



Review of commercial saturation diving procedures: Bell excursion dives

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What were the reasons for the change?



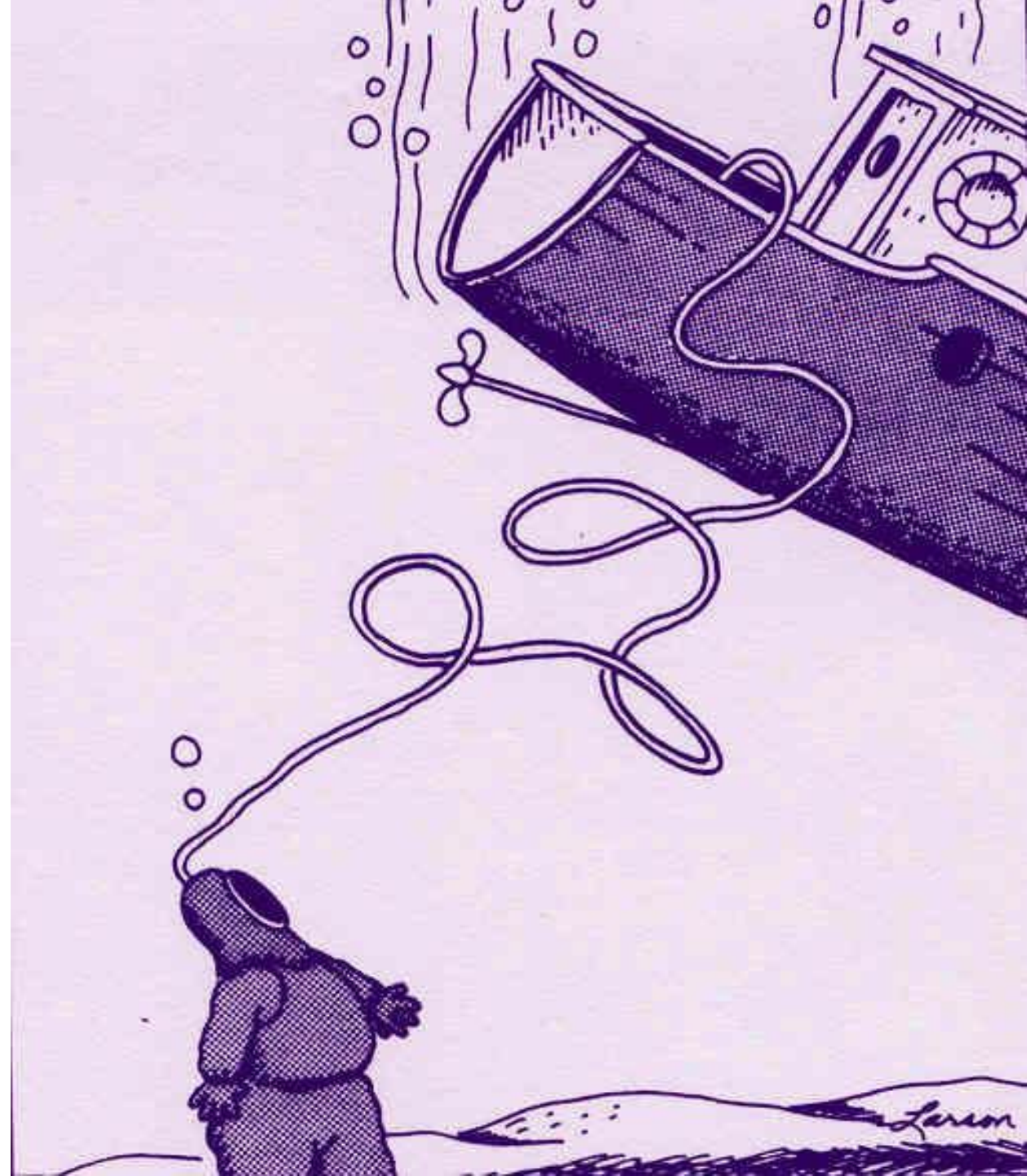
Who remember
the stories?



Why do we use
different
procedures?



Our project:
Keep
the lessons learned



The Team

6 persons
(and more)



Dr Phil Bryson



Dr JY Massimelli



Dr J Risberg



C Cadieux



Dr L Mattiti



JP Imbert

The partners 13 diving companies

Boskalis, NL

DCN Diving, NL

DOF Subsea, WA,

Helix Well Ops, UK

K Subsea, Singapore

McDermott, Texas

Mermaid Subsea Services,

Thailand

NDE Offshore, Dubai

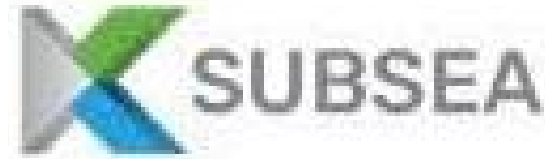
Posh Subsea, Singapore

RockSalt Subsea, UK,

Shelf Subsea, WA

Subsea7, UK

TechnipFMC, UK



your subsea service provider



The objective:
Share the information
(Scientifically)



Work already
published
or in review

A review of accelerated decompression from heliox saturation in commercial diving emergencies

[Jean-Pierre Imbert](#) , [Jean-Yves Massimelli](#) , [Ajit Kulkarni](#) , [Lyubisa Matity](#) , [Philip Bryson](#)

Review of saturation decompression procedures used in commercial diving

[Jean-Pierre Imbert](#) , [Lyubisa Matity](#) , [Jean-Yves Massimelli](#) , [Philip Bryson](#)

Review of excursion procedures used in commercial heliox saturation diving

[Jean-Pierre Imbert](#) , [Lyubisa Matity](#) , [Jean-Yves Massimelli](#) ,
C Cadieux, J Risberg, [Philip Bryson](#)

Work to be
published

A review of heliox saturation compression
procedures used in commercial diving.

