60.33	3.24	2.28	4.20
102	80/100	80	100	.00	9999.00	74.33	3.39	2.33	4.44
103	80/110	80	110	.00	9999.00	87.33	3.64	2.51	4.77
104	80/120	80	120	.00	9999.00	99.33	3.92	2.72	5.11
105	80/130	80	130	.00	9999.00	110.33	4.29	3.05	5.52
106	80/140	80	140	.00	9999.00	124.33	4.48	3.23	5.71
107	80/150	80	150	.00	9999.00	137.33	4.70	3.45	5.94
108	80/160	80	160	.00	9999.00	150.33	4.96	3.66	6.24
109	80/170	80	170	.00	9999.00	162.33	5.28	3.81	6.72
110	80/180	80	180	.00	9999.00	173.33	5.68	4.03	7.31
111	80/190	80	190	.00	9999.00	184.33	6.09	4.27	7.87
112	80/200	80	200	.00	9999.00	195.33	6.49	4.54	8.40
113	80/210	80	210	.00	9999.00	208.33	6.82	4.80	8.79
114	80/220	80	220	.00	9999.00	220.33	7.16	5.08	9.20
115	80/230	80	230	.00	9999.00	233.33	7.47	5.34	9.55
116	80/240	80	240	.00	9999.00	244.33	7.83	5.66	9.95
117	80/250	80	250	.00	9999.00	256.33	8.10	5.91	10.24
118	80/260	80	260	.00	9999.00	269.33	8.33	6.13	10.48
119	80/270	80	270	.00	9999.00	282.33	8.52	6.31	10.68
120	80/280	80	280	.00	9999.00	296.33	8.68	6.47	10.84
121	80/290	80	290	.00	9999.00	309.33	8.85	6.62	11.02
122	80/300	80	300	.00	9999.00	321.33	9.03	6.77	11.24
123	80/310	80	310	.00	9999.00	333.33	9.19	6.89	11.43
124	80/320	80	320	.00	9999.00	345.33	9.33	7.01	11.60
125	90/32	90	32	.00	9999.00	1.50	2.28	1.60	2.95
126	90/40	90	40	.00	9999.00	15.50	2.13	1.46	2.78
127	90/50	90	50	.00	9999.00	32.50	2.19	1.53	2.85
128	90/60	90	60	.00	9999.00	46.50	2.58	1.89	3.26
129	90/70	90	70	.00	9999.00	58.50	3.11	2.29	3.93
130	90/80	90	80	.00	9999.00	74.50	3.50	2.54	4.44
131	90/90	90	90	.00	9999.00	91.50	3.83	2.76	4.90
132	90/100	90	100	.00	9999.00	107.50	4.17	2.99	5.33
133	90/110	90	110	.00	9999.00	122.50	4.52	3.27	5.76

134	90/120	90	120	.00	9999.00	140.50	4.79	3.52	6.05
135	90/130	90	130	.00	9999.00	157.50	5.09	3.81	6.35
136	90/140	90	140	.00	9999.00	174.50	5.38	4.00	6.75
137	90/150	90	150	.00	9999.00	188.50	5.90	4.29	7.48
138	90/160	90	160	.00	9999.00	203.50	6.39	4.58	8.17
139	90/170	90	170	.00	9999.00	219.50	6.82	4.87	8.73
140	90/180	90	180	.00	9999.00	234.50	7.28	5.25	9.26
141	90/190	90	190	.00	9999.00	250.50	7.71	5.61	9.77
142	100/27	100	27	.00	9999.00	1.67	2.33	1.62	3.04
143	100/30	100	30	.00	9999.00	7.67	2.08	1.44	2.72
144	100/35	100	35	.00	9999.00	18.67	2.21	1.53	2.88
145	100/40	100	40	.00	9999.00	29.67	2.30	1.58	3.02
146	100/45	100	45	.00	9999.00	39.67	2.30	1.66	2.93
147	100/50	100	50	.00	9999.00	48.67	2.51	1.87	3.15
148	100/55	100	55	.00	9999.00	57.67	2.76	2.08	3.44
149	100/60	100	60	.00	9999.00	64.67	3.09	2.33	3.84
150	100/65	100	65	.00	9999.00	71.67	3.51	2.66	4.35
151	100/70	100	70	.00	9999.00	80.67	3.82	2.89	4.74
152	100/75	100	75	.00	9999.00	91.67	4.01	3.02	4.99
153	100/80	100	80	.00	9999.00	102.67	4.15	3.10	5.20
154	100/90	100	90	.00	9999.00	122.67	4.63	3.45	5.80
155	100/100	100	100	.00	9999.00	144.67	4.96	3.71	6.20
156	100/110	100	110	.00	9999.00	165.67	5.33	4.04	6.61
157	110/24	110	24	.00	9999.00	1.83	2.48	1.71	3.24
158	110/25	110	25	.00	9999.00	4.83	2.11	1.44	2.78
159	110/30	110	30	.00	9999.00	18.83	2.23	1.55	2.91
160	110/35	110	35	.00	9999.00	31.83	2.26	1.55	2.97
161	110/40	110	40	.00	9999.00	43.83	2.36	1.72	3.00
162	110/45	110	45	.00	9999.00	54.83	2.61	1.97	3.25
163	110/50	110	50	.00	9999.00	64.83	2.89	2.20	3.57
164	110/55	110	55	.00	9999.00	74.83	3.30	2.54	4.06
165	110/60	110	60	.00	9999.00	82.83	3.85	2.99	4.70
166	110/65	110	65	.00	9999.00	94.83	4.13	3.20	5.06
167	110/70	110	70	.00	9999.00	107.83	4.43	3.42	5.43
168	110/80	110	80	.00	9999.00	132.83	4.97	3.81	6.11
169	110/90	110	90	.00	9999.00	162.83	5.20	3.97	6.41
170	120/19	120	19	.00	9999.00	2.00	2.22	1.49	2.95
171	120/20	120	20	.00	9999.00	3.00	2.13	1.39	2.86
172	120/25	120	25	.00	9999.00	14.00	2.26	1.56	2.95
173	120/30	120	30	.00	9999.00	30.00	2.25	1.55	2.94
174	120/35	120	35	.00	9999.00	45.00	2.36	1.70	3.02
175	120/40	120	40	.00	9999.00	58.00	2.55	1.91	3.18
176	120/45	120	45	.00	9999.00	70.00	2.96	2.27	3.65
177	120/50	120	50	.00	9999.00	81.00	3.45	2.67	4.22
178	120/55	120	55	.00	9999.00	92.00	4.02	3.16	4.88
179	120/60	120	60	.00	9999.00	105.00	4.52	3.57	5.46
180	120/70	120	70	.00	9999.00	138.00	5.00	3.91	6.08
181	120/80	120	80	.00	9999.00	173.00	5.39	4.19	6.57
182	130/16	130	16	.00	9999.00	2.17	2.12	1.39	2.86
183	130/20	130	20	.00	9999.00	8.17	2.12	1.44	2.80
184	130/25	130	25	.00	9999.00	24.17	2.22	1.52	2.92
185	130/30	130	30	.00	9999.00	41.17	2.28	1.58	2.97
186	130/35	130	35	.00	9999.00	57.17	2.52	1.86	3.16
187	130/40	130	40	.00	9999.00	72.17	2.90	2.20	3.60
188	130/45	130	45	.00	9999.00	85.17	3.48	2.69	4.27
189	130/50	130	50	.00	9999.00	98.17	4.16	3.27	5.03
190	130/60	130	60	.00	9999.00	133.17	5.02	3.98	6.04
191	130/70	130	70	.00	9999.00	175.17	5.44	4.27	6.59
192	140/13	140	13	.00	9999.00	2.33	1.94	1.21	2.67
193	140/15	140	15	.00	9999.00	4.33	1.84	1.11	2.56
194	140/20	140	20	.00	9999.00	13.33	2.18	1.47	2.90
195	140/25	140	25	.00	9999.00	34.33	2.21	1.50	2.91
196	140/30	140	30	.00	9999.00	52.33	2.38	1.71	3.05
197	140/35	140	35	.00	9999.00	70.33	2.76	2.04	3.47
198	140/40	140	40	.00	9999.00	86.33	3.36	2.55	4.16
199	140/45	140	45	.00	9999.00	100.33	4.17	3.25	5.08
200	140/50	140	50	.00	9999.00	119.33	4.77	3.78	5.74
201	140/60	140	60	.00	9999.00	168.33	5.29	4.16	6.40
202	140/70	140	70	.00	9999.00	214.33	5.98	4.59	7.36
203	150/11	150	11	.00	9999.00	2.50	1.85	1.10	2.59
204	150/15	150	15	.00	9999.00	8.50	1.79	1.17	2.41
205	150/20	150	20	.00	9999.00	21.50	2.19	1.46	2.91
206	150/25	150	25	.00	9999.00	43.50	2.27	1.59	2.95
207	150/30	150	30	.00	9999.00	64.50	2.56	1.87	3.25
208	150/35	150	35	.00	9999.00	82.50	3.17	2.33	4.00
209	150/40	150	40	.00	9999.00	99.50	4.05	3.09	4.99

210	150/45	150	45	.00	9999.00	121.50	4.67	3.65	5.68
211	150/50	150	50	.00	9999.00	149.50	5.02	3.94	6.10
212	150/60	150	60	.00	9999.00	204.50	5.68	4.38	6.97
213	150/70	150	70	.00	9999.00	261.50	6.65	4.76	8.50
214	160/9	160	9	.00	9999.00	2.67	1.71	.96	2.45
215	160/10	160	10	.00	9999.00	3.67	1.62	.89	2.35
216	160/15	160	15	.00	9999.00	12.67	1.86	1.24	2.47
217	160/20	160	20	.00	9999.00	29.67	2.22	1.50	2.93
218	160/25	160	25	.00	9999.00	53.67	2.37	1.68	3.06
219	160/30	160	30	.00	9999.00	75.67	2.88	2.17	3.59
220	160/40	160	40	.00	9999.00	120.67	4.44	3.37	5.50
221	160/50	160	50	.00	9999.00	181.67	5.29	4.07	6.49
222	170/8	170	8	.00	9999.00	2.83	1.69	.92	2.46
223	170/10	170	10	.00	9999.00	5.83	1.49	.90	2.07
224	170/15	170	15	.00	9999.00	16.83	1.92	1.32	2.52
225	170/20	170	20	.00	9999.00	38.83	2.21	1.53	2.88
226	170/25	170	25	.00	9999.00	63.83	2.60	1.96	3.23
227	170/30	170	30	.00	9999.00	87.83	3.36	2.55	4.16
228	170/40	170	40	.00	9999.00	143.83	4.84	3.80	5.87
229	170/50	170	50	.00	9999.00	215.83	5.67	4.21	7.12

Table F-2

VVAL18-1 Constant 0.7 ATA PO2 in N2 Decompression Schedule
Risk Estimates

INPUT FILE P07181US.MLO OUTPUT FILE P07181US.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

1 19:19 DUKE/DAN 2 FEB 1997
PROGRAM TBLP7MLO1 USING 10 FSW STOPS
VVAL18-1.DAT(NITROGEN)

	PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	40/367	40	367	.00	9999.00	.67	4.76	3.46	6.05
2	40/370	40	370	.00	9999.00	.67	4.82	3.51	6.12
3	40/380	40	380	.00	9999.00	.67	5.02	3.68	6.34
4	40/390	40	390	.00	9999.00	.67	5.22	3.85	6.57
5	50/143	50	143	.00	9999.00	.83	2.71	1.90	3.51
6	50/150	50	150	.00	9999.00	.83	2.93	2.08	3.78
7	50/160	50	160	.00	9999.00	.83	3.27	2.36	4.18
8	50/170	50	170	.00	9999.00	1.83	3.45	2.48	4.41
9	50/180	50	180	.00	9999.00	4.83	3.60	2.59	4.59
10	50/190	50	190	.00	9999.00	7.83	3.78	2.74	4.81
11	50/200	50	200	.00	9999.00	10.83	3.97	2.89	5.03
12	50/210	50	210	.00	9999.00	13.83	4.15	3.04	5.25
13	50/220	50	220	.00	9999.00	16.83	4.33	3.19	5.46
14	50/230	50	230	.00	9999.00	18.83	4.57	3.38	5.73
15	50/240	50	240	.00	9999.00	20.83	4.80	3.58	6.00
16	50/250	50	250	.00	9999.00	24.83	4.91	3.66	6.14
17	50/260	50	260	.00	9999.00	28.83	5.02	3.74	6.28
18	50/270	50	270	.00	9999.00	32.83	5.12	3.82	6.41
19	50/280	50	280	.00	9999.00	40.83	5.01	3.68	6.31
20	50/290	50	290	.00	9999.00	47.83	4.95	3.60	6.28
21	50/300	50	300	.00	9999.00	55.83	4.86	3.48	6.21
22	50/310	50	310	.00	9999.00	62.83	4.82	3.40	6.21
23	50/320	50	320	.00	9999.00	69.83	4.80	3.31	6.26
24	50/330	50	330	.00	9999.00	76.83	4.80	3.22	6.35
25	50/340	50	340	.00	9999.00	83.83	4.81	3.14	6.45
26	50/350	50	350	.00	9999.00	89.83	4.87	3.13	6.58
27	50/360	50	360	.00	9999.00	96.83	4.90	3.10	6.68
28	50/370	50	370	.00	9999.00	102.83	4.98	3.12	6.80
29	50/380	50	380	.00	9999.00	108.83	5.05	3.15	6.91
30	50/390	50	390	.00	9999.00	114.83	5.12	3.21	7.00
31	60/74	60	74	.00	9999.00	1.00	2.10	1.37	2.82
32	60/80	60	80	.00	9999.00	1.00	2.31	1.58	3.02
33	60/90	60	90	.00	9999.00	6.00	2.28	1.56	3.00
34	60/100	60	100	.00	9999.00	12.00	2.45	1.67	3.22
35	60/110	60	110	.00	9999.00	16.00	2.72	1.87	3.57
36	60/120	60	120	.00	9999.00	19.00	3.06	2.12	3.99
37	60/130	60	130	.00	9999.00	23.00	3.35	2.33	4.36
38	60/140	60	140	.00	9999.00	28.00	3.59	2.51	4.65
39	60/150	60	150	.00	9999.00	34.00	3.76	2.63	4.87
40	60/160	60	160	.00	9999.00	40.00	3.92	2.76	5.07
41	60/170	60	170	.00	9999.00	45.00	4.14	2.94	5.32
42	60/180	60	180	.00	9999.00	50.00	4.35	3.12	5.56
43	60/190	60	190	.00	9999.00	54.00	4.57	3.31	5.81
44	60/200	60	200	.00	9999.00	60.00	4.70	3.42	5.96
45	60/210	60	210	.00	9999.00	67.00	4.80	3.51	6.07
46	60/220	60	220	.00	9999.00	73.00	4.97	3.66	6.26
47	60/230	60	230	.00	9999.00	85.00	4.83	3.53	6.12
48	60/240	60	240	.00	9999.00	97.00	4.74	3.36	6.10
49	60/250	60	250	.00	9999.00	108.00	4.75	3.23	6.24
50	60/260	60	260	.00	9999.00	118.00	4.81	3.17	6.43
51	60/270	60	270	.00	9999.00	129.00	4.86	3.12	6.57
52	60/280	60	280	.00	9999.00	138.00	4.99	3.17	6.77
53	60/290	60	290	.00	9999.00	148.00	5.08	3.23	6.88
54	60/300	60	300	.00	9999.00	157.00	5.19	3.33	7.01
55	60/310	60	310	.00	9999.00	166.00	5.31	3.44	7.14
56	60/320	60	320	.00	9999.00	175.00	5.41	3.54	7.25
57	60/330	60	330	.00	9999.00	184.00	5.50	3.63	7.34
58	60/340	60	340	.00	9999.00	193.00	5.59	3.71	7.42
59	60/350	60	350	.00	9999.00	201.00	5.69	3.82	7.53
60	60/360	60	360	.00	9999.00	209.00	5.79	3.92	7.63
61	60/370	60	370	.00	9999.00	217.00	5.88	4.01	7.71
62	60/380	60	380	.00	9999.00	225.00	5.96	4.09	7.79
63	60/390	60	390	.00	9999.00	233.00	6.03	4.17	7.85
64	70/51	70	51	.00	9999.00	1.17	2.15	1.49	2.80
65	70/60	70	60	.00	9999.00	7.17	2.09	1.36	2.81
66	70/70	70	70	.00	9999.00	15.17	2.28	1.58	2.98
67	70/80	70	80	.00	9999.00	23.17	2.53	1.76	3.29
68	70/90	70	90	.00	9999.00	30.17	2.84	1.97	3.70

