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IN

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SAFETY ANALYSIS OF FRENCH 1974 AIR DECOMPRESSION TABLES

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For years, air decompression tables were considered as very safe procedures. However, since 1981-82, there has been an increasing concern about the actual performances of air decompression tables among the british and french diving companies and authorities. Development of new shallow fields (such as in Middle East and Far East) or new techniques (such as inspection or structure repair) has suddenly increased the number of air dives and made safety problems arise.

It was first supposed that these procedures had a low decompression sickness (DCS) incidence but that the number of dives associated was so high that the yearly number of DCS had become significant. Then, it was realized that there was very little information available in the literature on the actual performances of the air tables, except perhaps in military diving. Because of the lack of information, it was impossible to document the following critical points :

- for the accidents recorded, are the symptoms associated to simple or serious DCS ?
- for a same dive, are some decompression techniques better than the others, mainly is there any difference between in-water and surface decompression ?
- for a same set of decompression tables, are some decompression schedules better than the others, i.e. are there any combinations of depth and time (exposure) associated to a higher risk of DCS ?
- for a same decompression schedule, is the use of any margin in the selection of the table associated to a significant increase of safety ?

It was clearly understood that in order to answer such questions it would be necessary to define a method that could provide results with adequate statistical significance.

Evaluation of decompression tables through a mathematical model had to be rejected due to today unsufficient understanding of the basic variables involved in the decompression process. It is commonly admitted that most of the current models are more mathematical data fitting systems than actual rationales.

Evaluation through man testing in an hyperbaric center using bends occurrence as the only performance criteria has been recognized as a very long process with low statistical significance (1).

Evaluation through ultrasonic doppler bubbles detection has been a very valuable technique because the "doppler" is a sensitive tool, but the method is limited by its cost when a large number of tables is involved. Several studies were carried out on the french air standard tables using doppler monitoring (2,3,4), and results on selected tables indicated that deep and/or long dives were associated to a higher grade of circulating bubbles, thus presumably to a higher risk of DCS.

Finally it appeared that the only way of solving the problem was to work on actual offshore dives and accidents, that have the advantage of providing a large amount of data and integrating all sorts of independent variables such as divers individuality, type of equipment used, sea conditions, etc... Such data have been published by the U.S. Navy on their air decompression procedures (5,6). Unfortunately, only the overall figures were presented which does not allow any further analysis.

Several actions were thus undertaken.

In 1983, on the british side, Dr. T.G. Shields was financed by the Department of Energy (DOE) to perform an evaluation of the performances of air tables during operations in the U.K. sector of the North Sea.

The study was published in July 1986 (7) and covers 8,000 no stop decompressions, 2,000 in-water decompressions and 15,000 air surface decompressions. Results , based primarily on surface decompressions, showed the uneven risk partition of DCS occurrence and permitted to identify exposures associated to a high DCS incidence.

In 1981, on the french side, Comex was awarded a research grant from the Fonds de Soutien aux Hydrocarbures by the Comité d'Etudes Pétrolières Marines (CEPM) to assess actual offshore safety performances of the French 1974 air decompression tables.
Data were provided by the two major french diving companies, Comex and C.G. Doris, that worked in cooperation on the project. A final report in french was submitted to the CEPM in December 1984 and this paper is intended to present its main results.

METHODS

French 1974 air decompression tables
In France, commercial diving started its development using the French Navy GERS air tables (8).
The French 1974 air decompression tables were developed in 1972 by Comex under the financial support of the Centre National d'Exploitation des Océans (CNEXO). A new set of in-water decompressions was computed using classic assumptions of multi theoretical tissues and sursaturation factors (non published). At the time, the tables appeared very conservative and tests were very successful except for multiple repetitive dives (repetitive diving was for this reason restricted to one repetitive dive).

The tables were introduced in 1974 in the french regulations for diving operations (9) and became the official procedures for air decompression in France (tables can be ordered at the following address : Imprimerie des Journaux Officiels, 26,rue Desaix, 75727 PARIS CEDEX 15, France).