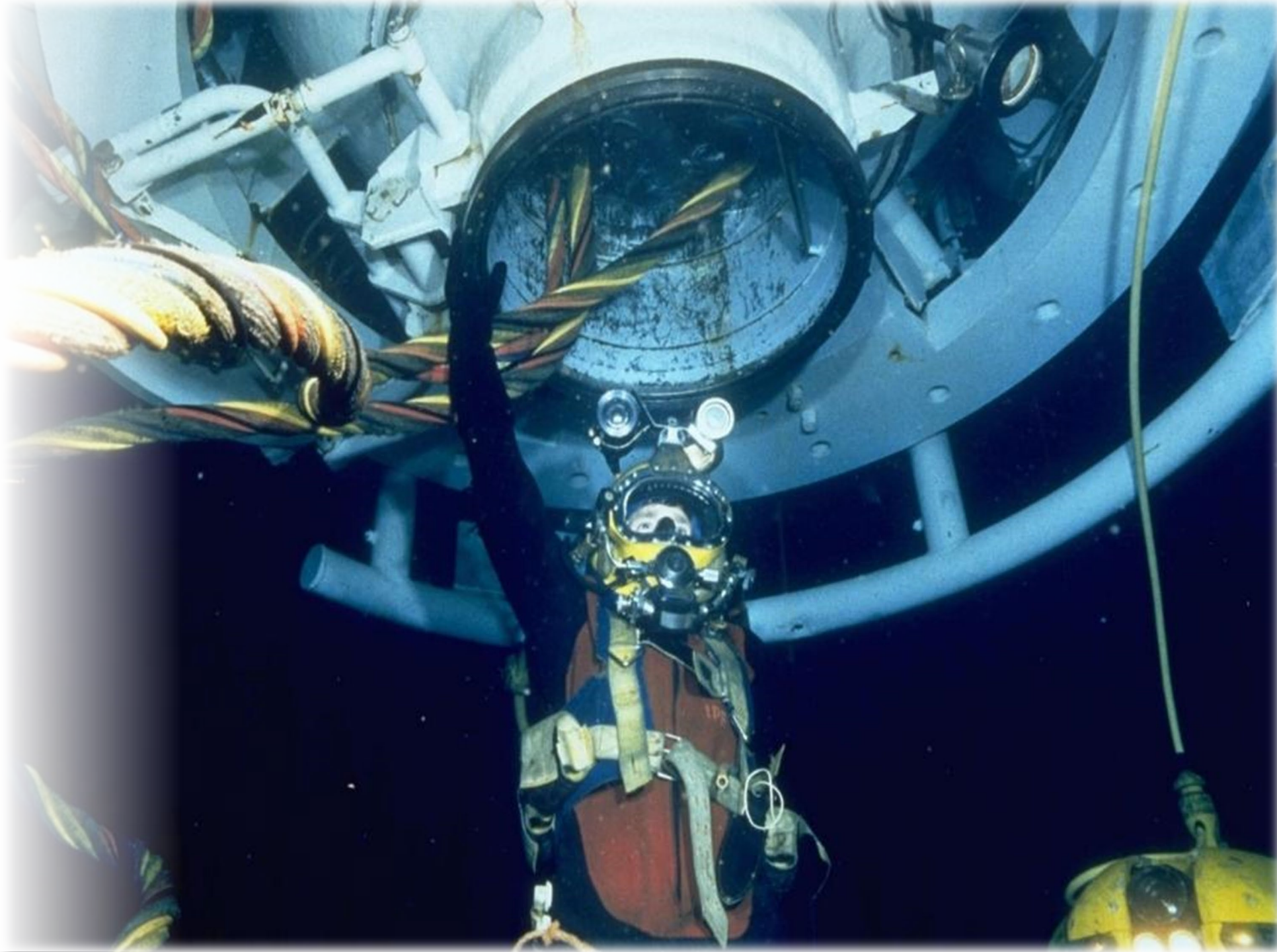
A review of deep diving saturation procedures used
in commercial diving.

Part 1: Risk analysis of deep diving

A review of deep diving saturation procedures used
in commercial diving.