69	70/100	70	100	.00	9999.00	36.17	3.14	2.17	4.11
70	70/110	70	110	.00	9999.00	42.17	3.54	2.46	4.61
71	70/120	70	120	.00	9999.00	50.17	3.82	2.66	4.97
72	70/130	70	130	.00	9999.00	59.17	4.03	2.81	5.24
73	70/140	70	140	.00	9999.00	68.17	4.23	2.96	5.48
74	70/150	70	150	.00	9999.00	75.17	4.51	3.19	5.81
75	70/160	70	160	.00	9999.00	82.17	4.78	3.43	6.11
76	70/170	70	170	.00	9999.00	91.17	4.96	3.60	6.29
77	70/180	70	180	.00	9999.00	101.17	5.09	3.74	6.42
78	70/190	70	190	.00	9999.00	114.17	5.07	3.75	6.37
79	70/200	70	200	.00	9999.00	129.17	4.99	3.60	6.36
80	70/210	70	210	.00	9999.00	144.17	4.99	3.45	6.51
81	70/220	70	220	.00	9999.00	158.17	5.09	3.42	6.73
82	70/230	70	230	.00	9999.00	171.17	5.22	3.48	6.92
83	70/240	70	240	.00	9999.00	185.17	5.32	3.57	7.04
84	70/250	70	250	.00	9999.00	199.17	5.44	3.68	7.16
85	70/260	70	260	.00	9999.00	212.17	5.57	3.80	7.30
86	70/270	70	270	.00	9999.00	226.17	5.64	3.88	7.37
87	70/280	70	280	.00	9999.00	238.17	5.76	4.00	7.49
88	70/290	70	290	.00	9999.00	251.17	5.84	4.08	7.57
89	70/300	70	300	.00	9999.00	262.17	5.96	4.19	7.70
90	70/310	70	310	.00	9999.00	274.17	6.03	4.27	7.77
91	70/320	70	320	.00	9999.00	284.17	6.15	4.38	7.89
92	70/330	70	330	.00	9999.00	295.17	6.24	4.47	7.97
93	70/340	70	340	.00	9999.00	305.17	6.34	4.58	8.07
94	70/350	70	350	.00	9999.00	315.17	6.45	4.69	8.19
95	80/39	80	39	.00	9999.00	1.33	2.19	1.55	2.84
96	80/40	80	40	.00	9999.00	2.33	2.06	1.41	2.70
97	80/50	80	50	.00	9999.00	14.33	2.14	1.42	2.85
98	80/60	80	60	.00	9999.00	24.33	2.43	1.71	3.13
99	80/70	80	70	.00	9999.00	36.33	2.61	1.86	3.35
100	80/80	80	80	.00	9999.00	45.33	3.07	2.19	3.94
101	80/90	80	90	.00	9999.00	54.33	3.53	2.52	4.54
102	80/100	80	100	.00	9999.00	63.33	3.97	2.82	5.11
103	80/110	80	110	.00	9999.00	75.33	4.24	2.99	5.47
104	80/120	80	120	.00	9999.00	87.33	4.51	3.19	5.81
105	80/130	80	130	.00	9999.00	98.33	4.82	3.45	6.17
106	80/140	80	140	.00	9999.00	107.33	5.21	3.78	6.62
107	80/150	80	150	.00	9999.00	121.33	5.35	3.94	6.73
108	80/160	80	160	.00	9999.00	142.33	5.15	3.83	6.45
109	80/170	80	170	.00	9999.00	161.33	5.16	3.72	6.57
110	80/180	80	180	.00	9999.00	179.33	5.26	3.67	6.82
111	80/190	80	190	.00	9999.00	196.33	5.43	3.75	7.07
112	80/200	80	200	.00	9999.00	214.33	5.58	3.88	7.24
113	80/210	80	210	.00	9999.00	232.33	5.68	3.98	7.35
114	80/220	80	220	.00	9999.00	250.33	5.79	4.09	7.45
115	80/230	80	230	.00	9999.00	266.33	5.95	4.24	7.63
116	80/240	80	240	.00	9999.00	282.33	6.07	4.35	7.76
117	80/250	80	250	.00	9999.00	297.33	6.19	4.46	7.88
118	80/260	80	260	.00	9999.00	312.33	6.31	4.59	8.01
119	80/270	80	270	.00	9999.00	327.33	6.42	4.70	8.11
120	80/280	80	280	.00	9999.00	341.33	6.55	4.83	8.23
121	80/290	80	290	.00	9999.00	355.33	6.70	4.97	8.39
122	80/300	80	300	.00	9999.00	369.33	6.82	5.07	8.53
123	80/310	80	310	.00	9999.00	382.33	6.96	5.19	8.70
124	80/320	80	320	.00	9999.00	395.33	7.07	5.28	8.83
125	90/32	90	32	.00	9999.00	3.50	1.91	1.29	2.52
126	90/40	90	40	.00	9999.00	14.50	2.16	1.49	2.83
127	90/50	90	50	.00	9999.00	29.50	2.31	1.64	2.98
128	90/60	90	60	.00	9999.00	43.50	2.72	2.00	3.42
129	90/70	90	70	.00	9999.00	56.50	3.20	2.36	4.04
130	90/80	90	80	.00	9999.00	68.50	3.78	2.78	4.78
131	90/90	90	90	.00	9999.00	79.50	4.46	3.28	5.61
132	90/100	90	100	.00	9999.00	95.50	4.78	3.49	6.05
133	90/110	90	110	.00	9999.00	110.50	5.10	3.72	6.46
134	90/120	90	120	.00	9999.00	123.50	5.52	4.06	6.95
135	90/130	90	130	.00	9999.00	147.50	5.38	4.02	6.73
136	90/140	90	140	.00	9999.00	173.50	5.26	3.91	6.60
137	90/150	90	150	.00	9999.00	197.50	5.37	3.83	6.89
138	90/160	90	160	.00	9999.00	220.50	5.53	3.89	7.14
139	90/170	90	170	.00	9999.00	243.50	5.71	4.06	7.34
140	90/180	90	180	.00	9999.00	265.50	5.90	4.24	7.53
141	90/190	90	190	.00	9999.00	287.50	6.05	4.40	7.67
142	100/27	100	27	.00	9999.00	5.67	1.84	1.26	2.41
143	100/30	100	30	.00	9999.00	10.67	1.98	1.37	2.58
144	100/35	100	35	.00	9999.00	18.67	2.16	1.49	2.82
145	100/40	100	40	.00	9999.00	27.67	2.24	1.54	2.93
146	100/45	100	45	.00	9999.00	36.67	2.42	1.76	3.07
147	100/50	100	50	.00	9999.00	44.67	2.63	1.96	3.30
148	100/55	100	55	.00	9999.00	53.67	2.89	2.18	3.60
149	100/60	100	60	.00	9999.00	62.67	3.18	2.41	3.95
150	100/65	100	65	.00	9999.00	70.67	3.54	2.69	4.39
151	100/70	100	70	.00	9999.00	77.67	3.95	3.00	4.89
152	100/75	100	75	.00	9999.00	84.67	4.36	3.32	5.40
153	100/80	100	80	.00	9999.00	91.67	4.74	3.60	5.87
154	100/90	100	90	.00	9999.00	110.67	5.26	3.97	6.54
155	100/100	100	100	.00	9999.00	128.67	5.74	4.32	7.14

156	100/110	100	110	.00	9999.00	157.67	5.55	4.19	6.89
157	110/24	110	24	.00	9999.00	8.83	1.85	1.26	2.43
158	110/25	110	25	.00	9999.00	10.83	1.90	1.31	2.49
159	110/30	110	30	.00	9999.00	19.83	2.06	1.41	2.71
160	110/35	110	35	.00	9999.00	30.83	2.24	1.54	2.93
161	110/40	110	40	.00	9999.00	41.83	2.35	1.72	2.98
162	110/45	110	45	.00	9999.00	51.83	2.68	2.02	3.34
163	110/50	110	50	.00	9999.00	61.83	3.06	2.34	3.77
164	110/55	110	55	.00	9999.00	71.83	3.41	2.62	4.19
165	110/60	110	60	.00	9999.00	81.83	3.87	3.00	4.73
166	110/65	110	65	.00	9999.00	90.83	4.36	3.40	5.31
167	110/70	110	70	.00	9999.00	98.83	4.92	3.85	5.97
168	110/80	110	80	.00	9999.00	119.83	5.66	4.41	6.90
169	110/90	110	90	.00	9999.00	149.83	5.80	4.46	7.12
170	120/19	120	19	.00	9999.00	7.00	1.65	1.11	2.19
171	120/20	120	20	.00	9999.00	9.00	1.72	1.17	2.28
172	120/25	120	25	.00	9999.00	19.00	1.94	1.32	2.55
173	120/30	120	30	.00	9999.00	29.00	2.18	1.48	2.87
174	120/35	120	35	.00	9999.00	43.00	2.33	1.69	2.97
175	120/40	120	40	.00	9999.00	55.00	2.70	2.03	3.37
176	120/45	120	45	.00	9999.00	67.00	3.11	2.37	3.84
177	120/50	120	50	.00	9999.00	79.00	3.61	2.80	4.41
178	120/55	120	55	.00	9999.00	90.00	4.18	3.29	5.06
179	120/60	120	60	.00	9999.00	101.00	4.75	3.77	5.73
180	120/70	120	70	.00	9999.00	125.00	5.79	4.61	6.96
181	120/80	120	80	.00	9999.00	164.00	5.82	4.56	7.06
182	130/16	130	16	.00	9999.00	7.17	1.54	1.02	2.06
183	130/20	130	20	.00	9999.00	14.17	1.77	1.19	2.35
184	130/25	130	25	.00	9999.00	26.17	2.02	1.36	2.68
185	130/30	130	30	.00	9999.00	40.17	2.26	1.60	2.90
186	130/35	130	35	.00	9999.00	55.17	2.56	1.88	3.25
187	130/40	130	40	.00	9999.00	68.17	3.14	2.36	3.91
188	130/45	130	45	.00	9999.00	82.17	3.70	2.84	4.56
189	130/50	130	50	.00	9999.00	96.17	4.35	3.43	5.28
190	130/60	130	60	.00	9999.00	124.17	5.61	4.51	6.69
191	130/70	130	70	.00	9999.00	169.17	5.78	4.57	6.97
192	140/13	140	13	.00	9999.00	5.33	1.41	.90	1.93
193	140/15	140	15	.00	9999.00	9.33	1.55	1.02	2.08
194	140/20	140	20	.00	9999.00	20.33	1.82	1.24	2.39
195	140/25	140	25	.00	9999.00	34.33	2.11	1.44	2.77
196	140/30	140	30	.00	9999.00	51.33	2.42	1.74	3.09
197	140/35	140	35	.00	9999.00	67.33	2.95	2.23	3.66
198	140/40	140	40	.00	9999.00	82.33	3.69	2.78	4.59
199	140/45	140	45	.00	9999.00	98.33	4.45	3.48	5.41
200	140/50	140	50	.00	9999.00	115.33	5.15	4.10	6.19
201	140/60	140	60	.00	9999.00	158.33	5.96	4.77	7.14
202	140/70	140	70	.00	9999.00	226.33	5.47	4.00	6.91
203	150/11	150	11	.00	9999.00	3.50	1.60	.90	2.31
204	150/15	150	15	.00	9999.00	14.50	1.56	1.02	2.09
205	150/20	150	20	.00	9999.00	27.50	1.90	1.29	2.52
206	150/25	150	25	.00	9999.00	43.50	2.24	1.64	2.84
207	150/30	150	30	.00	9999.00	62.50	2.74	2.07	3.42
208	150/35	150	35	.00	9999.00	80.50	3.47	2.60	4.33
209	150/40	150	40	.00	9999.00	98.50	4.33	3.40	5.25
210	150/45	150	45	.00	9999.00	118.50	5.08	4.00	6.15
211	150/50	150	50	.00	9999.00	141.50	5.66	4.53	6.79
212	150/60	150	60	.00	9999.00	212.50	5.45	4.09	6.80
213	150/70	150	70	.00	9999.00	287.50	5.78	3.94	7.59
214	160/9	160	9	.00	9999.00	2.67	1.71	.96	2.45
215	160/10	160	10	.00	9999.00	3.67	1.62	.89	2.35
216	160/15	160	15	.00	9999.00	18.67	1.62	1.08	2.16
217	160/20	160	20	.00	9999.00	34.67	2.00	1.38	2.60
218	160/25	160	25	.00	9999.00	52.67	2.52	1.89	3.14
219	160/30	160	30	.00	9999.00	74.67	3.18	2.44	3.92
220	160/40	160	40	.00	9999.00	118.67	4.87	3.84	5.90
221	160/50	160	50	.00	9999.00	180.67	5.62	4.37	6.85
222	170/8	170	8	.00	9999.00	2.83	1.69	.92	2.46
223	170/10	170	10	.00	9999.00	6.83	1.45	.91	1.98
224	170/15	170	15	.00	9999.00	22.83	1.71	1.19	2.23
225	170/20	170	20	.00	9999.00	40.83	2.17	1.55	2.78
226	170/25	170	25	.00	9999.00	63.83	2.84	2.16	3.51
227	170/30	170	30	.00	9999.00	88.83	3.69	2.85	4.51
228	170/40	170	40	.00	9999.00	143.83	5.37	4.26	6.47
229	170/50	170	50	.00	9999.00	232.83	5.36	3.85	6.84

Table F-3

NMRI P07'93 Constant 0.7 ATA PO2 in N2 Decompression Schedule
Risk Estimates

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INPUT FILE P0793USN.MLO OUTPUT FILE P0793USN.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	40	367	.00	9999.00	30.67	3.21	1.95	4.45
2	40	370	.00	9999.00	35.67	3.06	1.79	4.32
3	40	380	.00	9999.00	35.67	3.23	1.93	4.52
4	40	390	.00	9999.00	40.67	3.22	1.87	4.54
5	50	143	.00	9999.00	10.83	2.07	1.33	2.80
6	50	150	.00	9999.00	10.83	2.28	1.50	3.06
7	50	160	.00	9999.00	20.83	2.14	1.34	2.93
8	50	170	.00	9999.00	25.83	2.22	1.39	3.05
9	50	180	.00	9999.00	25.83	2.53	1.64	3.42
10	50	190	.00	9999.00	30.83	2.62	1.69	3.54
11	50	200	.00	9999.00	30.83	2.94	1.95	3.92
12	50	210	.00	9999.00	35.83	3.02	2.00	4.03
13	50	220	.00	9999.00	35.83	3.35	2.27	4.41
14	50	230	.00	9999.00	45.83	3.19	2.10	4.27
15	50	240	.00	9999.00	45.83	3.51	2.37	4.63
16	50	250	.00	9999.00	45.83	3.82	2.63	5.00
17	50	260	.00	9999.00	50.83	3.90	2.67	5.11
18	50	270	.00	9999.00	50.83	4.21	2.93	5.46
19	50	280	.00	9999.00	55.83	4.26	2.98	5.53
20	50	290	.00	9999.00	55.83	4.57	3.23	5.88
21	50	300	.00	9999.00	60.83	4.63	3.26	5.98
22	50	310	.00	9999.00	60.83	4.92	3.51	6.32
23	50	320	.00	9999.00	65.83	4.98	3.51	6.43
24	50	330	.00	9999.00	75.83	4.85	3.27	6.40
25	50	340	.00	9999.00	80.83	4.93	3.27	6.57
26	50	350	.00	9999.00	90.83	4.85	3.11	6.55
27	50	360	.00	9999.00	95.83	4.95	3.14	6.72
28	50	370	.00	9999.00	105.83	4.88	3.03	6.70
29	50	380	.00	9999.00	110.83	4.99	3.09	6.84
30	50	390	.00	9999.00	120.83	4.92	3.05	6.76
31	60	74	.00	9999.00	1.00	2.15	1.42	2.88
32	60	80	.00	9999.00	6.00	1.83	1.19	2.47
33	60	90	.00	9999.00	6.00	2.24	1.53	2.94
34	60	100	.00	9999.00	16.00	2.23	1.49	2.95
35	60	110	.00	9999.00	26.00	2.22	1.44	2.99
36	60	120	.00	9999.00	26.00	2.68	1.80	3.56
37	60	130	.00	9999.00	31.00	2.92	1.96	3.86
38	60	140	.00	9999.00	36.00	3.15	2.13	4.15
39	60	150	.00	9999.00	41.00	3.37	2.30	4.43
40	60	160	.00	9999.00	46.00	4.17	1.30	6.96
41	60	170	.00	9999.00	51.00	3.81	2.66	4.95
42	60	180	.00	9999.00	51.00	4.29	3.07	5.50
43	60	190	.00	9999.00	56.00	4.49	3.24	5.73
44	60	200	.00	9999.00	61.00	4.69	3.41	5.95
45	60	210	.00	9999.00	66.00	4.88	3.58	6.16
46	60	220	.00	9999.00	76.00	4.80	3.52	6.07
47	60	230	.00	9999.00	81.00	4.99	3.67	6.28
48	60	240	.00	9999.00	91.00	4.94	3.56	6.29
49	60	250	.00	9999.00	101.00	4.93	3.44	6.40
50	60	260	.00	9999.00	111.00	4.96	3.34	6.56
51	60	270	.00	9999.00	121.00	5.03	3.28	6.74
52	60	280	.00	9999.00	141.00	4.78	2.98	6.55
53	60	290	.00	9999.00	156.00	4.72	2.95	6.47
54	60	300	.00	9999.00	171.00	4.66	2.91	6.38
55	60	310	.00	9999.00	171.00	5.05	3.22	6.86
56	60	320	.00	9999.00	186.00	4.98	3.18	6.75
57	60	330	.00	9999.00	186.00	5.36	3.48	7.21
58	60	340	.00	9999.00	201.00	5.28	3.45	7.08
59	60	350	.00	9999.00	201.00	5.65	3.76	7.52
60	60	360	.00	9999.00	201.00	6.03	4.06	7.95
61	60	370	.00	9999.00	201.00	6.40	4.37	8.39
62	60	380	.00	9999.00	201.00	6.78	4.68	8.83
63	60	390	.00	9999.00	201.00	7.15	4.99	9.26
64	70	51	.00	9999.00	1.17	2.20	1.53	2.86
65	70	60	.00	9999.00	6.17	2.07	1.34	2.80
66	70	70	.00	9999.00	11.17	2.35	1.67	3.03
67	70	80	.00	9999.00	26.17	2.08	1.42	2.74
68	70	90	.00	9999.00	31.17	2.74	1.91	3.56
69	70	100	.00	9999.00	36.17	3.14	2.18	4.10
70	70	110	.00	9999.00	41.17	3.57	2.48	4.65
71	70	120	.00	9999.00	46.17	3.99	2.79	5.18
72	70	130	.00	9999.00	56.17	4.11	2.85	5.35

70	140	.00	9999.00	61.17	4.49	3.15	5.82
70	150	.00	9999.00	66.17	4.86	3.45	6.26
70	160	.00	9999.00	76.17	4.93	3.51	6.33
70	170	.00	9999.00	86.17	4.99	3.58	6.37
70	180	.00	9999.00	96.17	5.04	3.66	6.41
70	190	.00	9999.00	111.17	4.88	3.52	6.21
70	200	.00	9999.00	121.17	5.00	3.59	6.39
70	210	.00	9999.00	146.17	4.63	3.09	6.13
70	220	.00	9999.00	161.17	4.70	3.05	6.33
70	230	.00	9999.00	181.17	4.66	2.98	6.30
70	240	.00	9999.00	196.17	5.05	3.33	6.74
70	250	.00	9999.00	196.17	5.28	3.52	7.00
70	260	.00	9999.00	196.17	5.82	3.95	7.65
70	270	.00	9999.00	196.17	6.36	4.38	8.30
70	280	.00	9999.00	196.17	6.91	4.83	8.95
70	290	.00	9999.00	211.17	6.92	4.90	8.91
70	300	.00	9999.00	211.17	7.45	5.33	9.53
70	310	.00	9999.00	211.17	7.98	5.77	10.15
70	320	.00	9999.00	211.17	8.52	6.21	10.77
70	330	.00	9999.00	211.17	9.05	6.65	11.38
70	340	.00	9999.00	211.17	9.58	7.08	12.01
70	350	.00	9999.00	226.17	9.39	6.96	11.76
80	39	.00	9999.00	1.33	2.24	1.58	2.89
80	40	.00	9999.00	6.33	1.81	1.16	2.45
80	50	.00	9999.00	6.33	2.36	1.62	3.10
80	60	.00	9999.00	26.33	2.20	1.58	2.82
80	70	.00	9999.00	31.33	2.84	2.08	3.60
80	80	.00	9999.00	41.33	3.26	2.36	4.15
80	90	.00	9999.00	46.33	3.93	2.85	5.00
80	100	.00	9999.00	56.33	4.22	2.97	5.46
80	110	.00	9999.00	61.33	4.84	3.41	6.25
80	120	.00	9999.00	76.33	4.83	3.33	6.30
80	130	.00	9999.00	86.33	5.08	3.50	6.63
80	140	.00	9999.00	101.33	5.02	3.46	6.55
80	150	.00	9999.00	116.33	4.96	3.46	6.44
80	160	.00	9999.00	131.33	4.96	3.52	6.37
80	170	.00	9999.00	146.33	5.01	3.62	6.39
80	180	.00	9999.00	166.33	4.98	3.51	6.42
80	190	.00	9999.00	186.33	5.05	3.45	6.62
80	200	.00	9999.00	201.33	5.31	3.65	6.94
80	210	.00	9999.00	201.33	6.00	4.19	7.77
80	220	.00	9999.00	201.33	6.71	4.76	8.61
80	230	.00	9999.00	201.33	7.43	5.35	9.47
80	240	.00	9999.00	201.33	8.17	5.95	10.33
80	250	.00	9999.00	216.33	8.30	6.12	10.44
80	260	.00	9999.00	216.33	9.02	6.71	11.27
80	270	.00	9999.00	216.33	9.73	7.29	12.10
80	280	.00	9999.00	231.33	9.69	7.29	12.03
80	290	.00	9999.00	231.33	10.37	7.81	12.86
80	300	.00	9999.00	321.33	7.60	5.64	9.52
80	310	.00	9999.00	321.33	8.16	6.06	10.21
80	320	.00	9999.00	321.33	8.73	6.50	10.91
90	32	.00	9999.00	1.50	2.32	1.63	3.00
90	40	.00	9999.00	6.50	2.35	1.58	3.12
90	50	.00	9999.00	26.50	2.39	1.76	3.01
90	60	.00	9999.00	36.50	3.07	2.31	3.82
90	70	.00	9999.00	46.50	3.70	2.78	4.63
90	80	.00	9999.00	56.50	4.36	3.23	5.47
90	90	.00	9999.00	66.50	4.96	3.61	6.28
90	100	.00	9999.00	81.50	5.08	3.53	6.60
90	110	.00	9999.00	101.50	4.99	3.38	6.57
90	120	.00	9999.00	116.50	5.09	3.40	6.74
90	130	.00	9999.00	146.50	4.46	3.03	5.88
90	140	.00	9999.00	161.50	4.67	3.27	6.05
90	150	.00	9999.00	186.50	4.60	3.31	5.88
90	160	.00	9999.00	186.50	5.46	4.00	6.90
90	170	.00	9999.00	201.50	5.83	4.27	7.36
90	180	.00	9999.00	201.50	6.71	4.99	8.39
90	190	.00	9999.00	201.50	7.61	5.75	9.44
100	27	.00	9999.00	6.67	1.68	1.13	2.23
100	30	.00	9999.00	6.67	2.00	1.35	2.64
100	35	.00	9999.00	11.67	2.23	1.49	2.97
100	40	.00	9999.00	21.67	2.37	1.71	3.04
100	45	.00	9999.00	31.67	2.60	1.93	3.27
100	50	.00	9999.00	36.67	3.08	2.32	3.82
100	55	.00	9999.00	41.67	3.57	2.74	4.40
100	60	.00	9999.00	46.67	3.96	3.02	4.90
100	65	.00	9999.00	51.67	4.42	3.35	5.48
100	70	.00	9999.00	61.67	4.61	3.47	5.73
100	75	.00	9999.00	66.67	5.02	3.73	6.30
100	80	.00	9999.00	76.67	5.13	3.73	6.51
100	90	.00	9999.00	101.67	4.99	3.44	6.51
100	100	.00	9999.00	121.67	5.08	3.38	6.75
100	110	.00	9999.00	151.67	4.60	3.00	6.16
110	24	.00	9999.00	6.83	1.79	1.20	2.38
110	25	.00	9999.00	6.83	1.91	1.28	2.54
110	30	.00	9999.00	11.83	2.25	1.50	2.98