These procedures provide 3 sets of decompression tables :
- no stop decompressions (F no stop tables),
- air standard decompressions (F air std tables)
- air with oxygen stops at 6m and 3m decompressions (F air/oxy tables).

The different decompressions are carried out with in-water stops. 10 different pre-dive surface intervals, varying from 6 hours to 0 minute, are available for repetitive diving. A sample of decompression tables is presented in figure n°6 for 30m bottom depth.

Source of data : dives
This study was restricted to dives not exceeding 51 m for direct comparison with other published data.
Dive conditions were recorded from Comex and C.G. Doris diving reports for a period covering 1976 to 1983. These reports are presented in a way that allows direct computer typing of information such as date, worksite, divers names, diving method, diving equipment, type of work, working depth and time, pre-dive surface interval, decompression table selected, and actual decompression time.

Source of data : accidents
The only accidents considered in this study were the ones directly related to the performances of the decompression tables. All the accidents/incidents associated to errors of procedures (blow-up, shortened decompression, wrong table selection,...) or external causes (injury, wrong gas supplied, equipment failure,...) were disregarded.
The information came primarily from the analysis of company internal accident reports.
However, it has been recognized for long that the number of reported cases does not always correspond to the number of actual accidents.
One of the reasons is administrative. Operational people just hate paper work and it is not easy to get all the reports, all the time, with all the information.

The second reason is related to the difficulty of diagnosis. There are clear cases that are treated with the right procedures, but there are also mild cases such as "niggles" that are sometimes given some oxygen on mask, and there are some cases that are just treated by an hot shower. There are also the divers who do not report the pain !

As a consequence, a lot of complementary information was obtained both by worksites safety inspections, interviews during medical examinations, systematic investigations at base or informal chats over a glass of "pastis".

All the known incidents/accidents were taken into account, whether officially reported or not, whether treated or not, whether classified as bends or niggles or doubtful.

Over this long period, some divers got involved in several accidents, however no corrections were introduced as individual susceptibility was not considered as an independent variable in this study.

Treatment and validation of data

Data collected were coded and typed into a 4331 IBM computer. Acccident reports were checked by the safety, diving methods and medical departments.

Diving reports were typed in by operational personnel, who was qualified to check the abnormalities eventually detected. The input computer program allowed direct validation of the information on the screen with tests on diving method versus depth, actual bottom time versus table time, actual decompression time versus table time, etc...

In addition to the above precautions, consistency of the data was controlled at worksite level. Information from worksites with missing diving reports, missing accident reports or identified problems of method (such as altitude diving in one case) was rejected.

RESULTS

Divers

Approximately 350 to 800 divers, all professionally qualified, participated to the dives each year. Most of the divers performed an annual average of 10 to 20 air dives but some of them did up to 80 dives due to the local diving operations character. See figure no 1.

Worksites conditions

Geographical distribution of dives and types of work performed are indicated in figure no 1.
Diving methods were surface demand (60 %), SCUBA(35 %) and wet bell diving (5%).
Although the equipment used by the divers was not specifically studied, it can be estimated from the geographical distribution that 90% of the dives were carried out using passive thermal protections.

Decompression tables

Most of the 64,000 dives stored in the computer files came from french no stop (27,239), air standard (20,334) or air and oxygen (10,863) tables.
About 5,700 repetitive dives were also recorded over the 10 possible intervals for repetitive diving, but the information was unfortunately so scattered that it became of no statistical use.
Distribution of dives over the different combinations of tables depths and times is presented in tables no 1 and 2.
Frequency of use of depths and times for F air standard tables and F air/oxygen tables is presented in Figure no 3.

DCS accidents

For the 64,000 dives carried out with the French 1974 air decompression tables, 137 cases of type I and 5 cases of type II decompression accidents were recorded.
112 divers were involved in these accidents. Among them, 12 divers had 2 DCS, 3 divers had 3 DCS and 3 divers had 5 DCS, all of type I.