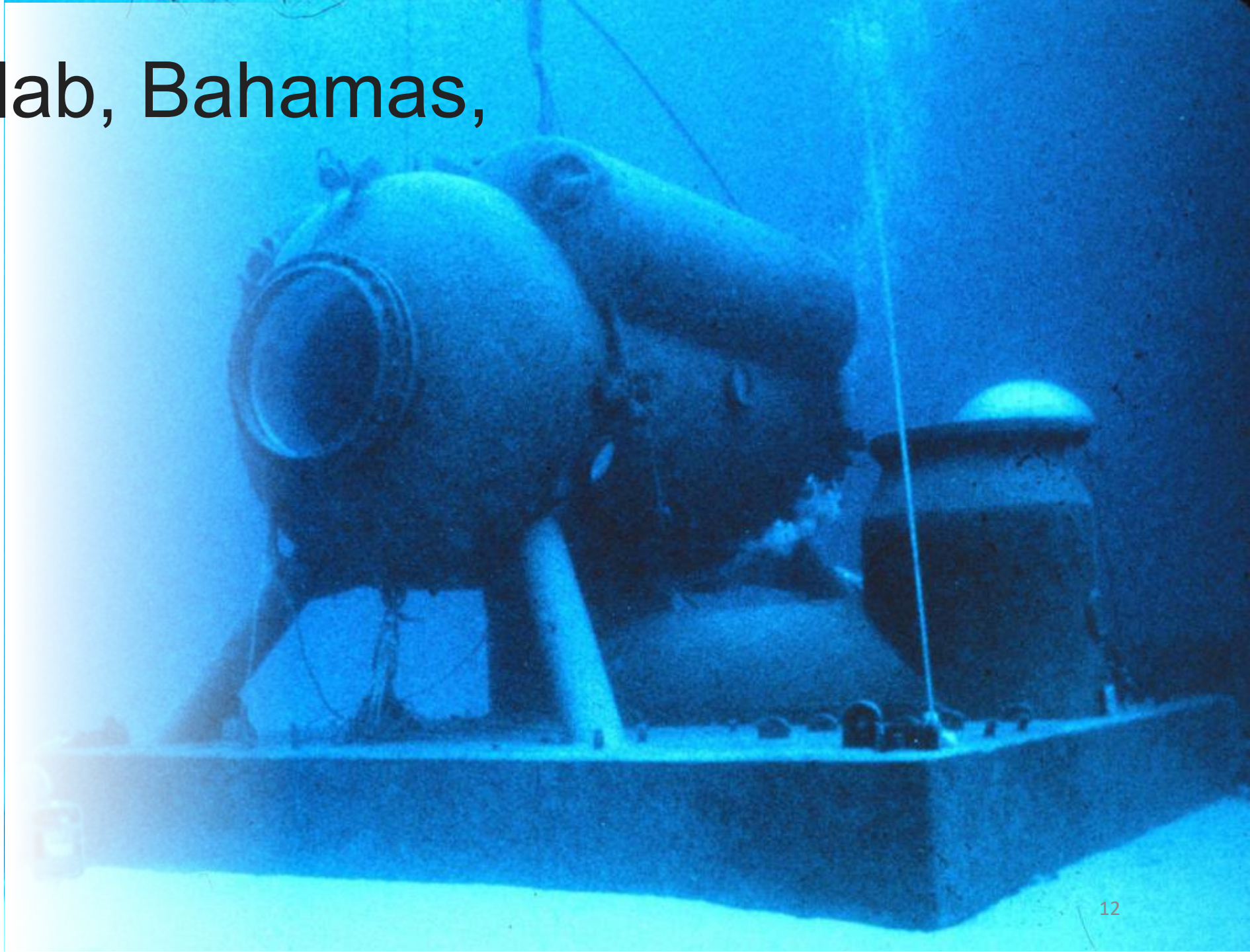
Part 2: A critical review of the 2019 Ichthys project
in Australia