160	110	35	.00	9999.00	21.83	2.48	1.76	3.20
161	110	40	.00	9999.00	31.83	2.82	2.10	3.53
162	110	45	.00	9999.00	36.83	3.43	2.58	4.27
163	110	50	.00	9999.00	46.83	3.86	2.98	4.74
164	110	55	.00	9999.00	51.83	4.54	3.56	5.51
165	110	60	.00	9999.00	61.83	4.75	3.68	5.81
166	110	65	.00	9999.00	71.83	4.99	3.79	6.17
167	110	70	.00	9999.00	86.83	4.95	3.67	6.21
168	110	80	.00	9999.00	111.83	5.05	3.53	6.56
169	110	90	.00	9999.00	151.83	4.35	2.86	5.81
170	120	19	.00	9999.00	2.00	2.25	1.52	2.98
171	120	20	.00	9999.00	7.00	1.66	1.10	2.22
172	120	25	.00	9999.00	7.00	2.38	1.64	3.12
173	120	30	.00	9999.00	22.00	2.38	1.68	3.07
174	120	35	.00	9999.00	32.00	2.80	2.06	3.53
175	120	40	.00	9999.00	42.00	3.32	2.47	4.17
176	120	45	.00	9999.00	47.00	4.09	3.13	5.04
177	120	50	.00	9999.00	57.00	4.62	3.60	5.62
178	120	55	.00	9999.00	67.00	5.11	4.01	6.20
179	120	60	.00	9999.00	82.00	5.23	4.04	6.40
180	120	70	.00	9999.00	117.00	4.99	3.56	6.39
181	120	80	.00	9999.00	147.00	5.03	3.37	6.66
182	130	16	.00	9999.00	2.17	2.15	1.41	2.88
183	130	20	.00	9999.00	7.17	2.02	1.35	2.70
184	130	25	.00	9999.00	17.17	2.34	1.58	3.09
185	130	30	.00	9999.00	27.17	2.80	2.03	3.56
186	130	35	.00	9999.00	37.17	3.43	2.50	4.36
187	130	40	.00	9999.00	47.17	4.13	3.13	5.12
188	130	45	.00	9999.00	57.17	4.83	3.76	5.89
189	130	50	.00	9999.00	72.17	5.18	4.08	6.27
190	130	60	.00	9999.00	112.17	5.06	3.80	6.30
191	130	70	.00	9999.00	147.17	5.08	3.51	6.63
192	140	13	.00	9999.00	2.33	1.96	1.23	2.69
193	140	15	.00	9999.00	7.33	1.57	1.07	2.08
194	140	20	.00	9999.00	7.33	2.41	1.66	3.15
195	140	25	.00	9999.00	22.33	2.60	1.84	3.36
196	140	30	.00	9999.00	32.33	3.32	2.34	4.28
197	140	35	.00	9999.00	42.33	4.18	3.10	5.25
198	140	40	.00	9999.00	57.33	4.76	3.67	5.85
199	140	45	.00	9999.00	72.33	5.25	4.12	6.37
200	140	50	.00	9999.00	97.33	5.16	4.06	6.24
201	140	60	.00	9999.00	137.33	5.22	3.82	6.60
202	140	70	.00	9999.00	177.33	5.21	3.49	6.89
203	150	11	.00	9999.00	2.50	1.87	1.12	2.61
204	150	15	.00	9999.00	7.50	1.79	1.17	2.40
205	150	20	.00	9999.00	12.50	2.49	1.65	3.34
206	150	25	.00	9999.00	27.50	2.93	2.11	3.74
207	150	30	.00	9999.00	37.50	3.88	2.78	4.97
208	150	35	.00	9999.00	52.50	4.64	3.49	5.77
209	150	40	.00	9999.00	67.50	5.38	4.19	6.55
210	150	45	.00	9999.00	92.50	5.41	4.28	6.54
211	150	50	.00	9999.00	117.50	5.39	4.21	6.56
212	150	60	.00	9999.00	162.50	5.48	3.98	6.95
213	150	70	.00	9999.00	192.50	6.22	4.26	8.14
214	160	9	.00	9999.00	22.67	.79	.54	1.04
215	160	10	.00	9999.00	22.67	.90	.62	1.17
216	160	15	.00	9999.00	22.67	1.54	1.07	2.00
217	160	20	.00	9999.00	22.67	2.43	1.67	3.18
218	160	25	.00	9999.00	47.67	2.63	1.83	3.42
219	160	30	.00	9999.00	47.67	4.24	3.09	5.38
220	160	40	.00	9999.00	87.67	5.42	4.27	6.55
221	160	50	.00	9999.00	142.67	5.38	4.14	6.60
222	170	8	.00	9999.00	22.83	.78	.52	1.03
223	170	10	.00	9999.00	22.83	1.01	.70	1.31
224	170	15	.00	9999.00	22.83	1.74	1.21	2.26
225	170	20	.00	9999.00	22.83	2.85	2.01	3.69
226	170	25	.00	9999.00	37.83	3.79	2.64	4.92
227	170	30	.00	9999.00	52.83	4.90	3.62	6.16
228	170	40	.00	9999.00	107.83	5.43	4.29	6.55
229	170	50	.00	9999.00	167.83	5.36	4.03	6.67

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Appendix G

Risk Estimates for No-Decompression Limits

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Table G-1

USN 1955 AIR TABLES NO-DECOMPRESSION TIMES AND RISKS

(DESCENT RATE 60 FSW/MIN : ASCENT RATE 60 FSW/MIN)

INPUT FILE AIR55ND.MLO OUTPUT FILE AIR55ND.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

	PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	[35.0 / 310.0] USNAIR55 NO-D	35	310	.00	9999.00	.60	5.42	4.14	6.69
2	[40.0 / 200.0] USNAIR55 NO-D	40	200	.00	9999.00	.70	3.96	2.94	4.97
3	[50.0 / 100.0] USNAIR55 NO-D	50	100	.00	9999.00	.80	2.53	1.78	3.27
4	[60.0 / 60.0] USNAIR55 NO-D	60	60	.00	9999.00	1.00	2.13	1.45	2.81
5	[70.0 / 50.0] USNAIR55 NO-D	70	50	.00	9999.00	1.20	2.37	1.65	3.08
6	[80.0 / 40.0] USNAIR55 NO-D	80	40	.00	9999.00	1.30	2.37	1.68	3.07
7	[90.0 / 30.0] USNAIR55 NO-D	90	30	.00	9999.00	1.50	2.11	1.47	2.74
8	[100.0 / 25.0] USNAIR55 NO-D	100	25	.00	9999.00	1.70	2.05	1.41	2.69
9	[110.0 / 20.0] USNAIR55 NO-D	110	20	.00	9999.00	1.80	1.88	1.24	2.50
10	[120.0 / 15.0] USNAIR55 NO-D 10	120	15	.00	9999.00	2.00	1.60	1.00	2.21
11	[130.0 / 10.0] USNAIR55 NO-D 11	130	10	.00	9999.00	2.20	1.29	.70	1.89
12	[140.0 / 10.0] USNAIR55 NO-D 12	140	10	.00	9999.00	2.30	1.41	.78	2.04
13	[150.0 / 5.0] USNAIR55 NO-D 13	150	5	.00	9999.00	2.50	1.03	.43	1.63
14	[160.0 / 5.0] USNAIR55 NO-D 14	160	5	.00	9999.00	2.70	1.09	.47	1.70
15	[170.0 / 5.0] USNAIR55 NO-D 15	170	5	.00	9999.00	2.80	1.14	.50	1.77
16	[180.0 / 5.0] USNAIR55 NO-D 16	180	5	.00	9999.00	3.00	1.19	.54	1.83
17	[190.0 / 5.0] USNAIR55 NO-D 17	190	5	.00	9999.00	3.20	1.24	.57	1.89

Table G-2

VVAL18 AIR NO-DECOMPRESSION TIMES AND RISKS

(DESCENT RATE 60 FSW/MIN : ASCENT RATE 60 FSW/MIN)

INPUT FILE AIR18ND .MLO

OUTPUT FILE AIR18ND .est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

1 19:19 DUKE/DAN 2 FEB 1997
PROGRAM TBLP7MLO1 USING 10 FSW STOPS
VVAL18.DAT (NITROGEN)

	PROFILE
1	20/ND
2	22/ND
3	24/ND
4	25/ND
5	30/ND
6	35/ND
7	40/ND
8	45/ND
9	50/ND
10	55/ND
11	60/ND
12	65/ND
13	70/ND
14	75/ND
15	80/ND
16	85/ND
17	90/ND
18	95/ND
19	100/ND
20	105/ND
21	110/ND
22	115/ND
23	120/ND
24	125/ND
25	130/ND
26	135/ND
27	140/ND
28	145/ND
29	150/ND
30	155/ND
31	160/ND
32	165/ND
33	170/ND
34	175/ND
35	180/ND
36	185/ND
37	190/ND
38	195/ND
39	200/ND

DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
20	32767	.00	9999.00	.33	7.44	5.89	8.96
22	32767	.00	9999.00	.37	9.15	7.28	10.98
24	2277	.00	9999.00	.40	10.66	8.49	12.78
25	1103	.00	9999.00	.42	9.37	7.41	11.30
30	372	.00	9999.00	.50	4.73	3.44	6.01
35	232	.00	9999.00	.58	3.43	2.46	4.39
40	163	.00	9999.00	.67	2.86	2.02	3.69
45	125	.00	9999.00	.75	2.65	1.86	3.43
50	92	.00	9999.00	.83	2.29	1.57	3.00
55	74	.00	9999.00	.92	2.24	1.49	2.98
60	63	.00	9999.00	1.00	2.26	1.52	3.01
65	55	.00	9999.00	1.08	2.30	1.58	3.01
70	49	.00	9999.00	1.17	2.34	1.63	3.04
75	44	.00	9999.00	1.25	2.37	1.67	3.07
80	40	.00	9999.00	1.33	2.41	1.70	3.11
85	36	.00	9999.00	1.42	2.44	1.72	3.16
90	34	.00	9999.00	1.50	2.47	1.74	3.20
95	31	.00	9999.00	1.58	2.51	1.76	3.25
100	29	.00	9999.00	1.67	2.54	1.78	3.29
105	27	.00	9999.00	1.75	2.57	1.79	3.34
110	26	.00	9999.00	1.83	2.60	1.81	3.38
115	24	.00	9999.00	1.92	2.63	1.82	3.43
120	23	.00	9999.00	2.00	2.61	1.80	3.41
125	21	.00	9999.00	2.08	2.52	1.72	3.31
130	19	.00	9999.00	2.17	2.45	1.66	3.23
135	18	.00	9999.00	2.25	2.40	1.61	3.18
140	17	.00	9999.00	2.33	2.37	1.58	3.15
145	15	.00	9999.00	2.42	2.30	1.51	3.08
150	14	.00	9999.00	2.50	2.19	1.42	2.96
155	13	.00	9999.00	2.58	2.12	1.35	2.89
160	12	.00	9999.00	2.67	2.07	1.30	2.83
165	11	.00	9999.00	2.75	2.03	1.26	2.80
170	11	.00	9999.00	2.83	2.01	1.23	2.78
175	10	.00	9999.00	2.92	1.99	1.20	2.77
180	10	.00	9999.00	3.00	1.98	1.19	2.76
185	9	.00	9999.00	3.08	1.97	1.17	2.76
190	9	.00	9999.00	3.17	1.96	1.16	2.75
195	8	.00	9999.00	3.25	1.95	1.14	2.76
200	8	.00	9999.00	3.33	1.95	1.14	2.76

Table G-3

VVAL18-1 AIR N0-DECOMPRESSION TIMES AND RISKS

(DESCENT RATE 60 FSW/MIN : ASCENT RATE 60 FSW/MIN)

INPUT FILE AIR181ND.MLO OUTPUT FILE AIR181ND.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

1 19:19 DUKE/DAN 2 FEB 1997
PROGRAM TBLP7MLO1 USING 10 FSW STOPS
VVAL18-1.DAT(NITROGEN)

	PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	20/ND	20	32767	.00	9999.00	.33	7.44	5.89	8.96
2	22/ND	22	889	.00	9999.00	.37	6.07	4.54	7.58
3	24/ND	24	663	.00	9999.00	.40	5.66	4.14	7.16
4	25/ND	25	595	.00	9999.00	.42	5.55	4.04	7.03
5	30/ND	30	405	.00	9999.00	.50	5.37	3.97	6.74
6	35/ND	35	310	.00	9999.00	.58	5.44	4.15	6.71
7	40/ND	40	200	.00	9999.00	.67	3.97	2.94	4.98
8	45/ND	45	135	.00	9999.00	.75	2.97	2.12	3.81
9	50/ND	50	100	.00	9999.00	.83	2.57	1.81	3.32
10	55/ND	55	81	.00	9999.00	.92	2.46	1.71	3.20
11	60/ND	60	66	.00	9999.00	1.00	2.39	1.61	3.17
12	65/ND	65	57	.00	9999.00	1.08	2.39	1.64	3.14
13	70/ND	70	50	.00	9999.00	1.17	2.40	1.67	3.13
14	75/ND	75	44	.00	9999.00	1.25	2.42	1.70	3.13
15	80/ND	80	40	.00	9999.00	1.33	2.41	1.70	3.12
16	85/ND	85	35	.00	9999.00	1.42	2.34	1.65	3.03
17	90/ND	90	32	.00	9999.00	1.50	2.30	1.61	2.99
18	95/ND	95	29	.00	9999.00	1.58	2.27	1.58	2.96
19	100/ND	100	26	.00	9999.00	1.67	2.26	1.56	2.95
20	105/ND	105	24	.00	9999.00	1.75	2.17	1.48	2.86
21	110/ND	110	21	.00	9999.00	1.83	2.09	1.41	2.76
22	115/ND	115	19	.00	9999.00	1.92	2.03	1.35	2.70
23	120/ND	120	18	.00	9999.00	2.00	1.99	1.31	2.67
24	125/ND	125	17	.00	9999.00	2.08	1.96	1.28	2.65
25	130/ND	130	15	.00	9999.00	2.17	1.95	1.25	2.64
26	135/ND	135	14	.00	9999.00	2.25	1.94	1.23	2.63
27	140/ND	140	14	.00	9999.00	2.33	1.93	1.22	2.64
28	145/ND	145	13	.00	9999.00	2.42	1.93	1.21	2.64
29	150/ND	150	12	.00	9999.00	2.50	1.93	1.20	2.65
30	155/ND	155	12	.00	9999.00	2.58	1.93	1.19	2.66
31	160/ND	160	11	.00	9999.00	2.67	1.93	1.18	2.67
32	165/ND	165	11	.00	9999.00	2.75	1.94	1.18	2.69
33	170/ND	170	10	.00	9999.00	2.83	1.94	1.17	2.70
34	175/ND	175	10	.00	9999.00	2.92	1.95	1.17	2.72
35	180/ND	180	9	.00	9999.00	3.00	1.95	1.17	2.73
36	185/ND	185	9	.00	9999.00	3.08	1.96	1.16	2.75
37	190/ND	190	9	.00	9999.00	3.17	1.96	1.16	2.75
38	195/ND	195	8	.00	9999.00	3.25	1.95	1.14	2.76
39	200/ND	200	8	.00	9999.00	3.33	1.95	1.14	2.76

Table G-4

NMRI 1993 AIR NO-DECOMPRESSION TIMES AND RISKS

(DESCENT RATE 60 FSW/MIN : ASCENT RATE 60 FSW/MIN)

INPUT FILE AIR93ND.MLO OUTPUT FILE AIR93ND.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	20	513	.00	9999.00	.33	2.29	1.23	3.35
2	25	338	.00	9999.00	.42	2.28	1.34	3.21
3	30	245	.00	9999.00	.50	2.30	1.49	3.10
4	35	185	.00	9999.00	.58	2.30	1.56	3.03
5	40	144	.00	9999.00	.67	2.30	1.58	3.02
6	45	114	.00	9999.00	.75	2.28	1.57	2.99
7	50	93	.00	9999.00	.83	2.29	1.58	3.00
8	55	77	.00	9999.00	.92	2.29	1.55	3.03
9	60	64	.00	9999.00	1.00	2.27	1.52	3.02
10	70	48	.00	9999.00	1.17	2.27	1.59	2.94
11	80	38	.00	9999.00	1.33	2.24	1.58	2.89
12	90	32	.00	9999.00	1.50	2.27	1.59	2.94
13	100	27	.00	9999.00	1.67	2.24	1.55	2.92
14	110	24	.00	9999.00	1.83	2.30	1.58	3.01
15	120	21	.00	9999.00	2.00	2.28	1.55	3.00
16	130	18	.00	9999.00	2.17	2.17	1.45	2.89
17	140	16	.00	9999.00	2.33	2.14	1.41	2.87
18	150	14	.00	9999.00	2.50	2.06	1.32	2.79
19	160	13	.00	9999.00	2.67	2.09	1.33	2.85
20	170	12	.00	9999.00	2.83	2.10	1.32	2.87
21	180	11	.00	9999.00	3.00	2.08	1.28	2.86
22	190	11	.00	9999.00	3.17	2.23	1.39	3.05

Table G-5

USN 1980 (VVAL18) 0.7 ATA PO2 IN N2 NO-DECOMPRESSION TIMES AND RISKS

(DESCENT RATE 60 FSW/MIN : ASCENT RATE 60 FSW/MIN)

INPUT FILE P0780ND .MLO OUTPUT FILE P0780ND .est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

1 19:14 DUKE/DAN 2 FEB 1997
PROGRAM TBLP7MLO1 USING 10 FSW STOPS
VVAL18.DAT (NITROGEN)

	PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	30/ND	30	32767	.00	9999.00	.50	5.87	4.58	7.14
2	32/ND	32	32767	.00	9999.00	.53	7.91	6.26	9.53
3	34/ND	34	32767	.00	9999.00	.57	10.06	7.98	12.08
4	35/ND	35	32767	.00	9999.00	.58	11.15	8.85	13.40
5	36/ND	36	1076	.00	9999.00	.60	9.64	7.61	11.62
6	38/ND	38	559	.00	9999.00	.63	6.76	5.12	8.38
7	40/ND	40	367	.00	9999.00	.67	4.77	3.47	6.05
8	45/ND	45	206	.00	9999.00	.75	3.13	2.22	4.04
9	50/ND	50	143	.00	9999.00	.83	2.71	1.90	3.51
10	55/ND	55	97	.00	9999.00	.92	2.21	1.51	2.90
11	60/ND	60	74	.00	9999.00	1.00	2.11	1.38	2.83
12	65/ND	65	60	.00	9999.00	1.08	2.14	1.43	2.84
13	70/ND	70	51	.00	9999.00	1.17	2.18	1.51	2.84
14	75/ND	75	45	.00	9999.00	1.25	2.22	1.56	2.87
15	80/ND	80	39	.00	9999.00	1.33	2.26	1.60	2.92
16	85/ND	85	36	.00	9999.00	1.42	2.30	1.62	2.98
17	90/ND	90	32	.00	9999.00	1.50	2.35	1.65	3.04
18	95/ND	95	30	.00	9999.00	1.58	2.39	1.67	3.10
19	100/ND	100	27	.00	9999.00	1.67	2.43	1.69	3.15
20	105/ND	105	25	.00	9999.00	1.75	2.47	1.71	3.22
21	110/ND	110	24	.00	9999.00	1.83	2.49	1.72	3.26
22	115/ND	115	21	.00	9999.00	1.92	2.37	1.62	3.11
23	120/ND	120	19	.00	9999.00	2.00	2.29	1.54	3.03
24	125/ND	125	17	.00	9999.00	2.08	2.23	1.49	2.97
25	130/ND	130	16	.00	9999.00	2.17	2.17	1.42	2.91
26	135/ND	135	14	.00	9999.00	2.25	2.03	1.29	2.75
27	140/ND	140	13	.00	9999.00	2.33	1.94	1.21	2.67
28	145/ND	145	11	.00	9999.00	2.42	1.89	1.15	2.62
29	150/ND	150	11	.00	9999.00	2.50	1.85	1.11	2.60
30	155/ND	155	10	.00	9999.00	2.58	1.84	1.08	2.59
31	160/ND	160	9	.00	9999.00	2.67	1.82	1.05	2.58
32	165/ND	165	9	.00	9999.00	2.75	1.81	1.03	2.59
33	170/ND	170	8	.00	9999.00	2.83	1.81	1.02	2.60

Table G-6

VVAL 18-1 0.7 ATA PO2 IN N2 N0-DECOMPRESSION TIMES AND RISKS

(DESCENT RATE 60 FSW/MIN : ASCENT RATE 60 FSW/MIN)

INPUT FILE P07181ND.MLO OUTPUT FILE P07181ND.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

	1.780	60.32	515.8	.0000	.0000
	5.740	9.072	6.838	1.000	.1000
	999.0	.9766	999.0	.0000	.0000
	2.259				

1 19:19 DUKE/DAN 2 FEB 1997
PROGRAM TBLP7MLO1 USING 10 FSW STOPS
VVAL18-1.DAT(NITROGEN)

	PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	30/ND	30	32767	.00	9999.00	.50	5.87	4.58	7.14
2	32/ND	32	32767	.00	9999.00	.53	7.91	6.26	9.53
3	34/ND	34	807	.00	9999.00	.57	6.21	4.63	7.77
4	35/ND	35	677	.00	9999.00	.58	5.93	4.37	7.47
5	36/ND	36	590	.00	9999.00	.60	5.75	4.20	7.26
6	38/ND	38	476	.00	9999.00	.63	5.54	4.06	6.99
7	40/ND	40	402	.00	9999.00	.67	5.46	4.05	6.85
8	45/ND	45	270	.00	9999.00	.75	4.92	3.73	6.10
9	50/ND	50	165	.00	9999.00	.83	3.47	2.52	4.41
10	55/ND	55	105	.00	9999.00	.92	2.50	1.75	3.25
11	60/ND	60	80	.00	9999.00	1.00	2.33	1.61	3.05
12	65/ND	65	63	.00	9999.00	1.08	2.25	1.48	3.01
13	70/ND	70	53	.00	9999.00	1.17	2.25	1.55	2.95
14	75/ND	75	45	.00	9999.00	1.25	2.27	1.59	2.94
15	80/ND	80	39	.00	9999.00	1.33	2.26	1.59	2.92
16	85/ND	85	34	.00	9999.00	1.42	2.18	1.54	2.82
17	90/ND	90	30	.00	9999.00	1.50	2.13	1.49	2.77
18	95/ND	95	27	.00	9999.00	1.58	2.11	1.47	2.75
19	100/ND	100	23	.00	9999.00	1.67	2.02	1.38	2.65
20	105/ND	105	21	.00	9999.00	1.75	1.91	1.29	2.54
21	110/ND	110	18	.00	9999.00	1.83	1.85	1.22	2.48
22	115/ND	115	17	.00	9999.00	1.92	1.82	1.18	2.45
23	120/ND	120	15	.00	9999.00	2.00	1.80	1.15	2.45
24	125/ND	125	14	.00	9999.00	2.08	1.79	1.13	2.45
25	130/ND	130	13	.00	9999.00	2.17	1.79	1.11	2.46
26	135/ND	135	12	.00	9999.00	2.25	1.80	1.10	2.49
27	140/ND	140	12	.00	9999.00	2.33	1.80	1.09	2.51
28	145/ND	145	11	.00	9999.00	2.42	1.81	1.09	2.54
29	150/ND	150	10	.00	9999.00	2.50	1.82	1.08	2.56
30	155/ND	155	10	.00	9999.00	2.58	1.84	1.08	2.59
31	160/ND	160	9	.00	9999.00	2.67	1.82	1.05	2.58
32	165/ND	165	9	.00	9999.00	2.75	1.81	1.03	2.59
33	170/ND	170	8	.00	9999.00	2.83	1.81	1.02	2.60

Table G-7

NMRI 1993 0.7 ATA PO2 IN N2 N0-DECOMPRESSION TIMES AND RISKS

(DESCENT RATE 60 FSW/MIN : ASCENT RATE 60 FSW/MIN)

INPUT FILE P0793ND.MLO OUTPUT FILE P0793ND.est

RISK COMPUTED USING PROGRAM RISK2NMR AND
PARAMETER FILE LE1EX7.VAR

1.780	60.32	515.8	.0000	.0000
5.740	9.072	6.838	1.000	.1000
999.0	.9766	999.0	.0000	.0000
2.259				

PROFILE	DEPTH	TIME	T1	T2	TASC	P(DCS)	LOW	HIGH
1	30	633	.00	9999.00	.50	2.22	1.14	3.30
2	35	359	.00	9999.00	.58	2.30	1.33	3.26
3	40	240	.00	9999.00	.67	2.30	1.49	3.10
4	45	171	.00	9999.00	.75	2.29	1.56	3.01
5	50	128	.00	9999.00	.83	2.31	1.59	3.02
6	55	98	.00	9999.00	.92	2.28	1.57	2.98
7	60	78	.00	9999.00	1.00	2.29	1.56	3.01
8	70	52	.00	9999.00	1.17	2.24	1.56	2.93
9	80	39	.00	9999.00	1.33	2.24	1.58	2.89
10	90	32	.00	9999.00	1.50	2.32	1.63	3.00
11	100	26	.00	9999.00	1.67	2.26	1.57	2.95
12	110	22	.00	9999.00	1.83	2.26	1.54	2.97
13	120	19	.00	9999.00	2.00	2.47	1.62	3.31
14	130	16	.00	9999.00	2.17	2.15	1.41	2.88
15	140	14	.00	9999.00	2.33	2.12	1.36	2.88
16	150	14	.00	9999.00	2.50	2.24	1.45	3.02

Appendix H

Risk Predictions for NEDU and NMRI Manned Validation Dive Profiles as Actually Tested

Notes:

Profile construction:
In doing the studies summarized in the tables in this appendix, skeleton profiles were first created which specified the desired depths, bottom times and surface or shallow intervals. However, the decompression stops during ascent were computed by the variation of the algorithm in use at the time. The various combinations of the method of computation (*Comp* column) and the parameter values used (*Param* column) resulted in different decompression stops for the same basic skeleton profile. Since all of these dives were done with the decompression schedules computed in real time, no two are exactly alike. In order to be able to group dives, "idealized" profile were constructed which were representative of those actually dove. Profiles which were so different that they could not be grouped (such as profiles for divers who did not complete a profile because of ear squeezes) were computed separately and are designated by the suffix (i). For each of these "idealized" profiles a risk of DCS was computed using the NMRI LE1 PDA (program *Risknmr2*, Diskette 3) along with the 95% confidence limits. Based on the total number of dives on that profile and the number of DCS cases observed, the 95% confidence limits were computed for the binomial probability assuming the binomial distribution.

Profile Description:

The profiles are described by a sequence of several depth/bottom time combinations. The depth/bottom time combinations in parentheses are either surface intervals (depth specified as 0) or a shallow interval (usually at 10,15 or 30 fsw). Ascent and descent rates were not the same for all profiles when actually tested, and in some cases the times are the actual times at depth, in others they include the descent time to that depth. Consult the original reports for details. Any time an ascent is called for, the particular model or procedures must find the decompression stops required.

Dive Types:

Dive Types I, II, III, VI and VII are those where a single gas was breathed throughout and Fleet procedures are available for constructing decompression schedules.

Type I dives were done breathing air throughout and all time between dives was spent at the surface. For example the Profile designated as 80/ND (0/60) 80/ND means that a no decompression dive was made to 80 fsw, then 60 min was spent at the surface follower by another no-decompression dive. In this case the actual no-decompression time was computed by the VVAL18, VVAL18-1 of Plan V4 algorithm. The USN'55 air repetitive procedures could be used to calculate decompression schedules for these dives. In this case the bottom times used were those computed by the VVAL18-1 algorithm, but the decompression schedules were those required by the USN'55 repetitive dive procedure for those bottom times. Needless to say, not all of the no-decompression bottom timers computed by VVAL18-1 were necessarily no-decompression dives according the USN'55 procedures. Type II Dives are single depth air dives.

Type III dives are dives where air was breathed throughout but where there were no intervals spent at the surface, rather a shallow interval was interspersed between the two dives. The Profile designated as 50/45 (15/360) 50/45 means that a bottom time of 45 min was spent at 50 fsw, then there was ascent to 15 fsw where 306 min was spent followed by a second excursion to 50 fsw with a bottom time of 45 min followed by decompression to the surface.

Profile Type VI and Type VII are the 0.7 ata constant PO2 in N2 counterparts to the Types I and II air profiles. Current USN decompression procedures were only available for the Type VII dives, and as with the air dives the VVAL18-1 no-decompression times were used as the bottom times when computing schedules using the P07'80 procedures.

There are no current Fleet procedures for computing decompression for dive Type IV, V, VIII, and IX.

Type IV dives had air breathing throughout except for the final decompression where a constant 0.7 ata PO2 in N2 gas was breathed. Type V dives involved breathing air for the deep excursions but a constant 0.7 ata PO2 in N2 gas was breathed during the shallow transits, that part of the dive in parentheses. Dive Type VIII had a single gas breathed throughout but there is no Fleet Procedure for computing the decompression schedule The Type IX dives are in fact single depth bounce dives but in these profiles air was breathed during descent and at depth and a switch

was made to a constant 0.7 ata PO2 breathing gas for decompression. Where *ND* appears, instead of a bottom time, it indicates that the maximum no-decompression time as computed by the algorithm was spent at that depth. The exact profiles are found on the Diskettes accompanying this report.

Table Key

Facility: Navy Experimental Diving Unit (NEDU), Naval Medical Research Institute (NMRI).

Report: For dives done at NEDU this is the NEDU report number (2,3,8). Dives from report 11-80 (2) are shown as being done in either Phase 1 (11-80.1) or Phase 2 (11-80.2).
For NMRI dives, 1-93 denotes the year the resultant decompression tables were completed (24).

Type: Type of dive, see key at end of table.

Pro #: The profile designator as used in the report describing the series.

Comp,Param: The computer program and parameter set used to compute the profile as actually dove during validation.

Under Comp: PROB denotes the NMRI probabilistic algorithm LE1 PDA (18), DMDB the computer algorithm used in the NEDU trials (1-3,8), MANUAL profiles computed by hand, and STD AIR, profiles from the current USN'55 Standard Air Decompression Tables.

Under Param: B(2.5-5.0), "VVAL", "MVAL", C3,C4,C5 are different parameter sets used by the designated computer program. CSMD denotes profile computed by the Combat Swimmer Multi-level Dive procedure. For dives where Comp is STD AIR, Param shows the depth/bottom time of the air schedule used for decompressing. Note that this is not necessarily the same as the depth/bottom time actually used, as shown under Profile.

Profile: A brief description of the profile shown by the depth/time combinations of the various segments. Times shown as "ND" mean that the no-decompression time as computed by the model being evaluated was used. Depth/time combinations in parenthesis are time spent at the surface (depth=0) or time spent at some shallow depth in multi- level dives. LA@20 means the last decompression stop was taken at 20 fsw.

Dives,DCS: The number of dives done and the number of cases of decompression sickness (DCS) which occurred.

PDCS: The probability of DCS for the profile exactly as dove computed by the LE1 PDA (program *Risknmr* on Diskette 3, see Appendix D)

Plow,Phigh: The upper and lower 95% confidence limits on the computed probability of DCS.

BLCL,BUCL: The upper and lower 95% confidence limits on the probability of DCS as computed assuming the binomial distribution and using the number of dives and number of DCS cases observed as the independent variables.

LCLX,UCLX: The upper and lower 95% confidence limits on the predicted number of DCS cases assuming the binomial distribution and using the number of dives and the computed PDCS as the independent variables.

out?: if "yes" then the PDCS (as computed by *Risknmr2*)or the observed number of DCS cases were outside of the computed 95% confidence limits assuming the binomial distribution as given in columns BLCL, BUCL, LCLX, and UCLX.

Table H-1

Results of NEDU and NMRI Manned Validation Dives
(sorted by type)

Obs	Facility	Report	Type	Pro #	Profile Decripion fsw/min, shallow/surface intervals in ()	Comp	Param	Dives	DCS	PDCS	Plow	Phigh	BLCL	BUCL	out?	LCLX	UCLX	out?
1	NMRI	1-93	I	A1b	60/ND (0/140) 60/ND (0/140) 60/ND	PROB	C3	29	0	5.4	4.0	6.9	0.0	11.9		0	4	
2	NMRI	1-93	I	C1a	100/60 (0/90) 100/60	PROB	C4	11	3	11.3	9.4	13.1	6.0	61.0		0	4	
3	NMRI	1-93	I	C1a(i)	100/60 (0/90) 40/7	PROB	C4	1	0	4.1	3.2	5.0	0.0	97.5		0	1	
4	NMRI	1-93	I	D1a	150/40 (0/90) 150/30	PROB	C4	11	1	11.7	9.8	13.5	0.2	41.3		0	4	
5	NMRI	1-93	I	D1b	100/ND (0/200) 100/ND (0/140) 100/ND	PROB	C3	36	3	7.1	5.1	9.0	1.8	22.5		0	6	
6	NMRI	1-93	I	G1a	60/60 (0/140) 60/30 (0/140) 60/ND	PROB	C3	26	1	5.4	4.0	6.8	0.1	18.4		0	4	
7	NMRI	1-93	I	H1a	100/25 (0/200) 100/15 (0/140) 100/ND	PROB	C3	20	0	6.4	4.5	8.2	0.0	16.8		0	4	
8	NEDU	8-85	I	27	80/ND (0/60) 80/ND	DMDB8	VVAL58	20	0	4.5	3.3	5.7	0.0	16.8		0	3	
9	NEDU	8-85	I	28	80/ND (0/95) 80/ND	DMDB8	VVAL58	20	2	5.2	3.9	6.5	1.2	31.7		0	3	
10	NEDU	8-85	I	29	80/ND (0/180) 80/ND	DMDB8	VVAL58	9	0	5.6	4.2	7.0	0.0	33.6		0	2	
11	NEDU	8-85	I	29	80/ND (0/180) 80/ND	DMDB8	VVAL56	20	1	5.8	4.4	7.2	0.1	24.9		0	4	
12	NEDU	8-85	I	30	100/ND (0/60) 100/ND	DMDB8	VVAL54	10	3	4.8	3.5	6.2	6.7	65.2	yes	0	2	yes
13	NEDU	8-85	I	30	100/ND (0/60) 100/ND	DMDB8	VVAL55	16	0	5.0	3.6	6.3	0.0	20.6		0	3	
14	NEDU	8-85	I	30	100/ND (0/60) 100/ND	DMDB8	VVAL52	10	2	5.4	4.0	6.8	2.5	55.6		0	2	
15	NEDU	8-85	I	31	100/ND (0/60) 100/ND (0/60) 100/ND	DMDB8	VVAL58	19	2	7.5	5.6	9.3	1.3	33.2		0	4	
16	NEDU	8-85	I	32	120/ND (0/60) 120/ND	DMDB8	VVAL59	20	0	4.9	3.4	6.3	0.0	16.8		0	3	
17	NEDU	8-85	I	33	150/ND (0/95) 150/ND	DMDB8	VVAL59	10	0	5.0	3.4	6.6	0.0	30.9		0	2	
18	NEDU	8-85	I	34	100/60 (0/90)100/40	DMDB8	VVAL52	9	1	9.5	7.8	11.2	0.3	48.3		0	3	
19	NEDU	8-85	I	35	100/60 (0/90)100/50	DMDB8	VVAL28	9	3	10.8	8.8	12.8	7.5	70.1		0	3	
20	NEDU	8-85	I	36	150/40 (0/90) 150/30	DMDB8	VVAL28	7	0	13.0	10.8	15.2	0.0	41.0		0	3	
21	NEDU	8-85	I	36	150/40 (0/90) 150/30	DMDB8	VVAL50	9	2	13.1	10.9	15.3	2.8	60.0		0	3	
22	NMRI	1-93	II	D1b(i)	100/ND	PROB	C3	4	0	2.6	1.9	3.4	0.0	60.2		0	1	
23	NMRI	1-93	II	E1a	100/60'	PROB	C4	27	3	4.4	3.5	5.4	2.4	29.2		0	4	
24	NMRI	1-93	II	F1a	150/30,LS@20'	PROB	C3	20	0	2.9	1.7	4.1	0.0	16.8		0	2	
25	NMRI	1-93	II	I1a	150/30,	PROB	C3	20	1	3.4	2.4	4.5	0.1	24.9		0	3	
26	NEDU	8-85	II	1	50/240'	DMDB8	VVAL28	20	0	5.9	4.6	7.1	0.0	16.8		0	4	
27	NEDU	8-85	II	2	60/ND'	DMDB8	VVAL26	29	0	2.4	1.6	3.2	0.0	11.9		0	3	
28	NEDU	8-85	II	3	60/100'	STD AIR	60/100	9	0	3.8	2.8	4.7	0.0	33.6		0	2	
29	NEDU	8-85	II	4	60/120'	DMDB8	VVAL28	18	0	4.5	3.4	5.6	0.0	18.5		0	3	
30	NEDU	8-85	II	5	60/180'	DMDB8	VVAL22	20	1	6.3	4.9	7.7	0.1	24.9		0	4	
31	NEDU	8-85	II	5	60/180'	DMDB8	VVAL25	10	4	7.0	5.5	8.6	12.2	73.8	yes	0	3	yes
32	NEDU	8-85	II	5	60/180'	STDAIR	60/200	10	3	7.8	6.1	9.5	6.7	65.2		0	3	
33	NEDU	8-85	II	6	80/120'	DMDB8	VVAL54	18	1	6.4	4.9	7.8	0.1	27.3		0	3	
34	NEDU	8-85	II	7	100/ND'	DMDB8	VVAL25	20	0	2.6	1.9	3.4	0.0	16.8		0	2	
35	NEDU	8-85	II	8	100/60'	DMDB8	VVAL22	30	0	4.8	3.8	5.8	0.0	11.6		0	4	
36	NEDU	8-85	II	8.1	100/60'	STD AIR	100/60	9	0	5.7	4.4	6.9	0.0	33.6		0	2	
37	NEDU	8-85	II	8.2	100/60'	STD AIR	100/70	29	0	5.4	4.2	6.6	0.0	11.9		0	4	
38	NEDU	8-85	II	9	100/90'	DMDB8	VVAL28	20	0	7.4	5.9	9.0	0.0	16.8		0	4	
39	NEDU	8-85	II	10	120/ND'	DMDB8	VVAL26	19	0	2.8	1.9	3.6	0.0	17.7		0	2	
40	NEDU	8-85	II	11	120/60'	DMDB8	VVAL28	29	1	6.9	5.7	8.2	0.1	17.6		0	5	
41	NEDU	8-85	II	11	120/60'	STD AIR	120/70	20	1	7.9	6.3	9.4	0.1	24.9		0	4	
42	NEDU	8-85	II	12	120/70'	DMDB8	VVAL28	10	2	7.8	6.4	9.2	2.5	55.6		0	3	
43	NEDU	8-85	II	13	120/80'	DMDB8	VVAL28	10	2	8.5	6.9	10.2	2.5	55.6		0	3	
44	NEDU	8-85	II	14	150/ND'	DMDB8	VVAL25	20	0	2.4	1.5	3.1	0.0	16.8		0	2	
45	NEDU	8-85	II	15	150/40'	DMDB8	VVAL28	27	1	6.4	4.9	7.8	0.1	19.0		0	5	
46	NEDU	8-85	II	15	150/40'	DMDB8	VVAL26	29	2	6.5	5.0	8.0	0.8	22.8		0	5	
47	NEDU	8-85	II	16	150/60'	DMDB8	VVAL22	20	5	8.8	7.5	10.2	8.7	49.1		0	5	
48	NEDU	8-85	II	17	190/ND'	DMDB8	VVAL26	19	0	2.3	1.4	3.1	0.0	17.7		0	2	
49	NEDU	8-85	II	18	190/30'	DMDB8	VVAL28	19	0	6.3	4.6	8.0	0.0	17.7		0	4	
50	NEDU	8-85	II	19	190/40'	DMDB8	VVAL28	10	2	8.5	6.9	10.1	2.5	55.6		0	3	
51	NEDU	8-85	II	29(i)	80/ND	DMDB8	VVAL58	1	0	3.2	2.3	4.1	0.0	97.5		0	1	
52	NEDU	8-85	II	35(i)	100/60	DMDB8	VVAL28	1	0	5.4	4.2	6.5	0.0	97.5		0	1	
53	NEDU	8-85	II	36(i)	150/40	DMDB8	VVAL28	1	0	6.4	4.9	7.8	0.0	97.5		0	1	
54	NMRI	1-93	III	A3	50/45 (15/360) 50/45	PROB	B(2.5-5.0)	29	0	3.2	2.2	4.2	0.0	11.9		0	3	
55	NMRI	1-93	III	B1b	80/60 (30/120) 80/60	MANUAL	CSMD	38	4	9.7	8.1	11.3	3.0	24.8		1	8	
56	NMRI	1-93	III	Ca1b	60/60 (30/120) 60/60	MANUAL	CSMD	49	2	6.6	5.4	7.8	0.5	14.0		0	7	
57	NMRI	1-93	III	Cb1b	60/60 (30/180) 60/60	MANUAL	CSMD	30	3	7.6	6.3	8.9	2.1	26.5		0	5	
58	NMRI	1-93	III	Cc1b	60/60 (15/180) 60/60	MANUAL	CSMD	41	1	5.0	4.0	6.0	0.1	12.9		0	5	
59	NMRI	1-93	III	Cc1b(i)	60/60 (15/125) 7/10	MANUAL	CSMD	1	0	0.7	0.4	1.0	0.0	97.5		0	0	
60	NMRI	1-93	III	E1b	80/60 (30/120) 80/60 LS@20	PROB	C5	47	3	9.1	7.2	11.0	1.3	17.5		1	8	
61	NMRI	1-93	III	E1b(i)	80/60 (30/46) 10/17	PROB	C5	1	0	2.2	1.6	2.7	0.0	97.5		0	0	
62	NMRI	1-93	IV	B2	80/60 (30/120) 80/60	PROB	B(2.5-5.0)	19	3	4.8	3.5	6.1	3.4	39.6		0	3	
63	NMRI	1-93	IV	C2	80/60 (15/220) 80/60	PROB	B(2.5-5.0)	40	1	5.1	3.8	6.3	0.1	13.2		0	5	
64	NMRI	1-93	IV	D2	60/90 (15/345) 60/90	PROB	B(2.5-5.0)	49	2	5.0	3.8	6.3	0.5	14.0		0	6	
65	NMRI	1-93	IV	E2	80/60 (30/235) 80/60	PROB	B(2.5-5.0)	26	0	4.8	3.1	6.4	0.0	13.2		0	4	
66	NEDU	8-85	IV	37	80/60 (20/180) 80/50	DMDB8	VVAL59	20	2	5.5	4.4	6.6	1.2	31.7		0	3	
67	NEDU	8-85	IV	38	80/50 (20/120) 100/20 (20/60) 60/40	DMDB8	VVAL59	8	1	4.8	3.7	5.9	0.3	52.7		0	2	
68	NEDU	8-85	IV	38	80/60 (20/180) 80/51	DMDB8	VVAL58	10	1	4.9	3.7	6.0	0.3	44.5		0	2	
69	NEDU	8-85	IX	24	60/120	DMDB8	VVAL59	18	0	3.2	2.2	4.2	0.0	18.5		0	2	
70	NEDU	8-85	IX	25	100/90	DMDB8	VVAL52	19	0	3.3	2.3	4.3	0.0	17.7		0	2	
71	NEDU	8-85	IX	26	150/40	DMDB8	VVAL52	19	0	4.2	3.2	5.1	0.0	17.7		0	3	
72	NMRI	1-93	V	A2	80/60 (30/115) 80/60	PROB	B(2.5-7.0)	29	5	7.0	5.8	8.2	5.9	35.8		0	5	
73	NMRI	1-93	V	B3	80/30 (15/175) 60/60 (15/175) 80/30	PROB	B(2.5-5.0)	28	0	2.9	1.9	3.9	0.0	12.3		0	3	