All the accidents occurred at surface. Frequency distribution of the times before the onset of the symptoms, after surfacing from the dive, is shown in figure no 4.

Dive conditions and symptoms of the type II accidents are presented in table n° 3. Distribution of the accidents over the different tables is shown in tables n° 1 and n° 2 for all types of DCS.
Overall DCS incidence, for both types of accident, is presented in table n°4 for the different French 1974 air decompression tables.

DCS incidence related to the hyperbaric exposure
In order to assess the possible influence of hyperbaric exposures the French 1974 air decompression tables were grouped into 4 categories of dives. The F no stop tables were considered as category 1. For the other categories, the partition was done on an empirical basis, each category being designated on its relative DCS incidence. See figure n°5. It was admitted that slightly different border lines could have been drawn on tables n° 1 and 2, but our choice was meant to be simple. We had in mind that the classification would have to be explained to worksites (see recommendations) and we wanted to avoid too many "steps" on the diagram to make things easy.

DCS incidence, for all types of accident, is presented in table n° 5 for the different dives categories.

DCS incidence related to the safety margin
In order to assess the possible influence of safety margins, the French air standard tables of categories 3 and 4 of figure no 5 were put together in a same class which represented the exposures related to the higher DCS incidence. The tables were sorted according to differences between actual dive conditions and table conditions, and their DCS incidence, for all types of accident, is presented in table n° 6.

DISCUSSION

Analysis of 64,000 offshore air dives permitted to identify the influence of decompression procedures, exposures and safety margins on the safety performances of the French 1974 air decompression tables.

Validity of the results
The main difficulty of such a work was to get the information, all the information. It is clear that the level of DCS incidence is so small that any omission will significantly alter the general statistics.

The overall DCS incidence for the French 1974 air tables (this study) was compared to the data presented in the report to DOE (7) and in the US Navy publication (5). Such a comparison assumes that the tables were used in similar hyperbaric conditions. This is true for the F air std tables and the in-water decompressions, the air/oxy tables and the surface decompressions of the report to DOE, but is only a speculation for the US Navy dives. Two types of exposures were retained, moderate and severe, and the results are presented in table n° 7.

Our results appeared similar to the ones of the DOE report but differed from the US Navy's ones. The possible explanations for such discrepencies could be :

- the US Navy divers were working in more severe conditions than the North Sea divers, which is doubtful.
- Dr. T.G. Shields and us have lost information on DCS. In our case, we would reply that, working inside a diving company, we had the means and the authority to get relatively accurate results.
- the systematic use of safety margins by diving supervisors in the North Sea improved the US surface decompression tables performances,
- the French air standard tables are more conservative than the US Navy ones. Effectively, they display always longer decompression times and/or deeper stops.

However the data did not allow to draw any conclusion other than each author having his own method of work, the different results should be compared with caution.

Use of the French 1974 air decompression tables

64,000 dives have been recorded from 1976 to 1983, which corresponds to extensive use of the tables by the french diving contractors. COMEX activity, for instance, corresponds to 9,000 air dives in 1983, a figure which is important when compared to the 15,000 annual air dives reported in the North Sea UK sector for the same period (7).

Because of their track records, the French 1974 air tables can be considered as the second air diving procedures after the US Navy Manual.

Dives reported corresponded to typical commercial diving operations. Results presented in figure no 2 show that the tables were used in area where the working depth does not exceed 30 to 45 metres such as Africa, Middle East and Far East. Work performed at bottom included a wide variety of tasks, a large proportion of which represented inspection or shallow construction work.

Although a large number of dives was conducted in the no stop decompression area, results presented in tables no 1 and 2 indicate that operational personnel did not hesitate to use the full extend of depth and bottom time possibilities of the tables. Note, however, that the last bottom time of a table should never be used for routine operation and kept as a back up in case the planned bottom time is exceeded.

Results presented in figure no 3 also clearly show that the air stops tables were generally used for dives of moderate hyperbaric exposure whereas the oxygen stops tables were preferred for long and/or deep dives to shorten decompression time. Moreover, diving supervisors seemed to avoid repetitive diving and tended to organize the work with one dive a day per diver.