Historical
development

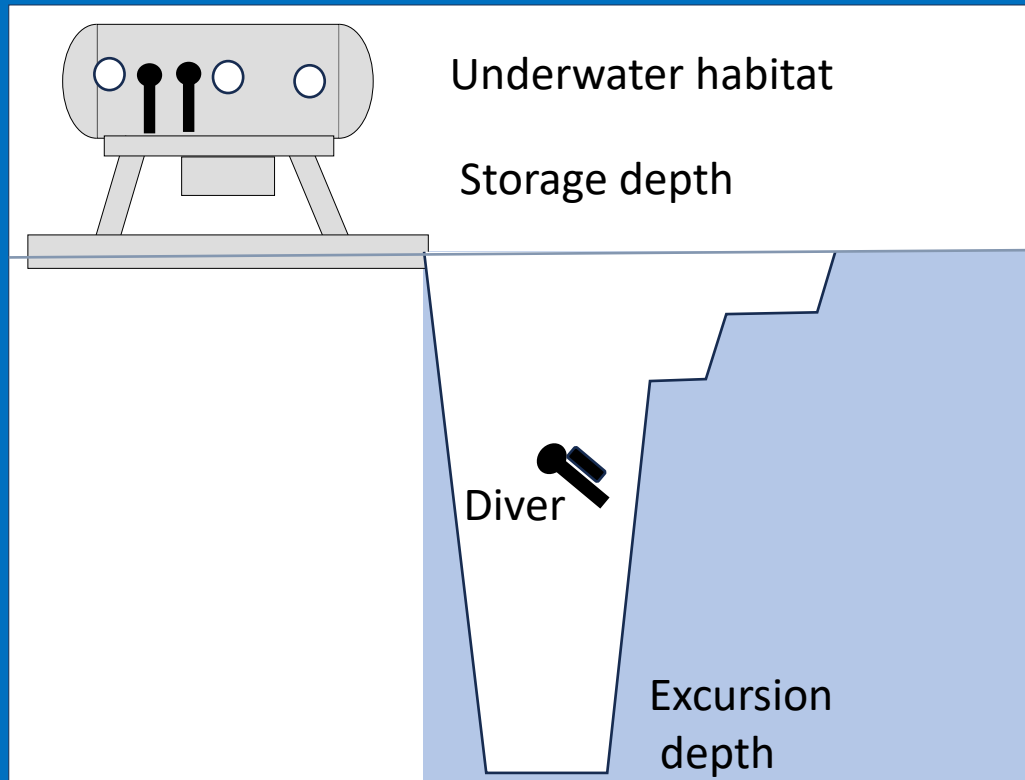


1970, Hydrolab, Bahamas,

An excursion dive
is a bounce dive
from the habitat



Dick Clarke's diving slate



200 FSW FOR 60 MINS

		1	Total DEDUCT
Ascend to	90 FSW @ 30 FPM	3 1/2	MINS
	90 FSW FOR 4 1/2 MINS	8	
Ascend to	80 " IN ONE MINUTE	9	
	80 " FOR 4 MINS	13	
Ascend to	70 " IN ONE MINUTE	14	
	70 " FOR 3 MINS	17	
Ascend to	60 " IN ONE MINUTE	18	
	60 " FOR 6 MINS	24	
Ascend to	50 " IN ONE MINUTE	25	
	50 " FOR 16 MINS	41	
Ascend to	HABITAT DEPTH, ONE MIN	42	

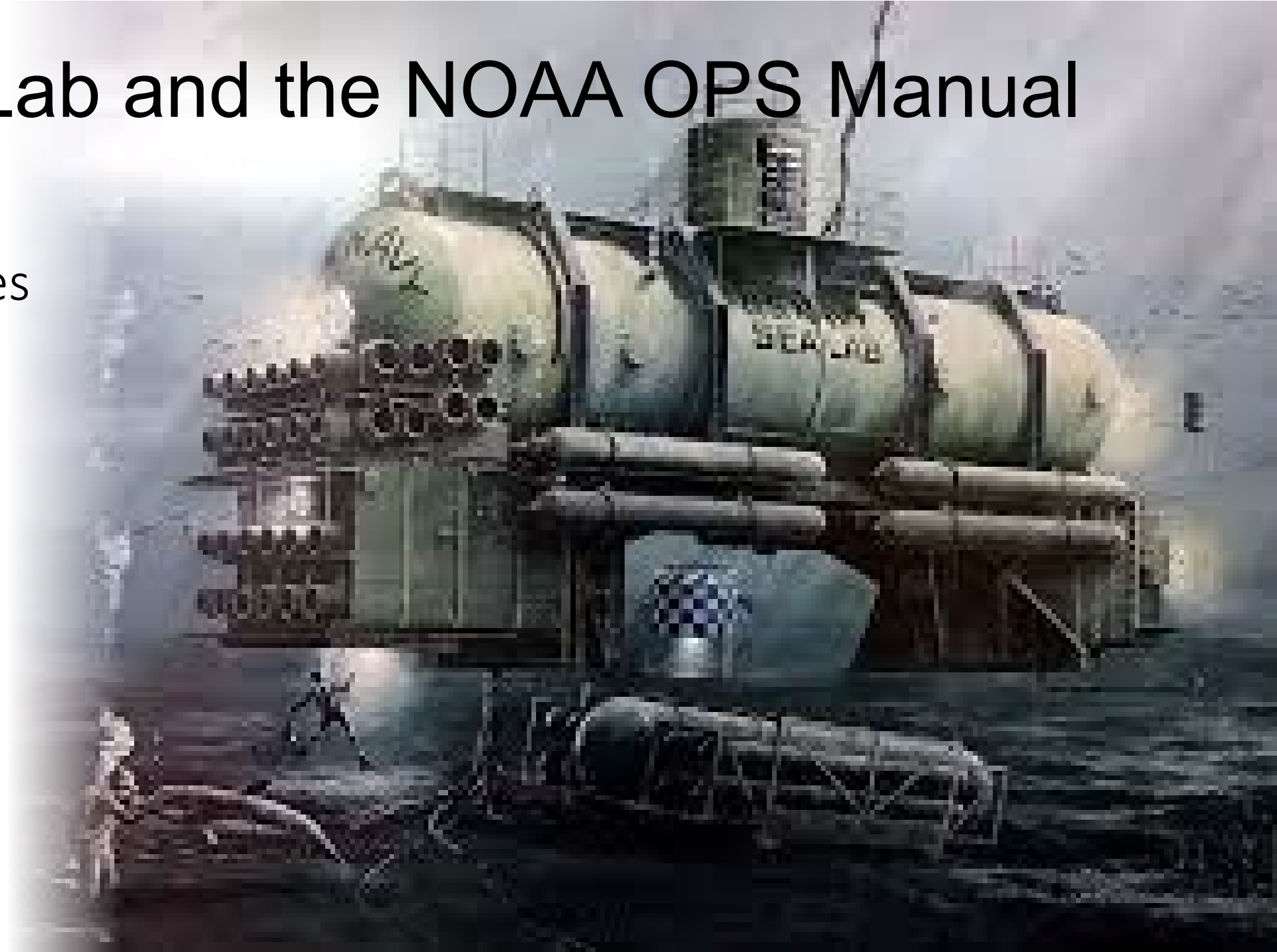
* Bob Williams } 600' 1600'
 * Dick Clarke } 1974