Table H-1 (con't)

Results of NEDU and NMRI Manned Validation Dives
(sorted by type)

Obs	Facility	Report	Type	Pro #	Profile Decripion fsw/min, shallow/surface intervals in ()	Comp	Param	Dives	DCS	PDCS	Plow	Phigh	BLCL	BUCL	out?	LCLX	UCLX	out?
74	NMRI	1-93	V	C3	60/45 (15/180) 60/60 (15/170) 60/45	PROB	B(2.5-5.0)	30	0	2.9	1.9	3.9	0.0	11.6		0	3	
75	NMRI	1-93	V	D3	80/30 (15/240) 60/60 (15/235) 80/45	PROB	B(2.5-5.0)	25	0	4.0	3.0	5.0	0.0	13.7		0	3	
76	NMRI	1-93	V	D3(i)	80/30 (15/240) 40/7	PROB	B(2.5-5.0)	1	0	0.4	0.2	0.7	0.0	97.5		0	0	
77	NMRI	1-93	V	E3	60/45 (15/235) 60/60 (15/235) 60/45	PROB	B(2.5-5.0)	27	0	2.6	1.7	3.5	0.0	12.8		0	3	
78	NEDU	1-84	VI	21.2	40/ND	DMDB7	VVAL14	10	0	4.8	3.5	6.1	0.0	30.9		0	2	
79	NEDU	1-84	VI	27.2	120/ND	DMDB7	VVAL18	30	0	2.3	1.5	3.0	0.0	11.6		0	3	
80	NEDU	1-84	VI	23(i).1	80/ND	DMDB7	MVAL97	2	0	2.2	1.6	2.8	0.0	84.2		0	1	
81	NEDU	11-80.1	VI	2	175/60'	DMDB7	MVAL2	9	2	13.3	10.4	16.0	2.8	60.0		0	3	
82	NEDU	11-80.1	VI	2	175/60'	DMDB7	MVAL1	10	3	14.3	11.3	17.3	6.7	65.2		0	4	
83	NEDU	11-80.1	VI	6	150/60'	DMDB7	MVAL3	28	2	9.2	7.3	11.1	0.9	23.5		0	6	
84	NEDU	11-80.1	VI	6	150/60'	DMDB7	MVAL2	9	0	10.1	8.0	12.3	0.0	33.6		0	3	
85	NEDU	11-80.2	VI	6	150/60'	DMDB7	MVAL4	10	1	7.8	6.2	9.4	0.3	44.5		0	3	
86	NEDU	11-80.2	VI	6	150/60'	DMDB7	MVAL3	10	2	9.2	7.3	11.1	2.5	55.6		0	3	
87	NEDU	11-80.2	VI	6	150/60'	DMDB7	MVAL5	20	3	10.4	8.4	12.3	3.2	37.9		0	5	
88	NEDU	11-80.2	VI	7	150/45'	DMDB7	MVAL5	10	3	7.4	6.0	8.8	6.7	65.2		0	3	
89	NEDU	11-80.2	VI	8	100/60'	DMDB7	MVAL5	10	1	4.1	3.1	5.1	0.3	44.5		0	2	
90	NEDU	11-80.2	VI	9	150/30'	DMDB7	MVAL5	20	0	4.4	3.4	5.3	0.0	16.8		0	3	
91	NEDU	11-80.2	VI	A	100/45'	DMDB7	MVAL5	20	0	2.4	1.7	3.0	0.0	16.8		0	2	
92	NEDU	11-80.2	VI	C	75/120'	DMDB7	MVAL5	20	0	5.1	3.7	6.5	0.0	16.8		0	3	
93	NEDU	8-85	VI	20	100/60'	DMDB8	VVAL29	27	0	4.0	3.0	4.9	0.0	12.8		0	3	
94	NEDU	8-85	VI	21	150/30'	DMDB8	VVAL29	19	0	4.0	2.9	5.2	0.0	17.7		0	3	
95	NEDU	8-85	VI	22	150/40'	DMDB8	VVAL29	26	2	4.4	3.5	5.4	0.9	25.1		0	4	
96	NEDU	8-85	VI	23	150/60'	DMDB8	VVAL29	9	2	4.3	3.4	5.2	2.8	60.0		0	2	
97	NEDU	1-84	VII	20	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	MVAL92	9	0	6.1	4.8	7.5	0.0	33.6		0	2	
98	NEDU	1-84	VII	20	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	MVAL97	10	0	6.4	5.0	7.8	0.0	30.9		0	2	
99	NEDU	1-84	VII	20	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	MVAL83	10	1	7.0	5.5	8.4	0.3	44.5		0	3	
100	NEDU	1-84	VII	20.1	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	VVAL14	10	1	4.8	3.6	6.1	0.3	44.5		0	2	
101	NEDU	1-84	VII	21	40/ND (0/80) 100/ND	DMDB7	MVAL97	20	0	5.2	4.1	6.3	0.0	16.8		0	3	
102	NEDU	1-84	VII	22	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	MVAL92	10	0	10.5	8.2	12.8	0.0	30.9		0	3	
103	NEDU	1-84	VII	22	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	MVAL97	10	1	10.7	8.4	13.0	0.3	44.5		0	3	
104	NEDU	1-84	VII	22.1	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	VVAL09	9	0	6.0	4.1	7.9	0.0	33.6		0	2	
105	NEDU	1-84	VII	22.1	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	VVAL14	10	0	6.6	4.6	8.6	0.0	30.9		0	2	
106	NEDU	1-84	VII	23	80/ND (0/80) 80/ND (0/80) 80/ND (0/60) 80/ND	DMDB7	VVAL09	9	0	5.4	3.7	7.1	0.0	33.6		0	2	
107	NEDU	1-84	VII	23	80/ND (0/80) 80/ND (0/80) 80/ND (0/60) 80/ND	DMDB7	MVAL97	18	2	9.9	7.9	11.9	1.4	34.7		0	5	
108	NEDU	1-84	VII	23.1	80/ND (0/80) 80/ND (0/80) 80/ND (0/60) 80/ND	DMDB7	VVAL09	10	0	5.2	3.6	6.8	0.0	30.9		0	2	
109	NEDU	1-84	VII	24	150/27 (0/80) 150/24 (0/60) 100/ND	DMDB7	MVAL97	20	5	11.8	9.9	13.6	8.7	49.1		0	5	
110	NEDU	1-84	VII	24.2	150/30 (0/80) 150/30	DMDB7	VVAL18	10	1	7.0	5.7	8.3	0.3	44.5		0	3	
111	NEDU	1-84	VII	25.2	100/60 (0/80) 100/50	DMDB7	VVAL18	10	0	6.6	5.3	7.9	0.0	30.9		0	2	
112	NEDU	1-84	VII	27.1	120/ND (0/80) 120/ND (0/80) 120/ND (0/60) 120/ND	DMDB7	VVAL18	10	0	6.5	4.3	8.6	0.0	30.9		0	2	
113	NEDU	1-84	VII	30.1	50/ND (0/80) 80/ND	DMDB7	VVAL18	10	0	4.1	3.0	5.1	0.0	30.9		0	2	
114	NEDU	1-84	VII	22.1(i)	100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	VVAL09	1	0	4.8	3.2	6.3	0.0	97.5		0	1	
115	NEDU	1-84	VII	23(i).2	80/ND (0/80) 80/ND (0/80) 80/ND	DMDB7	VVAL09	1	0	4.5	3.1	5.9	0.0	97.5		0	1	
116	NEDU	11-80.1	VIII	1	175/30 (10/60) 175/32	DMDB7	MVAL3	25	0	12.4	10.2	14.5	0.0	13.7		0	7	
117	NEDU	11-80.1	VIII	1	175/30 (10/60) 175/30	DMDB7	MVAL2	19	1	14.2	11.6	16.7	0.1	26.0		0	6	
118	NEDU	11-80.1	VIII	1	175/30 (10/60) 175/30	DMDB7	MVAL1	8	2	15.0	12.3	17.7	3.2	65.1		0	3	
119	NEDU	11-80.1	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL3	29	1	9.9	8.2	11.6	0.1	17.8		0	6	
120	NEDU	11-80.1	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL2	8	0	11.8	9.7	13.4	0.0	36.9		0	3	
121	NEDU	11-80.1	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL3	27	1	10.8	8.6	12.8	0.1	19.0		0	6	
122	NEDU	11-80.1	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL2	10	0	11.6	9.2	13.9	0.0	30.9		0	3	
123	NEDU	11-80.1	VIII	5	75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30	DMDB7	MVAL3	18	0	6.8	5.3	8.2	0.0	18.5		0	4	
124	NEDU	11-80.1	VIII	5	75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30	DMDB7	MVAL2	7	0	7.3	5.8	8.8	0.0	41.0		0	2	
125	NEDU	11-80.2	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL3	10	0	9.9	8.2	11.6	0.0	30.9		0	3	
126	NEDU	11-80.2	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL5	28	0	12.6	10.4	14.7	0.0	12.3	yes	1	7	yes
127	NEDU	11-80.2	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL3	10	1	10.8	8.6	12.8	0.3	44.5		0	3	
128	NEDU	11-80.2	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL5	40	0	11.8	9.7	13.8	0.0	8.8	yes	1	9	yes
129	NEDU	11-80.2	VIII	5	75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30	DMDB7	MVAL5	30	0	7.2	5.8	8.5	0.0	11.6		0	5	
130	NEDU	11-80.2	VIII	8	150/30 (10/90) 150/30	DMDB7	MVAL5	10	1	9.9	8.3	11.5	0.3	44.5		0	3	
							Total	2251	120									

Dive Type	
I	Repetitive Air
II	Single Air
III	Multi-level Air
IV	Multi level, O2 during decompression
IX	Single Air, O2 during decompression
V	O2 breathing during shallow interval
VI	Single 0.7 ata constant PO2
VII	Repet 0.7 ata constant PO2
VIII	Multi-level 0.7 ata constant PO2
(i)	dive terminated early, no DCS

Table H-2

Results of NEDU and NMRI Manned Validation Dives
(sorted by PDCS)