Performances of the French 1974 air decompression tables

All the decompression accidents recorded happened at surface. Most of the symptoms were declared within the first hour after surfacing but the risk seemed to persist at least during the first 6 hours after the end of the decompression (figuren°4).

Table no 4 indicates that most of the accidents associated to the French 1974 air decompression tables were "pain only" accidents.
Very few cases of type II accidents were recorded for all these tables that use in-water decompression (less than 1 type II accident for 10,000 dives).

Surprisingly , two type II accidents were recorded in the no stop decompression area, a region where very few problems are expected (table no 3). For three of the type II accidents, marked with a "*" on table no 3, it was possible to show that the diver had done multiple ascents between working depth and surface ("yoyo dives"), a dive profile that could perhaps be related to special character of the accident.
Such intermediate recompressions have been said to favour the transfer of bubbles normally trapped in the lung filter into the arterial bed (10, 11, 12).

The distribution of the accidents appeared to vary over the tables and to depend on the dives conditions (tables n° 1 and n° 2). For this reason, the performances of the different sets of decompression tables could not be directly compared on their overall DCS incidence.
In order to study the variability of the DCS incidence over the different combinations of tables depths and times, it was necessary to group the decompressions to obtain significant statistical results. Partition of the tables into 4 categories of exposures was done on an empirical basis (figure no 5). Shields and Lee (7) have proposed another system of partition based on a Decompression Penalty Index related to the equivalent decompression time using US air standard tables. The frontier used for the index=30 was very similar to our limit between categories 2 and 3 and is shown in figures no 5.

The minor differences between the two partitions should be related to the differences in the decompression tables considered.

Distribution of DCS incidence over the 4 categories of hyperbaric exposures (table no 5) confirmed a result that first came from the doppler studies (2, 3, 4), i.e. that the risk of DCS varies over the tables and increases for deep and/or long tables (categories 3 and 4). Although the overall DCS incidence is low, the risk could be significant for some combinations of depth and time. However, it must be noted that, in our study, the number of recorded long and/or deep dives being relatively small, the associated percentages are attached to a lower accuracy (or a broader confidence interval) than for the other dives.

This uneven risk distribution of DCS seems to be a common feature to several air decompression tables. It has also been shown in the report to DOE. It certainly was at the origin of the "Jesus factors" introduced by the North Sea diving supervisors for surface decompression.

A possible reason could be the shortcomings of the mathematical models used. All the different tables currently used in commercial diving were computed at about the same time using about the same assumptions and they can be expected to show similar limits.

Influence of the decompression technique

In an attempt to show possible differences between air stops and oxygen stops decompressions, the performances of the F air std tables and the F air/oxy tables were compared over the same exposures. Results in table no 5 seem to indicate that tables with oxygen stops achieved significant lower DCS incidence for category 3 exposures ($p \leqslant 1\%$) and should thus be regarded as a safer technique, at least for the tables and the dives considered.

In order to detect possible advantages of in-water decompression over surface decompression, the performances of the F air/oxy tables were compared to the surface decompression tables from report to DOE. Once again, such a comparison is reasonable because the tables were used over similar exposures.

The results of table n° 8 indicate that, although the overall DCS incidence appeared similar :

- in-water decompressions tend to produce type I accidents only,
- surface decompressions tend to produce a large proportion of type II accidents,

and thus in-water decompression should be preferred to surface decompression, at least for the tables considered.

Influence of safety margin

There are three sorts of safety margins that can be introduced in the decompression process.

The tables being presented by depth and time increments, the actual dives conditions almost never match the tables depth and time, and selected decompressions do most of the time provide a safety margin of 1 to 2 metres or 4 to 9 minutes. However, in commercial operations, dives are planned in advance and supervisors tend to use the full extend of permitted working time.

The second safety margin corresponds to modifications introduced by the companies in their diving manuals. French 1974 air tables were used without any modifications.