1975, SeaLab and the NOAA OPS Manual

Repex procedures
computed by
Hamilton

Air/nitrox
saturation

Unlimited
duration
excursions



The 1970s

1971

The Gulf Tide
discovered the
1.6 billion barrels
reservoir of Ekofisk

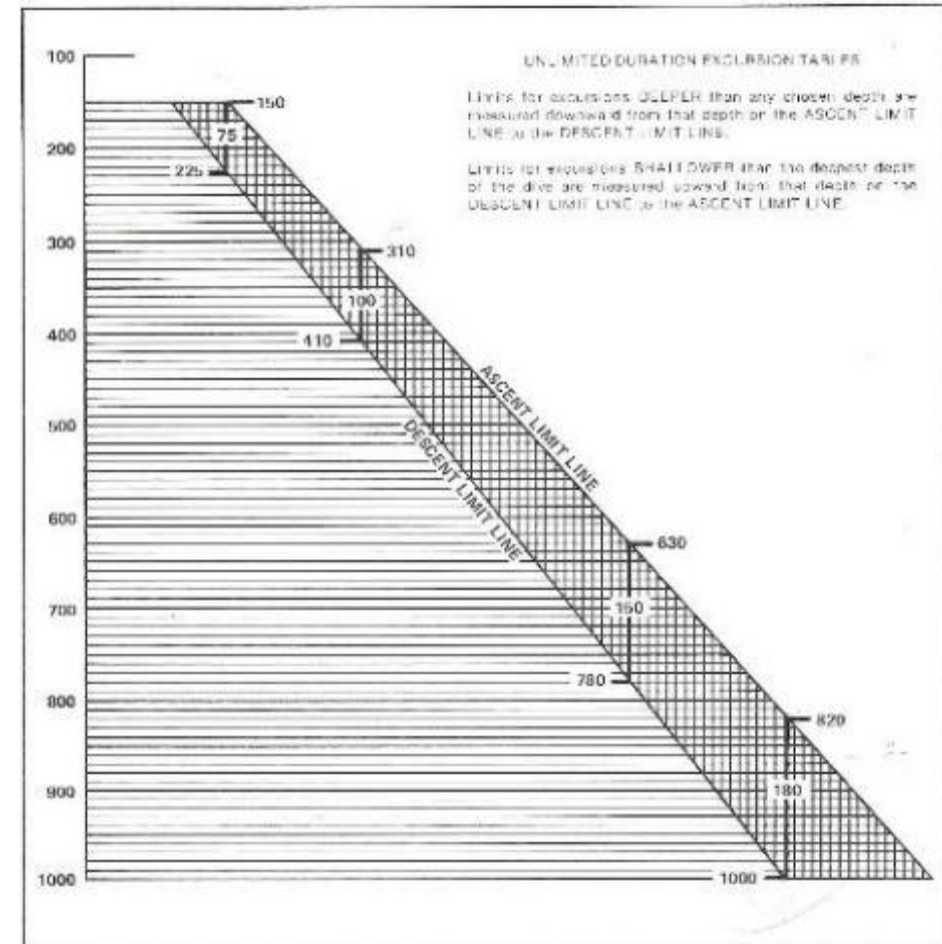
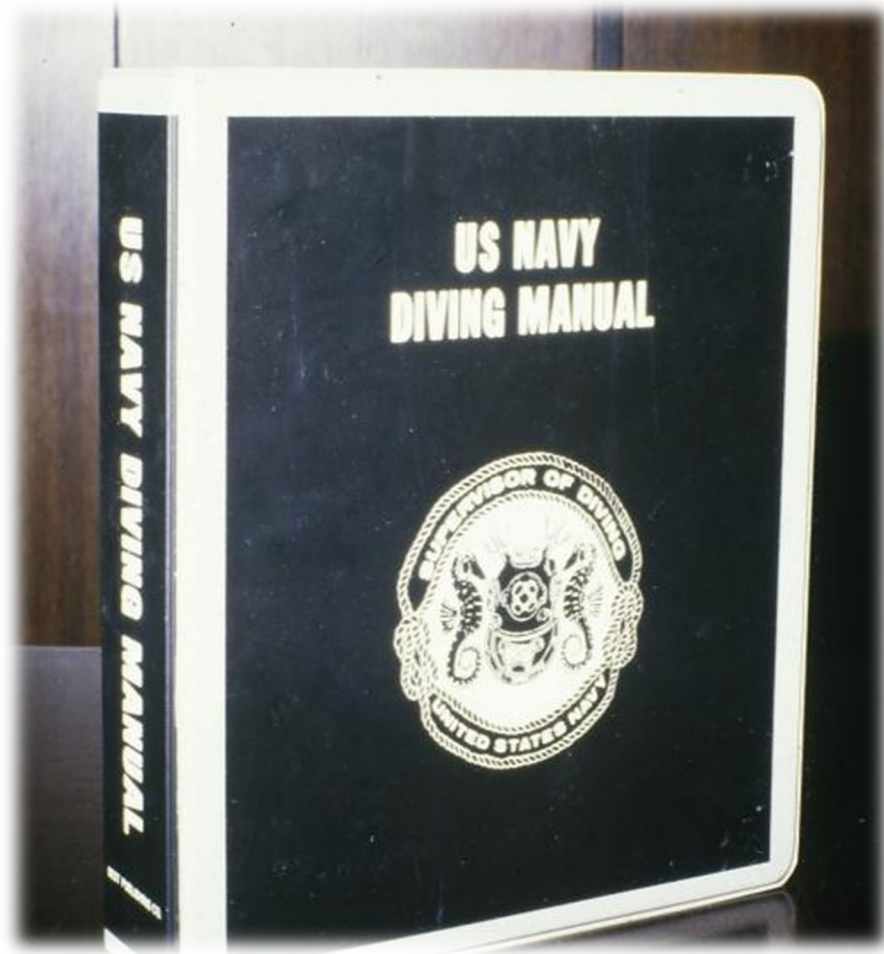