Obs	Facility	Report	Type	Pro #	Profile Decripion fswimin, shallow/surface intervals in ()	Comp	Param	Dives	DCS	PDCS	Plow	Phigh	BLCL	BUCL	out?	LCLX	UCLX	out?
1	NMRI	1-93	V	03(i)	80/30 (15/240) 40/7	PROB	B(2.5-5.0)	1	0	0.4	0.2	0.7	0.0	97.5		0	0	
2	NMRI	1-93	III	Cc1b(i)	60/60 (15/125) 7/10	MANUAL	CSMD	1	0	0.7	0.4	1.0	0.0	97.5		0	0	
3	NMRI	1-93	III	E1b(i)	80/60 (30/46) 10/17	PROB	C5	1	0	2.2	1.6	2.7	0.0	97.5		0	0	
4	NEDU	1-84	VI	23(i).1	80/ND	DMDB7	MVAL97	2	0	2.2	1.6	2.8	0.0	84.2		0	1	
5	NEDU	8-85	II	17	190/ND'	DMDB8	VVAL28	19	0	2.3	1.4	3.1	0.0	17.7		0	2	
6	NEDU	1-84	VI	27.2	120/ND	DMDB7	VVAL18	30	0	2.3	1.5	3.0	0.0	11.6		0	3	
7	NEDU	8-85	II	14	150/ND'	DMDB8	VVAL25	20	0	2.4	1.5	3.1	0.0	16.8		0	2	
8	NEDU	11-80.2	VI	A	100/45'	DMDB7	MVAL5	20	0	2.4	1.7	3.0	0.0	16.8		0	2	
9	NEDU	8-85	II	2	60/ND'	DMDB8	VVAL26	29	0	2.4	1.6	3.2	0.0	11.9		0	3	
10	NMRI	1-93	V	E3	60/45 (15/235) 60/60 (15/235) 60/45	PROB	B(2.5-5.0)	27	0	2.6	1.7	3.5	0.0	12.8		0	3	
11	NMRI	1-93	II	D1b(i)	100/ND	PROB	C3	4	0	2.6	1.9	3.4	0.0	60.2		0	1	
12	NEDU	8-85	II	7	100/ND'	DMDB8	VVAL25	20	0	2.6	1.9	3.4	0.0	16.8		0	2	
13	NEDU	8-85	II	10	120/ND'	DMDB8	VVAL28	19	0	2.8	1.9	3.6	0.0	17.7		0	2	
14	NMRI	1-93	II	F1a	150/30,LS@20'	PROB	C3	20	0	2.9	1.7	4.1	0.0	16.8		0	2	
15	NMRI	1-93	V	C3	60/45 (15/180) 60/60 (15/170) 60/45	PROB	B(2.5-5.0)	30	0	2.9	1.9	3.9	0.0	11.6		0	3	
16	NMRI	1-93	V	B3	80/30 (15/175) 60/60 (15/175) 80/30	PROB	B(2.5-5.0)	28	0	2.9	1.9	3.9	0.0	12.3		0	3	
17	NEDU	8-85	IX	24	60/120	DMDB8	VVAL59	18	0	3.2	2.2	4.2	0.0	18.5		0	2	
18	NEDU	8-85	II	29(i)	80/ND	DMDB8	VVAL58	1	0	3.2	2.3	4.1	0.0	97.5		0	1	
19	NMRI	1-93	III	A3	50/45 (15/360) 50/45	PROB	B(2.5-5.0)	29	0	3.2	2.2	4.2	0.0	11.9		0	3	
20	NEDU	8-85	IX	25	100/90	DMDB8	VVAL52	19	0	3.3	2.3	4.3	0.0	17.7		0	2	
21	NMRI	1-93	II	11a	150/30,	PROB	C3	20	1	3.4	2.4	4.5	0.1	24.9		0	3	
22	NEDU	8-85	II	3	60/100'	STD AIR	60/100	9	0	3.8	2.8	4.7	0.0	33.6		0	2	
23	NEDU	8-85	VI	20	100/60'	DMDB8	VVAL29	27	0	4.0	3.0	4.9	0.0	12.8		0	3	
24	NEDU	8-85	VI	21	150/30'	DMDB8	VVAL29	19	0	4.0	2.9	5.2	0.0	17.7		0	3	
25	NMRI	1-93	V	D3	80/30 (15/240) 60/60 (15/235) 80/45	PROB	B(2.5-5.0)	25	0	4.0	3.0	5.0	0.0	13.7		0	3	
26	NEDU	1-84	VII	30.1	50/ND (0/80) 80/ND	DMDB7	VVAL18	10	0	4.1	3.0	5.1	0.0	30.9		0	2	
27	NEDU	11-80.2	VI	B	100/60'	DMDB7	MVAL5	10	1	4.1	3.1	5.1	0.3	44.5		0	2	
28	NMRI	1-93	I	C1a(i)	100/60 (0/90) 40/7	PROB	C4	1	0	4.1	3.2	5.0	0.0	97.5		0	1	
29	NEDU	8-85	IX	26	150/40	DMDB8	VVAL52	19	0	4.2	3.2	5.1	0.0	17.7		0	3	
30	NEDU	8-85	VI	23	150/60'	DMDB8	VVAL29	9	2	4.3	3.4	5.2	2.8	60.0		0	2	
31	NEDU	11-80.2	VI	9	150/30'	DMDB7	MVAL5	20	0	4.4	3.4	5.3	0.0	16.8		0	3	
32	NMRI	1-93	II	E1a	100/60'	PROB	C4	27	3	4.4	3.5	5.4	2.4	29.2		0	4	
33	NEDU	8-85	VI	22	150/40'	DMDB8	VVAL29	26	2	4.4	3.5	5.4	0.9	25.1		0	4	
34	NEDU	8-85	II	4	60/120'	DMDB8	VVAL28	18	0	4.5	3.4	5.6	0.0	18.5		0	3	
35	NEDU	8-85	I	27	80/ND (0/60) 80/ND	DMDB8	VVAL58	20	0	4.5	3.3	5.7	0.0	16.8		0	3	
36	NEDU	1-84	VII	23(i).2	80/ND (0/80) 80/ND (0/80) 80/ND	DMDB7	VVAL09	1	0	4.5	3.1	5.9	0.0	97.5		0	1	
37	NMRI	1-93	IV	E2	80/60 (30/235) 80/60	PROB	B(2.5-5.0)	26	0	4.8	3.1	6.4	0.0	13.2		0	4	
38	NEDU	1-84	VI	21.2	40/ND	DMDB7	VVAL14	10	0	4.8	3.5	6.1	0.0	30.9		0	2	
39	NEDU	1-84	VII	22.1(i)	100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	VVAL09	1	0	4.8	3.2	6.3	0.0	97.5		0	1	
40	NEDU	8-85	IV	38	80/50 (20/120) 100/20 (20/60) 60/40	DMDB8	VVAL59	8	1	4.8	3.7	5.9	0.3	52.7		0	2	
41	NMRI	1-93	IV	B2	80/60 (30/120) 80/60	PROB	B(2.5-5.0)	19	3	4.8	3.5	6.1	3.4	39.6		0	3	
42	NEDU	1-84	VII	20.1	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	VVAL14	10	1	4.8	3.6	6.1	0.3	44.5		0	2	
43	NEDU	8-85	I	30	100/ND (0/60) 100/ND	DMDB8	VVAL54	10	3	4.8	3.5	6.2	6.7	65.2	yes	0	2	yes
44	NEDU	8-85	II	8	100/60'	DMDB8	VVAL22	30	0	4.8	3.8	5.8	0.0	11.6		0	4	
45	NEDU	8-85	I	32	120/ND (0/60) 120/ND	DMDB8	VVAL59	20	0	4.9	3.4	6.3	0.0	16.8		0	3	
46	NEDU	8-85	IV	38	80/60 (20/180) 80/51	DMDB8	VVAL58	10	1	4.9	3.7	6.0	0.3	44.5		0	2	
47	NEDU	8-85	I	30	100/ND (0/60) 100/ND	DMDB8	VVAL55	16	0	5.0	3.6	6.3	0.0	20.6		0	3	
48	NMRI	1-93	III	Cc1b	60/60 (15/180) 60/60	MANUAL	CSMD	41	1	5.0	4.0	6.0	0.1	12.9		0	5	
49	NEDU	8-85	I	33	150/ND (0/95) 150/ND	DMDB8	VVAL59	10	0	5.0	3.4	6.6	0.0	30.9		0	2	
50	NMRI	1-93	IV	D2	60/90 (15/345) 60/90	PROB	B(2.5-5.0)	49	2	5.0	3.8	6.3	0.5	14.0		0	6	
51	NMRI	1-93	IV	C2	80/60 (15/220) 80/60	PROB	B(2.5-5.0)	40	1	5.1	3.8	6.3	0.1	13.2		0	5	
52	NEDU	11-80.2	VI	C	75/120'	DMDB7	MVAL5	20	0	5.1	3.7	6.5	0.0	16.8		0	3	
53	NEDU	8-85	I	28	80/ND (0/95) 80/ND	DMDB8	VVAL56	20	2	5.2	3.9	6.5	1.2	31.7		0	3	
54	NEDU	1-84	VII	21	40/ND (0/80) 100/ND	DMDB7	MVAL97	20	0	5.2	4.1	6.3	0.0	16.8		0	3	
55	NEDU	1-84	VII	23.1	80/ND (0/80) 80/ND (0/80) 80/ND (0/60) 80/ND	DMDB7	VVAL09	10	0	5.2	3.6	6.8	0.0	30.9		0	2	
56	NEDU	8-85	I	30	100/ND (0/60) 100/ND	DMDB8	VVAL52	10	2	5.4	4.0	6.8	2.5	55.6		0	2	
57	NEDU	8-85	II	35(i)	100/60	DMDB8	VVAL28	1	0	5.4	4.2	6.5	0.0	97.5		0	1	
58	NMRI	1-93	I	G1a	60/60 (0/140) 60/30 (0/140) 60/ND	PROB	C3	28	1	5.4	4.0	6.8	0.1	18.4		0	4	
59	NEDU	8-85	II	8.2	100/60'	STD AIR	100/70	29	0	5.4	4.2	6.6	0.0	11.9		0	4	
60	NMRI	1-93	I	A1b	60/ND (0/140) 60/ND (0/140) 60/ND	PROB	C3	29	0	5.4	4.0	6.9	0.0	11.9		0	4	
61	NEDU	1-84	VII	23	80/ND (0/80) 80/ND (0/80) 80/ND (0/60) 80/ND	DMDB7	VVAL09	9	0	5.4	3.7	7.1	0.0	33.6		0	2	
62	NEDU	8-85	IV	37	80/60 (20/180) 80/50	DMDB8	VVAL59	20	2	5.5	4.4	6.6	1.2	31.7		0	3	
63	NEDU	8-85	I	29	80/ND (0/180) 80/ND	DMDB8	VVAL58	9	0	5.6	4.2	7.0	0.0	33.6		0	2	
64	NEDU	8-85	II	8.1	100/60'	STD AIR	100/60	9	0	5.7	4.4	6.9	0.0	33.6		0	2	
65	NEDU	8-85	I	29	80/ND (0/180) 80/ND	DMDB8	VVAL56	20	1	5.8	4.4	7.2	0.1	24.9		0	4	
66	NEDU	8-85	II	1	50/240'	DMDB8	VVAL28	20	0	5.9	4.6	7.1	0.0	16.8		0	4	
67	NEDU	1-84	VII	22.1	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	VVAL09	9	0	6.0	4.1	7.9	0.0	33.6		0	2	
68	NEDU	1-84	VII	20	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	MVAL92	9	0	6.1	4.8	7.5	0.0	33.6		0	2	
69	NEDU	8-85	II	5	60/180'	DMDB8	VVAL22	20	1	6.3	4.9	7.7	0.1	24.9		0	4	
70	NEDU	8-85	II	18	190/30'	DMDB8	VVAL28	19	0	6.3	4.6	8.0	0.0	17.7		0	4	
71	NEDU	8-85	II	6	80/120'	DMDB8	VVAL54	18	1	6.4	4.9	7.8	0.1	27.3		0	3	
72	NEDU	8-85	II	15	150/40'	DMDB8	VVAL28	27	1	6.4	4.9	7.8	0.1	19.0		0	5	
73	NEDU	8-85	II	36(i)	150/40	DMDB8	VVAL28	1	0	6.4	4.9	7.8	0.0	97.5		0	1	

Table H-2 (con't)

Results of NEDU and NMRI Manned Validation Dives
(sorted by PDCS)

Obs	Facility	Report	Type	Pro #	Profile Decription fsw/min, shallow/surface intervals in ()	Comp	Param	Dives	DCS	PDCS	Plow	Phigh	BLCL	BUCL	out?	LCLX	UCLX	out?
74	NMRI	1-93	I	H1a	100/25 (0/200) 100/15 (0/140) 100/ND	PROB	C3	20	0	6.4	4.5	8.2	0.0	16.8		0	4	
75	NEDU	1-84	VII	20	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	MVAL97	10	0	6.4	5.0	7.8	0.0	30.9		0	2	
76	NEDU	1-84	VII	27.1	120/ND (0/80) 120/ND (0/80) 120/ND (0/60) 120/ND	DMDB7	VVAL18	10	0	6.5	4.3	8.6	0.0	30.9		0	2	
77	NEDU	8-85	II	15	150/40'	DMDB8	VVAL26	29	2	6.5	5.0	8.0	0.8	22.6		0	5	
78	NMRI	1-93	III	Ca1b	60/60 (30/120) 60/60	MANUAL	CSMD	49	2	6.6	5.4	7.8	0.5	14.0		0	7	
79	NEDU	1-84	VII	22.1	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	VVAL14	10	0	6.6	4.6	8.6	0.0	30.9		0	2	
80	NEDU	1-84	VII	25.2	100/60 (0/80) 100/50	DMDB7	VVAL18	10	0	6.6	5.3	7.9	0.0	30.9		0	2	
81	NEDU	11-80.1	VIII	5	75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30	DMDB7	MVAL3	18	0	6.8	5.3	8.2	0.0	16.5		0	4	
82	NEDU	8-85	II	11	120/60'	DMDB8	VVAL28	29	1	6.9	5.7	8.2	0.1	17.8		0	5	
83	NEDU	1-84	VII	20	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	MVAL83	10	1	7.0	5.5	8.4	0.3	44.5		0	3	
84	NMRI	1-93	V	A2	80/60 (30/115) 80/60	PROB	B(2.5-7.0)	29	5	7.0	5.8	8.2	5.9	35.8		0	5	
85	NEDU	1-84	VII	24.2	150/30 (0/80) 150/30	DMDB7	VVAL18	10	1	7.0	5.7	8.3	0.3	44.5		0	3	
86	NEDU	8-85	II	5	60/180'	DMDB8	VVAL25	10	4	7.0	5.5	8.6	12.2	73.8	yes	0	3	yes
87	NMRI	1-93	I	D1b	100/ND (0/200) 100/ND (0/140) 100/ND	PROB	C3	36	3	7.1	5.1	9.0	1.8	22.5		0	6	
88	NEDU	11-80.2	VIII	5	75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30	DMDB7	MVAL5	30	0	7.2	5.8	8.5	0.0	11.6		0	5	
89	NEDU	11-80.1	VIII	5	75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30	DMDB7	MVAL2	7	0	7.3	5.6	8.8	0.0	41.0		0	2	
90	NEDU	8-85	II	9	100/90'	DMDB8	VVAL28	20	0	7.4	5.9	9.0	0.0	16.8		0	4	
91	NEDU	11-80.2	VI	7	150/45'	DMDB7	MVAL5	10	3	7.4	6.0	8.8	6.7	65.2		0	3	
92	NEDU	8-85	I	31	100/ND (0/60) 100/ND (0/60) 100/ND	DMDB8	VVAL56	19	2	7.5	5.6	9.3	1.3	33.2		0	4	
93	NMRI	1-93	III	Cb1b	60/60 (30/180) 60/60	MANUAL	CSMD	30	3	7.6	6.3	8.9	2.1	26.5		0	5	
94	NEDU	8-85	II	12	120/70'	DMDB8	VVAL26	10	2	7.8	6.4	9.2	2.5	55.6		0	3	
95	NEDU	11-80.2	VI	6	150/60'	DMDB7	MVAL4	10	1	7.8	6.2	9.4	0.3	44.5		0	3	
96	NEDU	8-85	II	5	60/180'	STDAIR	60/200	10	3	7.8	6.1	9.5	6.7	65.2		0	3	
97	NEDU	8-85	II	11	120/60'	STD AIR	120/70	20	1	7.9	6.3	9.4	0.1	24.9		0	4	
98	NEDU	8-85	II	19	190/40'	DMDB8	VVAL26	10	2	8.5	6.9	10.1	2.5	55.6		0	3	
99	NEDU	8-85	II	13	120/80'	DMDB8	VVAL28	10	2	8.5	6.9	10.2	2.5	55.6		0	3	
100	NEDU	8-85	II	16	150/60'	DMDB8	VVAL22	20	5	8.8	7.5	10.2	8.7	49.1		0	5	
101	NMRI	1-93	III	E1b	80/60 (30/120) 80/60 LS@20	PROB	C5	47	3	9.1	7.2	11.0	1.3	17.5		1	8	
102	NEDU	11-80.1	VI	6	150/60'	DMDB7	MVAL3	28	2	9.2	7.3	11.1	0.9	23.5		0	6	
103	NEDU	11-80.2	VI	6	150/60'	DMDB7	MVAL3	10	2	9.2	7.3	11.1	2.5	55.6		0	3	
104	NEDU	8-85	I	34	100/60 (0/90)100/40	DMDB8	VVAL52	9	1	9.5	7.6	11.2	0.3	46.3		0	3	
105	NMRI	1-93	III	B1b	80/60 (30/120) 80/60	MANUAL	CSMD	38	4	9.7	8.1	11.3	3.0	24.8		1	8	
106	NEDU	11-80.2	VIII	B	150/30 (10/90) 150/30	DMDB7	MVAL5	10	1	9.9	8.3	11.5	0.3	44.5		0	3	
107	NEDU	11-80.1	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL3	29	1	9.9	8.2	11.6	0.1	17.8		0	6	
108	NEDU	11-80.2	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL3	10	0	9.9	8.2	11.6	0.0	30.9		0	3	
109	NEDU	1-84	VII	23	80/ND (0/80) 80/ND (0/80) 80/ND (0/60) 80/ND	DMDB7	MVAL97	18	2	9.9	7.9	11.9	1.4	34.7		0	5	
110	NEDU	11-80.1	VI	6	150/60'	DMDB7	MVAL2	9	0	10.1	8.0	12.3	0.0	33.6		0	3	
111	NEDU	11-80.2	VI	6	150/60'	DMDB7	MVAL5	20	3	10.4	8.4	12.3	3.2	37.9		0	5	
112	NEDU	1-84	VII	22	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	MVAL92	10	0	10.5	8.2	12.8	0.0	30.9		0	3	
113	NEDU	1-84	VII	22	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	MVAL97	10	1	10.7	8.4	13.0	0.3	44.5		0	3	
114	NEDU	11-80.1	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL3	27	1	10.8	8.6	12.8	0.1	19.0		0	6	
115	NEDU	11-80.2	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL3	10	1	10.8	8.6	12.8	0.3	44.5		0	3	
116	NEDU	8-85	I	35	100/60 (0/90)100/50	DMDB8	VVAL28	9	3	10.8	8.8	12.8	7.5	70.1		0	3	
117	NMRI	1-93	I	C1a	100/60 (0/90) 100/60	PROB	C4	11	3	11.3	9.4	13.1	6.0	61.0		0	4	
118	NEDU	11-80.1	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL2	10	0	11.6	9.2	13.9	0.0	30.9		0	3	
119	NEDU	11-80.1	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL2	8	0	11.6	9.7	13.4	0.0	36.9		0	3	
120	NMRI	1-93	I	D1a	150/40 (0/90) 150/30	PROB	C4	11	1	11.7	9.8	13.5	0.2	41.3		0	4	
121	NEDU	1-84	VII	24	150/27 (0/80) 150/24 (0/60) 100/ND	DMDB7	MVAL97	20	5	11.8	9.9	13.6	8.7	49.1		0	5	
122	NEDU	11-80.2	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL5	40	0	11.8	9.7	13.8	0.0	8.8	yes	1	9	yes
123	NEDU	11-80.1	VIII	1	175/30 (10/60) 175/32	DMDB7	MVAL3	25	0	12.4	10.2	14.5	0.0	13.7		0	7	
124	NEDU	11-80.2	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL5	28	0	12.6	10.4	14.7	0.0	12.3	yes	1	7	yes
125	NEDU	8-85	I	36	150/40 (0/90) 150/30	DMDB8	VVAL28	7	0	13.0	10.8	15.2	0.0	41.0		0	3	
126	NEDU	8-85	I	36	150/40 (0/90) 150/30	DMDB8	VVAL50	9	2	13.1	10.9	15.3	2.8	60.0		0	3	
127	NEDU	11-80.1	VI	2	175/60'	DMDB7	MVAL2	9	2	13.3	10.4	16.0	2.8	60.0		0	3	
128	NEDU	11-80.1	VIII	1	175/30 (10/60) 175/30	DMDB7	MVAL2	19	1	14.2	11.6	16.7	0.1	26.0		0	6	
129	NEDU	11-80.1	VI	2	175/60'	DMDB7	MVAL1	10	3	14.3	11.3	17.3	6.7	65.2		0	4	
130	NEDU	11-80.1	VIII	1	175/30 (10/60) 175/30	DMDB7	MVAL1	8	2	15.0	12.3	17.7	3.2	65.1		0	3	

Dive Type		Total	2251	120
I	Repetitive Air			
II	Single Air			
III	Multi-level Air			
IV	Multi level, O2 during decompression			
IX	Single Air, O2 during decompression			
V	O2 breathing during shallow interval			
VI	Single 0.7 ata constant PO2			
VII	Repet 0.7 ata constant PO2			
VIII	Multi-level 0.7 ata constant PO2			
(i)	dive terminated early, no DCS			

Table H-3

DCS Cases and Severity for NEDU and NMRI Manned Validation Dives
(sorted by PDCS)