The last ones are additional depth or time majorations introduced by the diving supervisors in an attempt to increase decompression safety. Our experience is that operational personnel feels rather confident about the French tables and rarely use such precaution. Effectively, the average safety margin in the selection of bottom times of the F air std tables was 2.9 $\pm$1.7 min.

Results presented in table no 6 indicate that, although the DCS risk was high in the category 3 and 4 exposures, the divers decompressed with 5 minutes or more safety margin on bottom time showed a significant ($p \leqslant 10\%$) lower rate of DCS incidence.

In other words, the F air decompression tables used with 5 minutes shorter bottom times represent a new set of decompression tables which has already been tested by divers over the critical area with better results.

RECOMMENDATIONS

Because this study has permitted to correlate DCS incidence to exposures, it has been possible to issue recommendations for a better use of the French 1974 air tables.

For this, we had to define what should be an acceptable level of DCS incidence for air decompression tables. Very little was found on the subject in the literature (13) and proposed standards were judged too permissive. It was thus decided to take the performances of the French 1974 air decompresssion tables over categories 1, 2 and 3 as a reference, i. e. approximately :

- an overall incidence of type I accidents not exceeding 5 / 1,000 (0.50 ±0.45%). These type I accidents are known to be treated easily with recompression and hyperbaric oxygen on mask, without leaving any permanent disability.

- as low as possible type II DCS incidence, not exceeding an overall incidence of 1/10,000.

Working with these assumptions, and considering :

- the improvements obtained with divers using a safety margin of more than 5 min on bottom time tables,

- the fact that observed DCS cases are mostly type I accidents,

we issued recommendations in the final report to CEPM that were based on the use of a safety margin for dives associated to a higher risk of DCS occurrence (category 3 and 4 exposures).

Practically, we stated that in order to increase the safety of French 1974 air decompression tables, the dives carried out in the category 3 and 4 exposures should be decompressed according to the next longer bottom time available in the tables. The direct effect is to add a safety margin of at least 10 min to the bottom time.

Shields and Lee, in their report to DOE, correlating the DCS incidence with the Decompression Penalty Index, also issued a recommendation for safer air diving in the North Sea. Their recommendation was to limit diving to tables with an index not exceeding 30 and thus appeared more restrictive than ours.

However, it must be noted that in their study :

- they have worked mainly on surface decompression,

- they have recorded a lot of type II accidents,

- they have issued recommendation regardless of the decompression table used.

Our recommendation was implemented systematically in Comex worksites as a complementary instruction to the use of the French 1974 air decompression tables. We also issued a safety notice to recall the risks associated to multiple ascents to surface in shallow air dive.

Up to now, the results have been very satisfactory, but years of air diving will be required before we will have collected a sufficient number of diving reports to be able to document the improvement with statistical significance.

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FRENCH 1974 AIR TABLES

Table no 1 : distribution of dives and accidents (type I and type II) over French no stop decompression and the French air standard decompression tables.