North Sea
development
was based
on
saturation diving

Divers deployed
from a bell



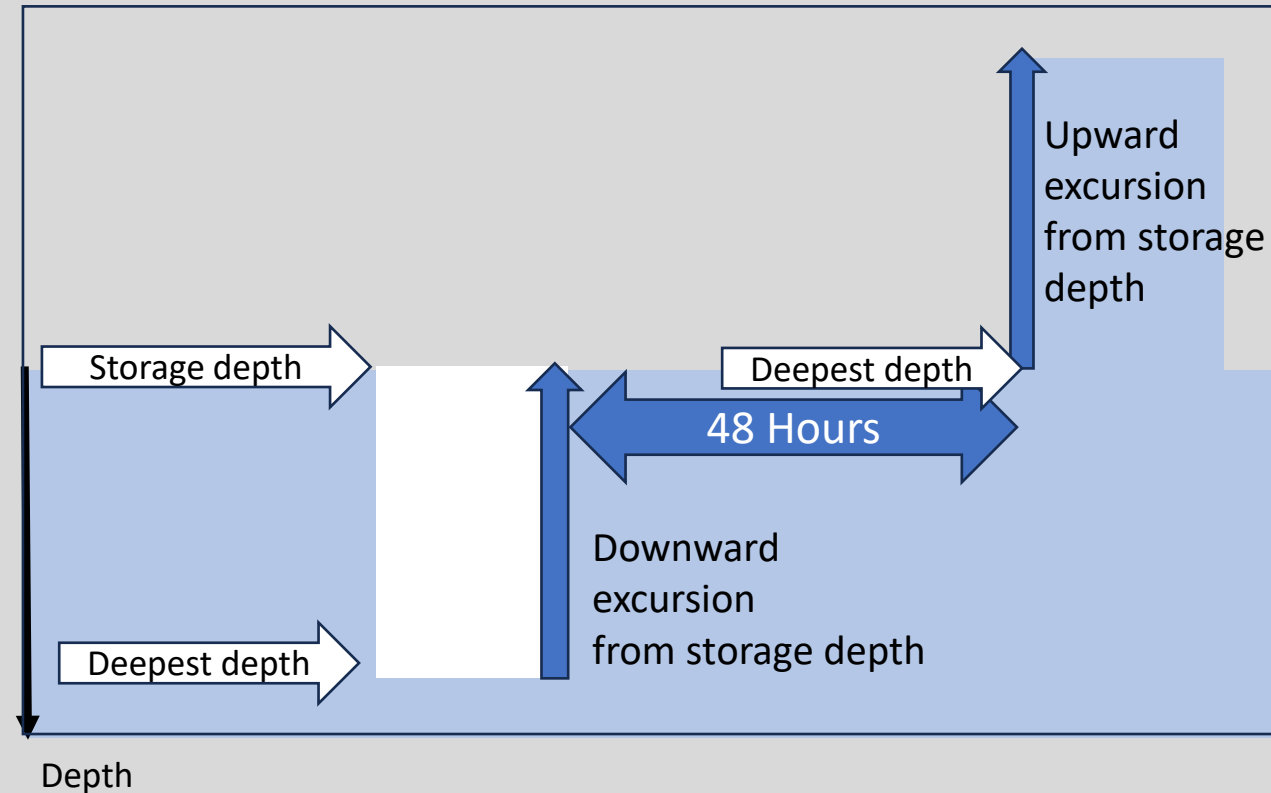
1977 US Navy Diving Manual