Obs	Facility	Report	Type	Pro #	Profile fsw/min, shallow/surface intervals in ()	Comp	Param	Dives	DCS	PDCS	DCS I	DCSII(p)	DCSII(w)
1	NMRI	1-93	V	D3(i)	80/30 (15/240) 40/7	PROB	B(2.5-5.0)	1	0	0.4	0	0	0
2	NMRI	1-93	III	Cc1b(i)	60/60 (15/125) 7/10	MANUAL	CSMD	1	0	0.7	0	0	0
3	NMRI	1-93	III	E1b(i)	80/60 (30/46) 10/17	PROB	C5	1	0	2.2	0	0	0
4	NEDU	1-84	VI	23(i).1	80/ND	DMDB7	MVAL97	2	0	2.2	0	0	0
5	NEDU	8-85	II	17	190/ND'	DMDB8	VVAL28	19	0	2.3	0	0	0
6	NEDU	1-84	VI	27.2	120/ND	DMDB7	VVAL18	30	0	2.3	0	0	0
7	NEDU	8-85	II	14	150/ND'	DMDB8	VVAL25	20	0	2.4	0	0	0
8	NEDU	11-80.2	VI	A	100/45'	DMDB7	MVAL5	20	0	2.4	0	0	0
9	NEDU	8-85	II	2	60/ND'	DMDB8	VVAL26	29	0	2.4	0	0	0
10	NMRI	1-93	V	E3	60/45 (15/235) 60/60 (15/235) 60/45	PROB	B(2.5-5.0)	27	0	2.6	0	0	0
11	NMRI	1-93	II	D1b(i)	100/ND	PROB	C3	4	0	2.6	0	0	0
12	NEDU	8-85	II	7	100/ND'	DMDB8	VVAL25	20	0	2.6	0	0	0
13	NEDU	8-85	II	10	120/ND'	DMDB8	VVAL28	19	0	2.8	0	0	0
14	NMRI	1-93	II	F1a	150/30,LS@20'	PROB	C3	20	0	2.9	0	0	0
15	NMRI	1-93	V	C3	60/45 (15/180) 60/60 (15/170) 60/45	PROB	B(2.5-5.0)	30	0	2.9	0	0	0
16	NMRI	1-93	V	B3	80/30 (15/175) 60/60 (15/175) 80/30	PROB	B(2.5-5.0)	28	0	2.9	0	0	0
17	NEDU	8-85	IX	24	60/120	DMDB8	VVAL59	18	0	3.2	0	0	0
18	NEDU	8-85	II	29(r)	80/ND	DMDB8	VVAL58	1	0	3.2	0	0	0
19	NMRI	1-93	III	A3	50/45 (15/360) 50/45	PROB	B(2.5-5.0)	29	0	3.2	0	0	0
20	NEDU	8-85	IX	25	100/90	DMDB8	VVAL52	19	0	3.3	0	0	0
21	NMRI	1-93	II	I1a	150/30,	PROB	C3	20	1	3.4	0	1	0
22	NEDU	8-85	II	3	60/100'	STD AIR	60/100	9	0	3.8	0	0	0
23	NEDU	8-85	VI	20	100/60'	DMDB8	VVAL29	27	0	4.0	0	0	0
24	NEDU	8-85	VI	21	150/30'	DMDB8	VVAL29	19	0	4.0	0	0	0
25	NMRI	1-93	V	D3	80/30 (15/240) 60/60 (15/235) 80/45	PROB	B(2.5-5.0)	25	0	4.0	0	0	0
26	NEDU	1-84	VII	30.1	50/ND (0/80) 80/ND	DMDB7	VVAL18	10	0	4.1	0	0	0
27	NEDU	11-80.2	VI	8	100/60'	DMDB7	MVAL5	10	1	4.1	0	1	0
28	NMRI	1-93	I	C1a(i)	100/60 (0/90) 40/7	PROB	C4	1	0	4.1	0	0	0
29	NEDU	8-85	IX	26	150/40	DMDB8	VVAL52	19	0	4.2	0	0	0
30	NEDU	8-85	VI	23	150/60'	DMDB8	VVAL29	9	2	4.3	2	0	0
31	NEDU	11-80.2	VI	9	150/30'	DMDB7	MVAL5	20	0	4.4	0	0	0
32	NMRI	1-93	II	E1a	100/60'	PROB	C4	27	3	4.4	1	2	0
33	NEDU	8-85	VI	22	150/40'	DMDB8	VVAL29	26	2	4.4	2	0	0
34	NEDU	8-85	II	4	60/120'	DMDB8	VVAL28	18	0	4.5	0	0	0
35	NEDU	8-85	I	27	80/ND (0/60) 80/ND	DMDB8	VVAL58	20	0	4.5	0	0	0
36	NEDU	1-84	VII	23(i).2	80/ND (0/80) 80/ND (0/80) 80/ND	DMDB7	VVAL09	1	0	4.5	0	0	0
37	NMRI	1-93	IV	E2	80/60 (30/235) 80/60	PROB	B(2.5-5.0)	26	0	4.8	0	0	0
38	NEDU	1-84	VI	21.2	40/ND	DMDB7	VVAL14	10	0	4.8	0	0	0
39	NEDU	1-84	VII	22.1(i)	100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	VVAL09	1	0	4.8	0	0	0
40	NEDU	8-85	IV	36	80/50 (20/120) 100/20 (20/60) 60/40	DMDB8	VVAL59	8	1	4.8	0	1	0
41	NMRI	1-93	IV	B2	80/60 (30/120) 80/60	PROB	B(2.5-5.0)	19	3	4.8	1	2	0
42	NEDU	1-84	VII	20.1	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	VVAL14	10	1	4.8	1	0	0
43	NEDU	8-85	I	30	100/ND (0/60) 100/ND	DMDB8	VVAL54	10	3	4.8	3	0	0
44	NEDU	8-85	II	8	100/60'	DMDB8	VVAL22	30	0	4.8	0	0	0
45	NEDU	8-85	I	32	120/ND (0/60) 120/ND	DMDB8	VVAL59	20	0	4.9	0	0	0
46	NEDU	8-85	IV	38	80/60 (20/180) 80/51	DMDB8	VVAL58	10	1	4.9	1	0	0
47	NEDU	8-85	I	30	100/ND (0/60) 100/ND	DMDB8	VVAL55	16	0	5.0	0	0	0
48	NMRI	1-93	III	Cc1b	60/60 (15/180) 60/60	MANUAL	CSMD	41	1	5.0	1	0	0
49	NEDU	8-85	I	33	150/ND (0/95) 150/ND	DMDB8	VVAL59	10	0	5.0	0	0	0
50	NMRI	1-93	IV	D2	60/90 (15/345) 60/90	PROB	B(2.5-5.0)	49	2	5.0	2	0	0
51	NMRI	1-93	IV	C2	80/60 (15/220) 80/60	PROB	B(2.5-5.0)	40	1	5.1	0	1	0
52	NEDU	11-80.2	VI	C	75/120'	DMDB7	MVAL5	20	0	5.1	0	0	0
53	NEDU	8-85	I	28	80/ND (0/95) 80/ND	DMDB8	VVAL58	20	2	5.2	2	0	0
54	NEDU	1-84	VII	21	40/ND (0/80) 100/ND	DMDB7	MVAL97	20	0	5.2	0	0	0
55	NEDU	1-84	VII	23.1	80/ND (0/80) 80/ND (0/80) 80/ND (0/60) 80/ND	DMDB7	VVAL09	10	0	5.2	0	0	0
56	NEDU	8-85	I	30	100/ND (0/60) 100/ND	DMDB8	VVAL52	10	2	5.4	2	0	0
57	NEDU	8-85	II	35(i)	100/60	DMDB8	VVAL28	1	0	5.4	0	0	0
58	NMRI	1-93	I	G1a	60/60 (0/140) 60/30 (0/140) 60/ND	PROB	C3	28	1	5.4	1	0	0
59	NEDU	8-85	II	8.2	100/60'	STD AIR	100/70	29	0	5.4	0	0	0
60	NMRI	1-93	I	A1b	60/ND (0/140) 60/ND (0/140) 60/ND	PROB	C3	29	0	5.4	0	0	0
61	NEDU	1-84	VII	23	80/ND (0/80) 80/ND (0/80) 80/ND (0/60) 80/ND	DMDB7	VVAL09	9	0	5.4	0	0	0
62	NEDU	8-85	IV	37	80/60 (20/180) 80/50	DMDB8	VVAL59	20	2	5.5	1	1	0
63	NEDU	8-85	I	29	80/ND (0/180) 80/ND	DMDB8	VVAL58	9	0	5.6	0	0	0
64	NEDU	8-85	II	8.1	100/60'	STD AIR	100/60	9	0	5.7	0	0	0
65	NEDU	8-85	I	29	80/ND (0/180) 80/ND	DMDB8	VVAL56	20	1	5.8	1	0	0
66	NEDU	8-85	II	1	50/240'	DMDB8	VVAL28	20	0	5.9	0	0	0
67	NEDU	1-84	VII	22.1	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	VVAL09	9	0	6.0	0	0	0
68	NEDU	1-84	VII	20	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	MVAL92	9	0	6.1	0	0	0
69	NEDU	8-85	II	5	60/180'	DMDB8	VVAL22	20	1	6.3	1	0	0
70	NEDU	8-85	II	18	190/30'	DMDB8	VVAL28	19	0	6.3	0	0	0
71	NEDU	8-85	II	6	80/120'	DMDB8	VVAL54	18	1	6.4	1	0	0
72	NEDU	8-85	II	15	150/40'	DMDB8	VVAL28	27	1	6.4	1	0	0
73	NEDU	8-85	II	36(i)	150/40	DMDB8	VVAL28	1	0	6.4	0	0	0

Table H-3 (con't)

DCS Cases and Severity for NEDU and NMRI Manned Validation Dives
(sorted by PDCS

Obs	Facility	Report	Type	Pro #	Profile	Comp	Param	Dives	DCS	PDCS	DCS I	DCSII(p)	DCSII(w)
74	NMRI	1-93	I	H1a	100/25 (0/200) 100/15 (0/140) 100/ND	PROB	C3	20	0	6.4	0	0	0
75	NEDU	1-84	VII	20	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	MVAL97	10	0	6.4	0	0	0
76	NEDU	1-84	VII	27.1	120/ND (0/80) 120/ND (0/80) 120/ND (0/60) 120/ND	DMDB7	VVAL18	10	0	6.5	0	0	0
77	NEDU	8-85	II	15	150/40'	DMDB8	VVAL26	29	2	6.5	2	0	0
78	NMRI	1-93	III	Ca1b	60/60 (30/120) 60/60	MANUAL	CSMD	49	2	6.6	1	0	1
79	NEDU	1-84	VII	22.1	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	VVAL14	10	0	6.6	0	0	0
80	NEDU	1-84	VII	25.2	100/60 (0/80) 100/50	DMDB7	VVAL18	10	0	6.6	0	0	0
81	NEDU	11-80.1	VIII	5	75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30	DMDB7	MVAL3	18	0	6.8	0	0	0
82	NEDU	8-85	II	11	120/60'	DMDB8	VVAL26	29	1	6.9	1	0	0
83	NEDU	1-84	VII	20	60/ND (0/80) 60/ND (0/80) 60/ND	DMDB7	MVAL83	10	1	7.0	1	0	0
84	NMRI	1-93	V	A2	80/60 (30/115) 80/60	PROB	B(2.5-7.0)	29	5	7.0	3	2	0
85	NEDU	1-84	VII	24.2	150/30 (0/80) 150/30	DMDB7	VVAL18	10	1	7.0	1	0	0
86	NEDU	8-85	II	5	60/180'	DMDB8	VVAL25	10	4	7.0	3	0	1
87	NMRI	1-93	I	D1b	100/ND (0/200) 100/ND (0/140) 100/ND	PROB	C3	36	3	7.1	3	0	0
88	NEDU	11-80.2	VIII	5	75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30	DMDB7	MVAL5	30	0	7.2	0	0	0
89	NEDU	11-80.1	VIII	5	75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30 (10/15) 75/30	DMDB7	MVAL2	7	0	7.3	0	0	0
90	NEDU	8-85	II	9	100/90'	DMDB8	VVAL26	20	0	7.4	0	0	0
91	NEDU	11-80.2	VI	7	150/45'	DMDB7	MVAL5	10	3	7.4	3	0	0
92	NEDU	8-85	I	31	100/ND (0/60) 100/ND (0/60) 100/ND	DMDB8	VVAL58	19	2	7.5	2	0	0
93	NMRI	1-93	III	Cb1b	60/60 (30/180) 60/60	MANUAL	CSMD	30	3	7.6	3	0	0
94	NEDU	8-85	II	12	120/70'	DMDB8	VVAL28	10	2	7.8	1	1	0
95	NEDU	11-80.2	VI	6	150/60'	DMDB7	MVAL4	10	1	7.8	1	0	0
96	NEDU	8-85	II	5	60/180'	STDAIR	60/200	10	3	7.8	3	0	0
97	NEDU	8-85	II	11	120/60'	STD AIR	120/70	20	1	7.9	1	0	0
98	NEDU	8-85	II	19	190/40'	DMDB8	VVAL28	10	2	8.5	2	0	0
99	NEDU	8-85	II	13	120/80'	DMDB8	VVAL28	10	2	8.5	1	0	1
100	NEDU	8-85	II	16	150/60'	DMDB8	VVAL22	20	5	8.8	3	1	1
101	NMRI	1-93	III	E1b	80/60 (30/120) 80/60 LS@20	PROB	C5	47	3	9.1	3	0	0
102	NEDU	11-80.1	VI	6	150/60'	DMDB7	MVAL3	28	2	9.2	2	0	0
103	NEDU	11-80.2	VI	6	150/60'	DMDB7	MVAL3	10	2	9.2	2	0	0
104	NEDU	8-85	I	34	100/60 (0/90)100/40	DMDB8	VVAL52	9	1	9.5	1	0	0
105	NMRI	1-93	III	B1b	80/60 (30/120) 80/60	MANUAL	CSMD	38	4	9.7	1	0	3
106	NEDU	11-80.2	VIII	B	150/30 (10/90) 150/30	DMDB7	MVAL5	10	1	9.9	0	0	1
107	NEDU	11-80.1	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL3	29	1	9.9	1	0	0
108	NEDU	11-80.2	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL3	10	0	9.9	0	0	0
109	NEDU	1-84	VII	23	80/ND (0/80) 80/ND (0/80) 80/ND (0/60) 80/ND	DMDB7	MVAL97	18	2	9.9	2	0	0
110	NEDU	11-80.1	VI	6	150/60'	DMDB7	MVAL2	9	0	10.1	0	0	0
111	NEDU	11-80.2	VI	6	150/60'	DMDB7	MVAL5	20	3	10.4	2	0	1
112	NEDU	1-84	VII	22	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	MVAL92	10	0	10.5	0	0	0
113	NEDU	1-84	VII	22	100/ND (0/80) 100/ND (0/80) 100/ND (0/80) 100/ND	DMDB7	MVAL97	10	1	10.7	1	0	0
114	NEDU	11-80.1	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL3	27	1	10.8	1	0	0
115	NEDU	11-80.2	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL3	10	1	10.8	1	0	0
116	NEDU	8-85	I	35	100/60 (0/90)100/50	DMDB8	VVAL28	9	3	10.8	2	1	0
117	NMRI	1-93	I	C1a	100/60 (0/90) 100/60	PROB	C4	11	3	11.3	1	1	1
118	NEDU	11-80.1	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL2	10	0	11.6	0	0	0
119	NEDU	11-80.1	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL2	8	0	11.6	0	0	0
120	NMRI	1-93	I	D1a	150/40 (0/90) 150/30	PROB	C4	11	1	11.7	1	0	0
121	NEDU	1-84	VII	24	150/27 (0/80) 150/24 (0/60) 100/ND	DMDB7	MVAL97	20	5	11.8	5	0	0
122	NEDU	11-80.2	VIII	4	125/30 (10/30) 125/30 (10/30) 125/30	DMDB7	MVAL5	40	0	11.8	0	0	0
123	NEDU	11-80.1	VIII	1	175/30 (10/60) 175/32	DMDB7	MVAL3	25	0	12.4	0	0	0
124	NEDU	11-80.2	VIII	3	150/30 (30/120) 150/30	DMDB7	MVAL5	28	0	12.6	0	0	0
125	NEDU	8-85	I	36	150/40 (0/90) 150/30	DMDB8	VVAL28	7	0	13.0	0	0	0
126	NEDU	8-85	I	36	150/40 (0/90) 150/30	DMDB8	VVAL50	9	2	13.1	2	0	0
127	NEDU	11-80.1	VI	2	175/60'	DMDB7	MVAL2	9	2	13.3	1	0	1
128	NEDU	11-80.1	VIII	1	175/30 (10/60) 175/30	DMDB7	MVAL2	19	1	14.2	0	0	1
129	NEDU	11-80.1	VI	2	175/60'	DMDB7	MVAL1	10	3	14.3	2	0	1
130	NEDU	11-80.1	VIII	1	175/30 (10/60) 175/30	DMDB7	MVAL1	8	2	15.0	2	0	0
							Totals	2251	120		92	15	13

Dive Type	
I	Repetitive Air
II	Single Air
III	Multi-level Air
IV	Multi-level, O2 during decompression
V	Single Air, O2 during Decompression
VI	O2 breathing diring shallow interval
VII	Singel 0.7 ata constant PO2
VIII	Repet 0.7 ata constant PO2
IX	Single Air, O2 during decompression
(i)	dive terminated early, no DCS

DCS Type	
DCS I	Joint Pain Only
DCS II(p)	Peiperal Paresthesias with or without joint pain
DCS II(w)	Cardiovascular, Cerbral, Muscle Weakness

Appendix I

Risks for Computed Multi-level, Repetitive and Gas Switch Dives

Table I-1

Air Multi-level and Repetitive Dive Decompression Schedule
Overall Risk

			USN'55 repet and CSMD				VVAL18			VVAL18-1			*Plan V4*		
Facility	Report	Type	Pro #	P(DCS)	LOW	HIGH	P(DCS)	LOW	HIGH	P(DCS)	LOW	HIGH	P(DCS)	LOW	HIGH
NEDU	Aug-85	(I)	33	2.91	1.88	3.93	4.20	2.76	5.62	3.68	2.31	5.02	3.82	2.48	5.13
NEDU	Aug-85	(I)	32	3.10	2.09	4.09	3.97	2.67	5.24	3.71	2.45	4.96	3.54	2.35	4.71
NEDU	Aug-85	(I)	30	3.11	2.18	4.04	3.78	2.59	4.97	3.76	2.57	4.93	3.45	2.34	4.55
NMRI	Jan-93	(III)	A3	3.25	2.26	4.23	3.79	2.75	4.81	3.79	2.75	4.81	3.18	2.17	4.18
NEDU	Aug-85	(I)	27	3.60	2.50	4.69	3.55	2.45	4.64	3.64	2.51	4.75	3.38	2.33	4.41
NEDU	Aug-85	(I)	28	3.86	2.69	5.01	3.80	2.64	4.95	3.90	2.71	5.08	3.63	2.52	4.72
NEDU	Aug-85	(I)	31	4.01	2.77	5.24	5.01	3.34	6.66	5.08	3.40	6.72	4.63	3.07	6.17
NEDU	Aug-85	(I)	29	4.35	3.08	5.61	4.27	2.98	5.54	4.39	3.10	5.67	4.09	2.86	5.30
NMRI	Jan-93	(I)	D1b	5.00	3.46	6.52	6.35	4.39	8.27	6.33	4.40	8.23	5.77	3.94	7.57
NMRI	Jan-93	(III)	Cc1b	5.06	4.02	6.09	5.02	3.98	6.04	5.44	4.35	6.51	4.93	3.87	5.98
NMRI	Jan-93	(I)	H1a	5.43	3.77	7.05	5.93	4.03	7.78	6.02	4.12	7.88	5.62	3.80	7.41
NMRI	Jan-93	(I)	G1a	5.55	4.19	6.89	5.61	4.15	7.04	5.79	4.32	7.24	5.28	3.87	6.66
NMRI	Jan-93	(I)	A1b	5.74	4.34	7.12	5.70	4.23	7.15	6.06	4.55	7.56	5.37	3.93	6.78
NMRI	Jan-93	(III)	Ca1b	6.59	5.38	7.79	4.89	3.88	5.88	5.65	4.54	6.75	5.17	4.12	6.20
NMRI	Jan-93	(III)	Cb1b	7.60	6.28	8.91	5.34	4.30	6.37	5.84	4.73	6.93	5.17	4.13	6.21
NMRI	Jan-93	(III)	B1b	9.78	8.15	11.39	6.04	4.91	7.16	6.02	4.92	7.10	5.33	4.26	6.39
NMRI	Jan-93	(III)	E1b	9.78	8.15	11.39	6.04	4.91	7.16	6.02	4.92	7.10	5.26	4.22	6.30
NEDU	Aug-85	(I)	34	11.64	9.50	13.72	8.51	7.20	9.80	8.90	7.54	10.24	7.45	6.25	8.63
NEDU	Aug-85	(I)	35	12.90	10.45	15.28	9.01	7.67	10.33	8.84	7.52	10.13	7.58	6.39	8.75
NEDU	Aug-85	(I)	36	13.73	11.57	15.84	10.16	8.42	11.86	8.83	7.19	10.44	8.18	6.82	9.52
NMRI	Jan-93	(I)	D1a	13.73	11.57	15.84	10.16	8.42	11.86	8.83	7.19	10.44	8.40	7.00	9.78
NMRI	Jan-93	(I)	C1a	14.09	11.31	16.78	9.35	7.96	10.72	8.56	7.29	9.81	7.82	6.53	9.09