Table time	12m	15m	18m	21m	24m	27m	30m	33m	36m	39m	42m	45m	48m	51m
	Table depth													
5min	0 326	0 298	0 177	0 217	0 164	0 114	0 271	0 128	0 229	0 109	0 119	0 53	0 55	0 69
10min	0 487	0 459	0 439	0 637	0 449	0 345	0 774	0 401	0 625	0 190	0 280	0 184	0 141	1 145
15min	0 439	0 547	0 451	0 608	1 528	0 427	0 683	1 400	0 621	0 245	0 175	0 158	0 143	2 93
20min	0 457	0 558	0 433	0 605	0 713	0 812	0 594	0 489	2 1009	0 394	0 165	1 78	0 80	0 19
25min	0 288	0 290	0 299	0 435	0 552	0 476	0 403	2 408	1 367	1 181	0 64	0 34	0 40	0 12
30min	0 509	0 458	0 481	1 710	0 686	0 778	0 567	0 174	0 271	2 129	0 69	2 84	2 91	0 23
40min	0 603	0 562	0 671	0 666	1 631	0 431	0 338	0 219	2 142	3 64	0 56	0 33	0 48	0 19
50min	0 484	0 633	1 804	1 458	0 380	0 244	0 212	2 131	0 80	1 25	0 36	1 11	0 13	0 6
60min	0 464	0 743	0 460	2 331	0 275	1 206	5 227	0 80	0 51	0 4	1 23	0 7	2 6	0 0
70min	1 384	0 545	0 304	1 215	0 90	1 59	1 72	0 25	2 24	0 4	1 6	0 0		
80min	0 316	0 708	0 171	1 110	0 68	2 43	1 29	0 16	0 8	0 3				
90min	0 290	0 420	0 199	0 106	1 35	0 15	0 22	0 3						
100min	0 208	0 265	0 122	0 43	0 35	0 19	0 14							
110min	0 140	0 272	1 87	1 24	0 19	0 14								
120min	0 205	1 368	0 56	0 33	1 39									
130min	0 85	0 132	0 36	0 12										
140min	0 98	0 88	0 23											
150min	0 92	0 75	0 25											
160min	0 82	0 58												
170min	0 45													
180min	0 918													

n / N : upper case = number of DCS, lower case = number of dives

No stop decompression limit

Table no 2 : Distribution of dives and accidents (type I and type II) over the French air and oxygen decompression tables.

Table time	12m	15m	18m	21m	24m	27m	30m	33m	36m	39m	42m	45m	48m	51m
	Table depth													
5min														0 7
10min										0 19	0 19	0 11	0 20	0 25
15min								0 4	0 37	0 31	0 10	0 26	0 34	0 29
20min							0 27	0 20	0 59	0 65	0 41	0 48	0 52	0 34
25min						0 24	0 28	0 31	0 100	0 70	0 28	0 39	0 57	0 33
30min					0 19	0 40	0 86	0 86	0 182	0 116	0 50	0 130	1 84	0 83
40min				0 38	0 70	0 126	1 169	0 115	0 236	0 110	1 85	0 61	1 127	2 154
50min				0 71	0 137	0 109	0 223	0 206	2 286	1 80	1 72	1 36	4 46	6 75
60min			0 39	0 117	1 211	0 176	0 348	3 137	3 396	3 107	3 133	1 25	3 28	1 40
70min			0 43	0 111	0 171	0 112	0 140	2 126	5 237	1 75	1 32	2 13	0 10	0 14
80min			0 58	0 169	0 117	0 125	1 80	2 65	1 167	0 10	0 62	0 3	1 8	
90min		0 17	0 64	0 213	2 170	0 85	1 61	1 80	1 50	1 1	0 3			
100min		0 21	0 76	1 96	0 143	1 51	0 53	1 59	0 4					
110min		0 19	0 54	0 67	0 78	0 34	1 33	0 15						
120min		0 63	1 95	0 153	0 152	1 13	0 6							
130min		0 36	0 78	0 43	0 87	0 7								
140min		0 26	0 64	1 24	0 38									
150min		0 26	0 58	0 14										
160min		0 37	0 20											
170min		0 20												
180min														

n / N : upper case : number of DCS, lower case : number of dives

Table n° 3 : dive conditions of the Type II accidents

Table used	no stop	no stop	air std	air std	air/oxy
Table depth	12 m*	21 m*	33 m	36 m	18 m*
Table time	70min	30min	15min	70min	120min
Surface delay	06h27	00h20	02h00	00h31	02h46
Symptoms	fatigue nausea vomiting	pins/needles vertigo	pins/needles visual pb	vertigo speech pb pins/needles	back pain chokes

Table n° 4 : Overall DCS incidence for the French 1974 air decompression tables.

Decompression tables	Dives	Type I DCS	Type II DCS	Total DCS	overall DCS incidence
F no stop	27,239	2	2	4	0.01 ± 0.01%
F air std	20,348	52	2	54	0.27 ± 0.07%
F air/oxy	10,848	67	1	68	0.62 ± 0.15%
F air std repetitive	4,616	11	0	11	0.24 ± 0.14%
F air/oxy repetitive	727	5	0	5	0.69 ± 0.61%

Table n° 5 : DCS incidence (all types) for French 1974 air decompression tables over the different categories of exposures.