US Navy Diving Manual

Unlimited excursion duration

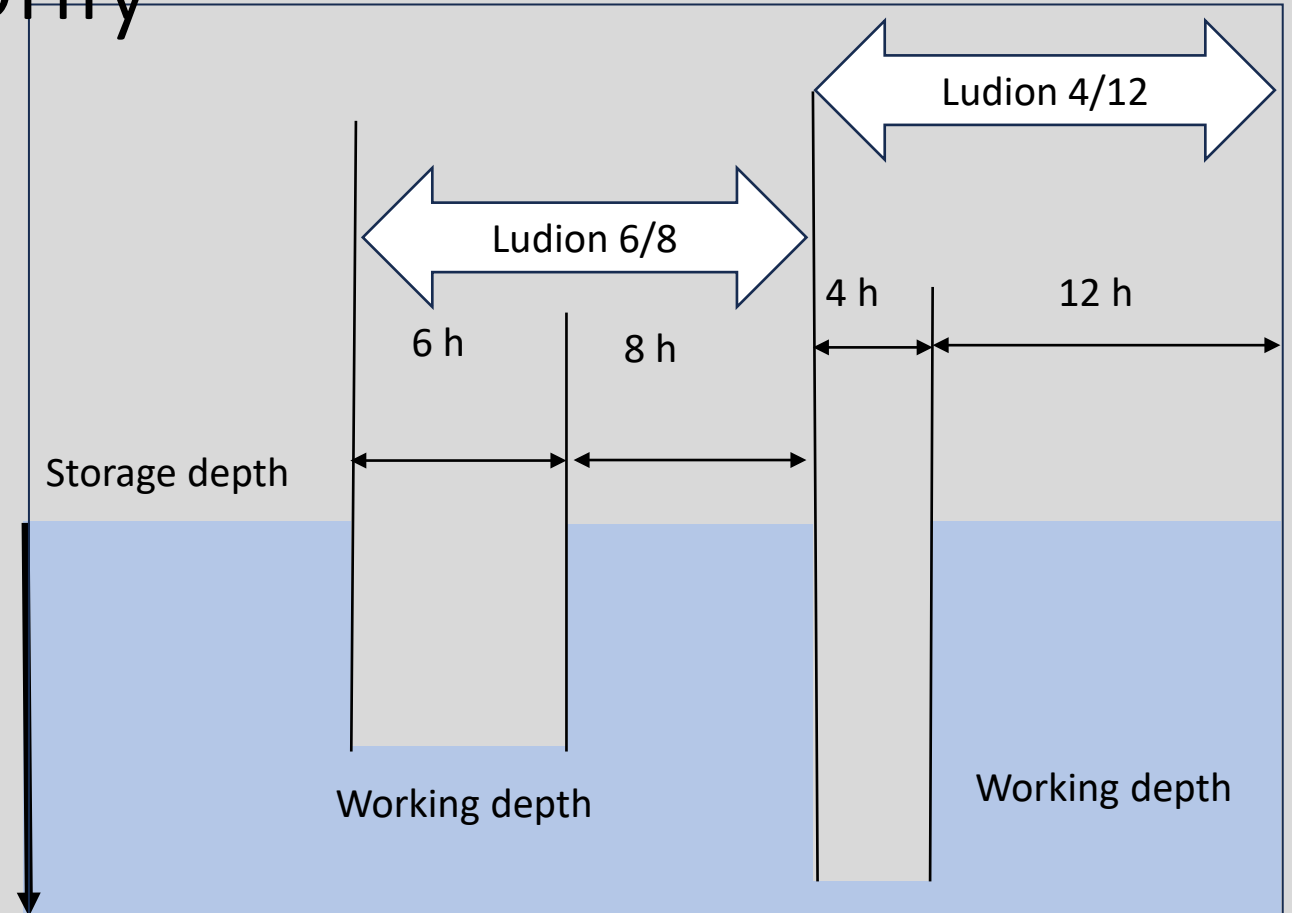
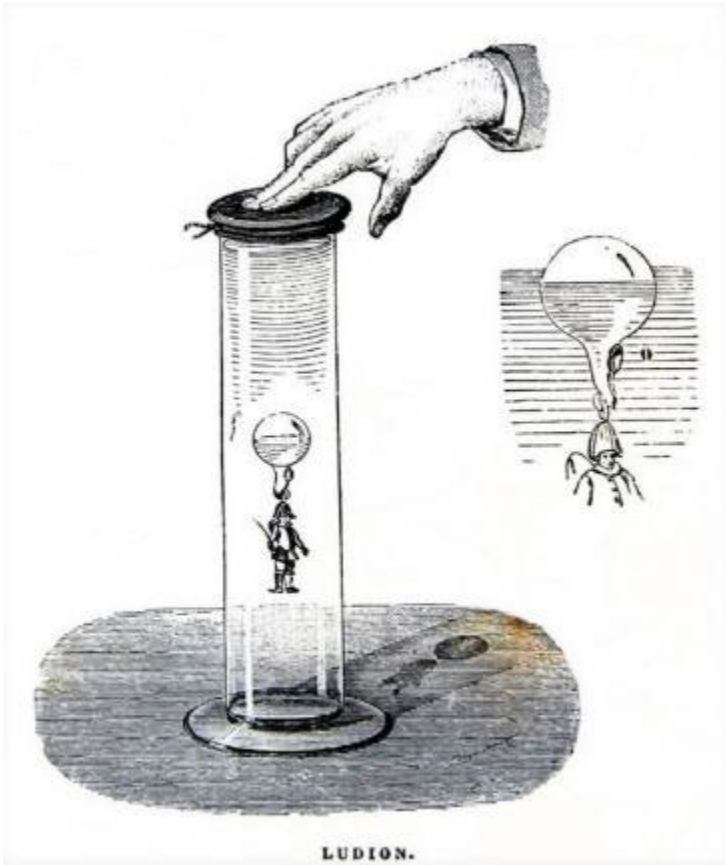
Defined from the Deepest Depth