Table I-2

Constant 0.7 ata PO2 in N2 Multi-level, Repetitive, and Gas Switch Dive Decompression Schedule Overall Risk																
				VVAL18			VVAL18-1			*Plan V4*			P07'80 repet tables			
Facility	Report	Type	Pro #	P(DCS)	LOW	HIGH	P(DCS)	LOW	HIGH	P(DCS)	LOW	HIGH	P(DCS)	LOW	HIGH	
NMRI	1-93	(V)	E3	2.65	1.76	3.53	2.65	1.76	3.53	2.37	1.53	3.20				
NEDU	8-85	(IX)	24	2.86	1.9	3.81	3.37	2.34	4.39	2.97	2	3.92				
NMRI	1-93	(V)	B3	3.12	2.08	4.16	3.12	2.08	4.16	2.80	1.82	3.77				
NEDU	8-85	(IX)	26	3.13	2.37	3.88	3.4	2.55	4.24	4.53	3.47	5.59				
NMRI	1-93	(V)	C3	3.14	2.15	4.13	3.14	2.15	4.13	2.69	1.74	3.63				
NMRI	1-93	(V)	D3	4.07	3.00	5.13	4.12	3.05	5.18	3.78	2.80	4.74				
NEDU	Jan-84	(VII)	30	4.09	3.05	5.12	5.14	3.97	6.3	3.57	2.72	4.41	3.39	2.43	4.34	
NEDU	8-85	(IX)	25	4.2	3.06	5.32	4.77	3.54	5.98	4.85	3.37	6.3				
NEDU	Jan-84	(VII)	20	4.57	3.38	5.74	4.97	3.69	6.22	4.43	3.26	5.59	2.97	2.03	3.89	
NMRI	1-93	(IV)	B2	4.99	3.74	6.22	5.47	4.22	6.71	5.12	3.76	6.46				
NEDU	Nov-80	(VIII)	5	5.36	4.14	6.56	5.96	4.65	7.25	5.52	4.34	6.69				
NEDU	8-85	(IV)	37	5.44	4.37	6.49	5.58	4.50	6.65	5.25	4.12	6.37				
NEDU	Jan-84	(VII)	23	5.52	3.8	7.21	5.75	4.05	7.42	5.6	3.87	7.29	2.82	1.91	3.73	
NEDU	8-85	(IV)	38	5.57	4.35	6.76	6.04	4.76	7.31	4.45	3.33	5.54				
NMRI	1-93	(V)	A2	5.74	4.73	6.74	6.57	5.45	7.68	5.16	4.23	6.09				
NEDU	Nov-80	(VIII)	B	6.16	5.01	7.3	6.56	5.38	7.72	5.96	4.91	7				
NMRI	1-93	(IV)	C2	6.18	5.03	7.31	6.85	5.66	8.03	5.29	4.00	6.57				
NEDU	Nov-80	(VIII)	3	6.18	4.91	7.44	5.96	4.63	7.28	5.73	4.66	6.78				
NEDU	Jan-84	(VII)	22	6.24	4.25	8.19	6.28	4.26	8.26	6.06	4.1	7.98	3.12	1.99	4.24	
NMRI	1-93	(IV)	E2	6.39	4.66	8.09	5.53	3.78	7.24	5.15	3.35	6.91				
NEDU	Jan-84	(VII)	21	6.39	4.99	7.77	6.99	5.5	8.45	3.41	2.42	4.38	4.48	3.04	5.91	
NEDU	Jan-84	(VII)	27	6.45	4.29	8.56	6.41	4.2	8.57	6.15	4.03	8.23	3.05	1.85	4.23	
NEDU	Jan-84	(VII)	25.2	6.61	5.29	7.91	7.28	5.87	8.67	6.86	5.31	8.38	2.47	1.8	3.12	
NMRI	1-93	(IV)	D2	6.79	5.52	8.04	6.30	5.06	7.52	5.20	3.88	6.50				
NEDU	Jan-84	(VII)	24.2	7.02	5.66	8.35	7.24	5.89	8.56	6.69	5.4	7.97	4.99	3.19	6.75	
NEDU	Nov-80	(VIII)	1	7.22	5.82	8.59	6.44	4.97	7.89	6.13	4.96	7.29				
NEDU	Nov-80	(VIII)	4	7.48	6.22	8.72	7.43	6.2	8.63	6	4.73	7.26				
NEDU	Jan-84	(VII)	24	7.74	6.24	9.22	8.3	6.83	9.75	6.61	5.28	7.93	3.83	2.39	5.25	

APPENDIX J

Risk of Last Decompression for Multi-level, Repetitive, and Gas Switch Dives

Table J-1

Multi-level and Repetitive Air Dives, Risk of Last Decompression

VVAL18

facility	Report	type	pro#	T1	T2	TASC	P(DCS)	LOW	HIGH
NMRI	Jan-93	(III)	A3	405.58	9999	0.83	3.67	2.66	4.67
NMRI	Jan-93	(I)	G1a	372	9999	1	2.55	1.77	3.32
NMRI	Jan-93	(I)	A1b	374.45	9999	1	2.56	1.77	3.35
NEDU	Aug-85	(I)	27	101.52	9999	1.33	2.39	1.63	3.14
NEDU	Aug-85	(I)	28	136.52	9999	1.33	2.39	1.61	3.17
NEDU	Aug-85	(I)	29	221.52	9999	1.33	2.37	1.52	3.21
NEDU	Aug-85	(I)	30	91.39	9999	1.67	2.48	1.7	3.26
NEDU	Aug-85	(I)	31	158.86	9999	1.67	2.47	1.64	3.3
NMRI	Jan-93	(I)	H1a	383.33	9999	1.67	2.46	1.47	3.44
NMRI	Jan-93	(I)	D1b	388.91	9999	1.67	2.46	1.42	3.48
NEDU	Aug-85	(I)	32	85.34	9999	2	2.55	1.72	3.38
NEDU	Aug-85	(I)	33	77.08	9999	2.5	2.75	1.85	3.63
NMRI	Jan-93	(III)	Cc1b	240.75	9999	60	4.73	3.73	5.73
NMRI	Jan-93	(III)	Ca1b	180.5	9999	173.56	4.85	3.85	5.84
NMRI	Jan-93	(III)	Cb1b	240.5	9999	201.8	5.3	4.27	6.33
NEDU	Aug-85	(I)	34	307.89	9999	208.04	5.96	4.86	7.04
NEDU	Aug-85	(I)	35	307.89	9999	259.39	6.47	5.3	7.63
NEDU	Aug-85	(I)	36	331.12	9999	283.82	7.34	5.92	8.73
NMRI	Jan-93	(I)	D1a	331.12	9999	283.82	7.34	5.92	8.73
NMRI	Jan-93	(I)	C1a	307.89	9999	316.47	6.82	5.57	8.06
NMRI	Jan-93	(III)	B1b	180.83	9999	318.81	5.91	4.79	7.02
NMRI	Jan-93	(III)	E1b	180.83	9999	318.81	5.91	4.79	7.02

Table J-2

Multi-level and Repetitive Air Dives, Risk for last decompression
VVAL 18-1

facility	Report	type	pro#	T1	T2	TASC	P(DCS)	LOW	HIGH
NMRI	Jan-93	(III)	A3	405.58	9999	0.83	3.67	2.66	4.67
NMRI	Jan-93	(I)	A1b	379.83	9999	1	2.75	1.91	3.58
NMRI	Jan-93	(I)	G1a	372	9999	1	2.74	1.94	3.53
NEDU	Aug-85	(I)	27	101.57	9999	1.33	2.48	1.69	3.25
NEDU	Aug-85	(I)	28	136.57	9999	1.33	2.49	1.67	3.3
NEDU	Aug-85	(I)	29	221.57	9999	1.33	2.5	1.65	3.33
NEDU	Aug-85	(I)	30	88.53	9999	1.67	2.51	1.73	3.28
NEDU	Aug-85	(I)	31	158.46	9999	1.67	2.56	1.71	3.4
NMRI	Jan-93	(I)	D1b	388.78	9999	1.67	2.58	1.55	3.59
NMRI	Jan-93	(I)	H1a	383.33	9999	1.67	2.56	1.56	3.55
NEDU	Aug-85	(I)	32	80.3	9999	2	2.41	1.63	3.19
NEDU	Aug-85	(I)	33	75.27	9999	2.5	2.27	1.48	3.06
NMRI	Jan-93	(III)	Cc1b	240.75	9999	30.01	5.15	4.1	6.2
NMRI	Jan-93	(III)	Ca1b	180.5	9999	118.17	5.61	4.5	6.71
NMRI	Jan-93	(III)	Cb1b	240.5	9999	166.74	5.8	4.7	6.89
NEDU	Aug-85	(I)	34	299.85	9999	178.14	6.47	5.31	7.61
NEDU	Aug-85	(I)	35	299.85	9999	267.28	6.4	5.23	7.56
NMRI	Jan-93	(III)	B1b	180.83	9999	316.46	5.89	4.8	6.98
NMRI	Jan-93	(III)	E1b	180.83	9999	316.46	5.89	4.8	6.98
NMRI	Jan-93	(I)	C1a	299.85	9999	367.18	6.12	5.02	7.2
NEDU	Aug-85	(I)	36	311.43	9999	379.88	6.07	4.84	7.28
NMRI	Jan-93	(I)	D1a	311.43	9999	379.88	6.07	4.84	7.28

Table J-3

Multi-level and RepetitiveAir Dives Risk of Last Decompression

PLAN V4

Facility	Report	Pro #	Type	T1	T2	TASC	P(DCS)	LOW	HIGH
NMRI	Jan-93	A1B	(I)	373.5	9999	1	2.27	1.5	3.03
NMRI	Jan-93	G1A	(I)	372	9999	1	2.24	1.48	2.99
NEDU	Aug-85	27	(I)	100.33	9999	1.33	2.26	1.55	2.96
NEDU	Aug-85	29	(I)	220.33	9999	1.33	2.27	1.46	3.06
NEDU	Aug-85	28	(I)	135.33	9999	1.34	2.26	1.53	3
NEDU	Aug-85	30	(I)	89.5	9999	1.67	2.23	1.52	2.93
NEDU	Aug-85	31	(I)	158.17	9999	1.67	2.22	1.47	2.97
NMRI	Jan-93	D1B	(I)	385.5	9999	1.67	2.2	1.25	3.14
NMRI	Jan-93	H1A	(I)	383.33	9999	1.67	2.2	1.26	3.14
NEDU	Aug-85	32	(I)	83.67	9999	2	2.21	1.48	2.94
NEDU	Aug-85	33	(I)	113.67	9999	2.5	2.2	1.42	2.97
NMRI	Jan-93	A3	(III)	405.67	9999	30.83	3.06	2.07	4.05
NMRI	Jan-93	CC1B	(III)	240.83	9999	56	4.65	3.61	5.68
NMRI	Jan-93	CA1B	(III)	180.67	9999	131	5.03	3.98	6.07
NMRI	Jan-93	CB1B	(III)	240.67	9999	196	5.04	3.99	6.07
NEDU	Aug-85	34	(I)	201.67	9999	296.66	5.28	4.25	6.3
NEDU	Aug-85	35	(I)	201.67	9999	371.66	5.41	4.35	6.46
NMRI	Jan-93	B1B	(III)	206	9999	376.33	5.12	4.07	6.16
NMRI	Jan-93	E1B	(III)	180.83	9999	376.34	5.14	4.1	6.16
NEDU	Aug-85	36	(I)	257.5	9999	417.5	5.52	4.6	6.44
NMRI	Jan-93	D1A	(I)	282.5	9999	432.5	5.59	4.65	6.52
NMRI	Jan-93	C1A	(I)	206.67	9999	451.66	5.61	4.66	6.55

Table J-4

Mulit-level and Repetitive Constant 0.7 ata PO2 in N2 and Air/PO2 Gas Switch Dives
Risk of Last Decompression

VVAL18

Facility	Report	type	pro#	T1	T2	TASC	P(DCS)	LOW	HIGH
NEDU	Jan-84	(VII)	20	259.85	9999	1	2.46	1.69	3.22
NMRI	Jan-93	(V)	C3	456.5	9999	1	2.82	1.91	3.71
NMRI	Jan-93	(V)	E3	581.5	9999	1	2.32	1.55	3.09
NEDU	Jan-84	(VII)	23	285.03	9999	1.33	2.19	1.34	3.03
NEDU	Jan-84	(VII)	30	223.87	9999	1.33	2.73	1.91	3.54
NMRI	Jan-93	(V)	B3	446.83	9999	1.33	2.71	1.8	3.6
NEDU	Jan-84	(VII)	21	447.83	9999	1.67	4.4	3.35	5.45
NEDU	Jan-84	(VII)	22	286.83	9999	1.67	2.3	1.4	3.2
NEDU	Jan-84	(VII)	24	356.84	9999	1.67	4.33	3.34	5.31
NEDU	Jan-84	(VII)	27	257.99	9999	2	2.32	1.43	3.2
NEDU	Aug-85	(IV)	38	263.67	9999	18.58	5.06	3.91	6.2
NMRI	Jan-93	(V)	D3	566.83	9999	22.73	3.66	2.69	4.61
NEDU	Aug-85	(IX)	24	0	9999	39	2.86	1.9	3.81
NMRI	Jan-93	(IV)	D2	435.75	9999	53.02	6.33	5.04	7.6
NMRI	Jan-93	(IV)	C2	281.08	9999	62.31	5.5	4.35	6.63
NEDU	Nov-80	(VIII)	5	192.58	9999	65.59	4.3	3.17	5.41
NEDU	Aug-85	(IV)	37	241	9999	70.08	5.19	4.17	6.2
NEDU	Aug-85	(IX)	26	0	9999	79.5	3.13	2.37	3.88
NEDU	Nov-80	(VIII)	B	155.27	9999	84.36	5.5	4.42	6.57
NMRI	Jan-93	(IV)	B2	175.83	9999	103.34	4.86	3.62	6.09
NEDU	Aug-85	(IX)	25	0	9999	107.67	4.2	3.06	5.32
NEDU	Jan-84	(VII)	25.2	208.52	9999	109.26	4.94	3.81	6.06
NEDU	Nov-80	(VIII)	4	186.47	9999	109.58	6.27	5.06	7.47
NMRI	Jan-93	(IV)	E2	295.83	9999	114.44	6.27	4.56	7.95
NEDU	Nov-80	(VIII)	3	159.27	9999	135.7	5.84	4.61	7.06
NEDU	Jan-84	(VII)	24.2	185.73	9999	138.18	5.5	4.42	6.57
NEDU	Nov-80	(VIII)	1	154.92	9999	170.29	6.56	5.15	7.95
NMRI	Jan-93	(V)	A2	175.83	9999	238.96	5.64	4.63	6.64

Table J-5

Mulit-level and Repetitive Constant 0.7 ata PO2 in N2 and Air/PO2 Gas Switch Dives
Risk of Last Decompression

VVAL18-1

Facility	Report	type	pro#	T1	T2	TASC	P(DCS)	LOW	HIGH
NEDU	Jan-84	(VII)	20	266.46	9999	1	2.66	1.85	3.47
NEDU	Aug-85	(IV)	38	263.67	9999	1	5.54	4.34	6.73
NMRI	Jan-93	(V)	C3	456.5	9999	1	2.82	1.91	3.71
NMRI	Jan-93	(V)	E3	581.5	9999	1	2.32	1.55	3.09
NEDU	Jan-84	(VII)	23	287.31	9999	1.33	2.38	1.52	3.23
NEDU	Jan-84	(VII)	30	246.56	9999	1.33	3.51	2.58	4.43
NMRI	Jan-93	(V)	B3	446.83	9999	1.33	2.71	1.8	3.6
NEDU	Jan-84	(VII)	21	483.21	9999	1.67	4.83	3.71	5.95
NEDU	Jan-84	(VII)	22	286.86	9999	1.67	2.41	1.48	3.32
NEDU	Jan-84	(VII)	24	354.29	9999	1.67	4.85	3.81	5.89
NEDU	Jan-84	(VII)	27	257.05	9999	2	2.42	1.51	3.31
NMRI	Jan-93	(V)	D3	566.83	9999	17.95	3.71	2.74	4.67
NEDU	Aug-85	(IX)	24	0	9999	29	3.37	2.34	4.39
NMRI	Jan-93	(IV)	C2	281.08	9999	51.07	6.18	4.99	7.35
NEDU	Nov-80	(VIII)	5	189.38	9999	56.4	4.91	3.7	6.11
NEDU	Aug-85	(IV)	37	241	9999	60.12	5.33	4.29	6.36
NMRI	Jan-93	(IV)	D2	435.75	9999	61.88	5.84	4.58	7.08
NEDU	Aug-85	(IX)	26	0	9999	75.5	3.4	2.55	4.24
NEDU	Nov-80	(VIII)	B	160.84	9999	78.38	6.01	4.87	7.14
NMRI	Jan-93	(IV)	B2	175.83	9999	93.8	5.35	4.09	6.59
NEDU	Aug-85	(IX)	25	0	9999	96.67	4.77	3.54	5.98
NEDU	Jan-84	(VII)	25.2	206.55	9999	97.84	5.61	4.36	6.83
NEDU	Nov-80	(VIII)	4	187.33	9999	108.9	6.44	5.22	7.65
NMRI	Jan-93	(IV)	E2	295.83	9999	137.8	5.4	3.69	7.09
NEDU	Nov-80	(VIII)	3	164.96	9999	142.66	5.69	4.38	6.97
NEDU	Jan-84	(VII)	24.2	183.17	9999	143.19	5.67	4.56	6.78
NMRI	Jan-93	(V)	A2	175.83	9999	182.7	6.47	5.34	7.58
NEDU	Nov-80	(VIII)	1	155.92	9999	199	5.83	4.33	7.31

Table J-6

Multi-level and Repetitive Constant PO2 in N2 and Air/PO2 Gas Switch Dives
Risk of Last Decompression

PLAN V4

Facility	Report	Pro #	Type	T1	T2	TASC	P(DCS)	LOW	HIGH
NEDU	Jan-84	20	(VII)	261.67	9999	1	2.24	1.49	2.98
NEDU	Jan-84	23	(VII)	286.5	9999	1.33	2.23	1.38	3.07
NEDU	Jan-84	21	(VII)	320.83	9999	1.66	2.13	1.41	2.85
NEDU	Jan-84	22	(VII)	286.33	9999	1.67	2.21	1.34	3.06
NEDU	Jan-84	27	(VII)	257.17	9999	2	2.16	1.32	2.99
NMRI	Jan-93	E3	(V)	587.33	9999	6	2.07	1.3	2.83
NMRI	Jan-93	B3	(V)	452.67	9999	6.33	2.41	1.52	3.29
NEDU	Jan-84	24	(VII)	307.5	9999	6.66	2.97	2.07	3.85
NMRI	Jan-93	C3	(V)	462.33	9999	16	2.38	1.49	3.27
NMRI	Jan-93	D3	(V)	572.67	9999	31.33	3.4	2.48	4.3
NEDU	Jan-84	30	(VII)	141.33	9999	31.34	2.93	2.16	3.69
NEDU	Aug-85	24	(IX)	0	9999	36	2.97	2	3.92
NEDU	Aug-85	38	(IV)	262.67	9999	46	4.05	2.99	5.11
NEDU	Aug-85	26	(IX)	0	9999	52.5	4.53	3.47	5.59
NEDU	Nov-80	5	(VIII)	199.83	9999	56.34	4.77	3.61	5.91
NEDU	Nov-80	B	(VIII)	147.5	9999	82.5	5.25	4.29	6.21
NMRI	Jan-93	D2	(IV)	460.83	9999	86.17	4.94	3.61	6.26
NEDU	Aug-85	37	(IV)	266.33	9999	86.34	5.08	3.99	6.16
NEDU	Aug-85	25	(IX)	0	9999	86.66	4.85	3.37	6.3
NMRI	Jan-93	C2	(IV)	306.17	9999	91.5	4.9	3.61	6.17
NEDU	Jan-84	25.2	(VII)	187.17	9999	96.66	5.1	3.67	6.5
NMRI	Jan-93	B2	(IV)	175.83	9999	116.5	4.99	3.64	6.32
NEDU	Jan-84	24.2	(VII)	148	9999	122.5	5.1	3.98	6.21
NEDU	Nov-80	3	(VIII)	157.17	9999	127.5	5.37	4.32	6.41
NEDU	Nov-80	4	(VIII)	154.17	9999	142.16	5.13	3.89	6.35
NMRI	Jan-93	E2	(IV)	295.83	9999	156.5	5.02	3.25	6.75
NEDU	Nov-80	1	(VIII)	118	9999	173	5.21	4.11	6.3
NMRI	Jan-93	A2	(V)	176.17	9999	271.33	5.06	4.12	5.99