Exposure	Tables	Dives	DCS	DCS incidence
Category 1	F no stop	27,239	4	0.01 ± 0.01%
Category 2	F air std F air/oxy	17,904 4,570	20 4	0.11 ± 0.05% 0.09 ± 0.09%
Category 3	F air std F air/oxy	2,137 3,947	26 18	1.22 ± 0.48% 0.46 ± 0.21%
Category 4	F air std F air/oxy	307 2,331	8 46	2.61 ± 1.84% 1.97 ± 0.58%

Table n° 6 : DCS incidence (all types) of F air std tables for different safety margins over categories 3 and 4 exposures.

Safety margin	Dives	DCS	DCS incidence
Less than 3m on depth Less than 5min on time	1,579	22	1.4 ± 0.6%
Less than 3m on depth 5 min or more on time	691	4	0.6 ± 0.6%
3 m or more on depth Less than 5min on time	124	6	4.8 ± 3.9%
3 m or more on depth 5 min or more on time	50	1	2.0 ± 4.0%

Note : Standard errors in tables n° 4.5. and 6 were calculated for $p \leq 5$ %.

Table n° 7 : Comparison of overall DCS incidence (all types) for tables from different sources, for different exposures.

Reference	Moderate exposures	Severe exposures
This study	in-water decompression F air std tables 0.26 ± 0.07 %	in-water decompression F air/oxy tables 0.62 ± 0.15 %
Report to DOE (7)	in-water decompression non identified tables 0.24 ± 0.21 %	surface decompression non identified tables 0.49 ± 0.11 %
US Navy (5)	in-water decompression US air std tables 7.28/1000	surface decompression US surf D tables 26.5/1000

Table no 8 : Comparison of DCS incidence of F air/oxy tables, that use in-water decompression, and surface decompression tables from the report to DOE.

	Surf D tables (report to DOE)	F air/oxy tables (this study)
Dives	14,891	10,863
Type I DCS	39	67
Type II DCS	34	1
Total DCS	73	68
Overall DCS incidence	0.49 ± 0.11%	0.62 ± 0.15%
Proportion type II/DCS	47%	1.5%

Note : Standard errors in tables n° 7 and 8 were calculated for $p \leq 5$ %.

FIGURE N° 1: Distribution of annual number of air decompressions per diver

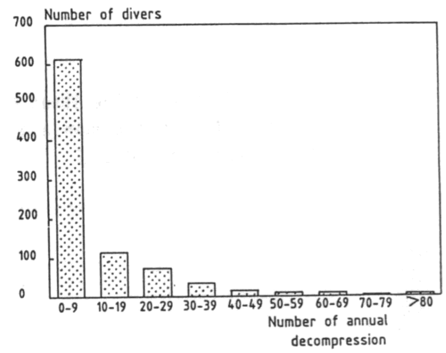


FIGURE N° 2: Location and work distribution in the use of French 1974 air decompression tables

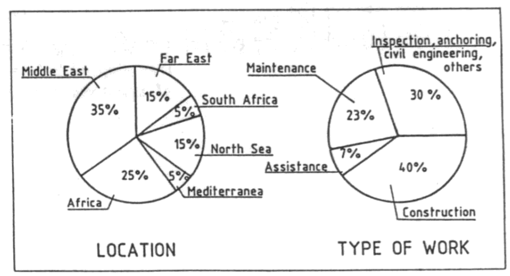


FIGURE N° 3: Depth and time distribution in the use of French 1974 air decompression tables

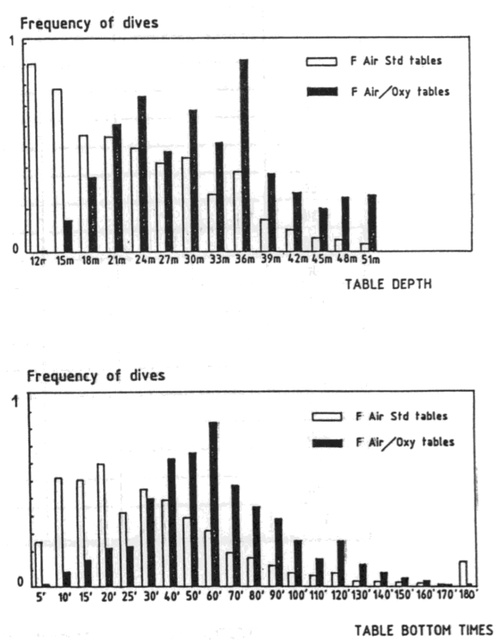


FIGURE N° 4: Distribution of the times elapsed between the end of decompression and the onset of first symptoms of DCS

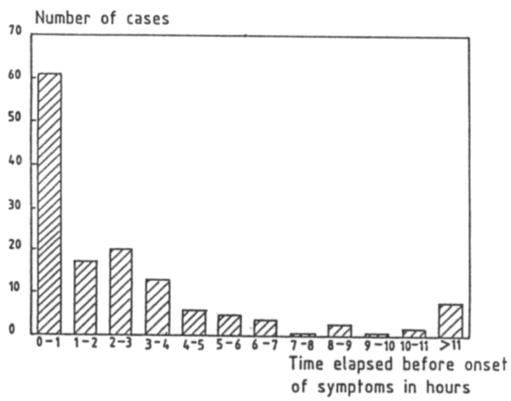
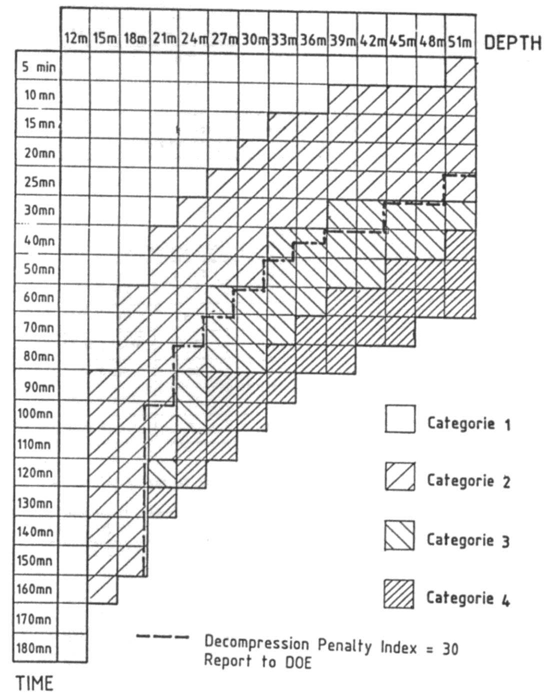


FIGURE N° 5: Classification of French air standard decompression tables in 4 categories of hyperbaric exposures



PROFONDEUR : 30 mètres. — INTERVALLE : 8 heures 00 minute.

DURÉE PLONGÉE	21 M AIR	18 M AIR	15 M AIR	12 M AIR	9 M AIR	6 M OXY	3 M OXY	TOTAL REMONTÉE	6 M AIR	3 M AIR	TOTAL REMONTÉE
5								2,0			2,0
10								2,0			2,0
15								2,0			2,0
20							1	2,8		2	3,8
25							3	4,8		5	6,8
30							5	6,8		10	11,8
40						2	10	13,6	2	18	21,6
50						5	14	20,6	10	20	31,6
60						8	20	29,6	15	30	46,6
70					4	9	22	36,4	16	37	58,4
80					8	9	25	43,4	19	41	69,4
90					10	13	26	50,4	26	41	78,4
100					12	15	27	55,4	31	44	88,4
110					14	17	28	60,4			
120				1	20	20	30	72,2			
130											
140											
150											
160											
170											
180											

FIGURE no 6 : French 1974 air decompression tables for 30 metres.