1974 Comex Diving Manual



1974 Comex Ludion Excursions concept Descending excursion only

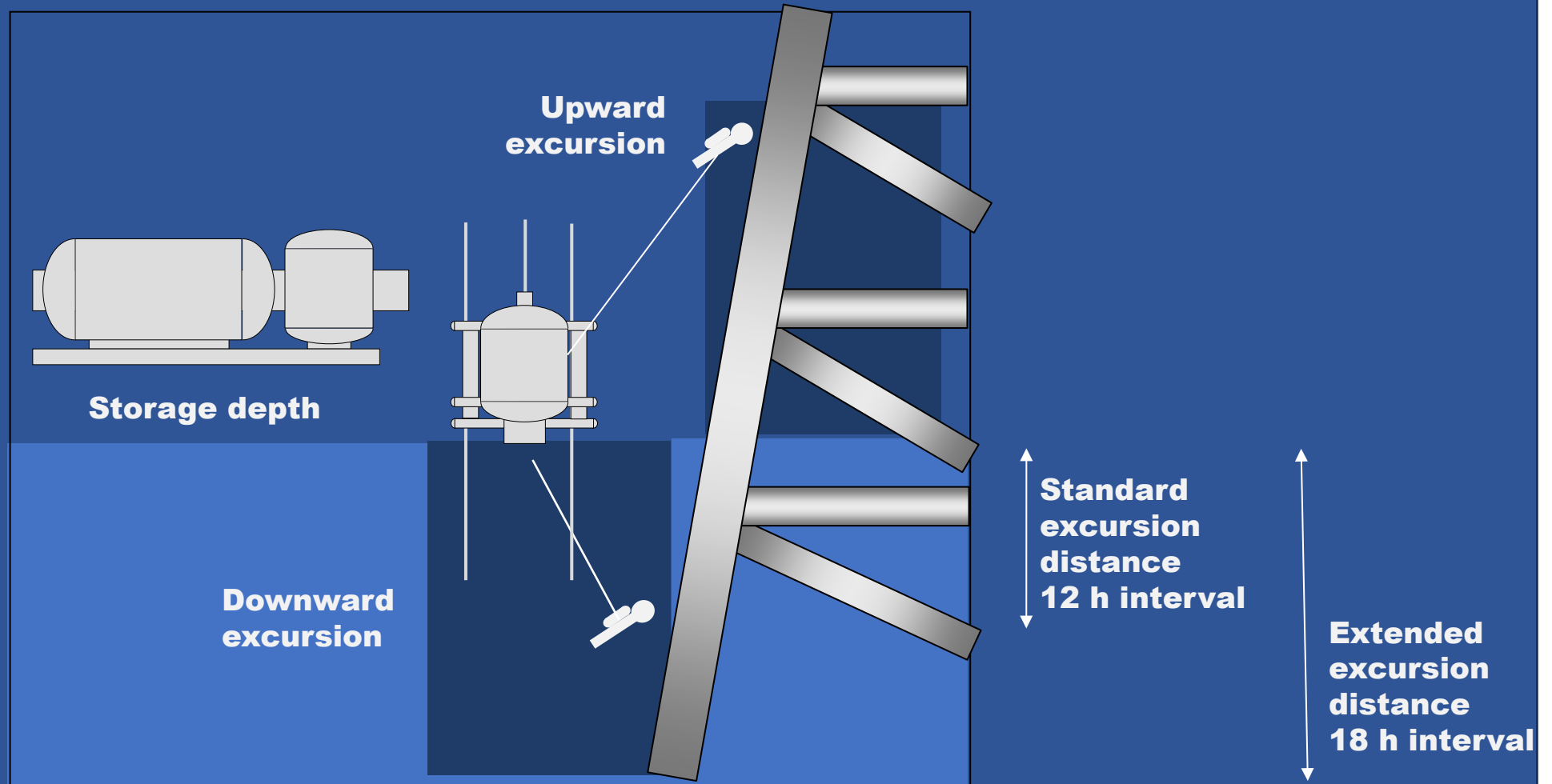


The 1980s

Development of Inspection/Repair/Maintenance



Standard and extended excursions

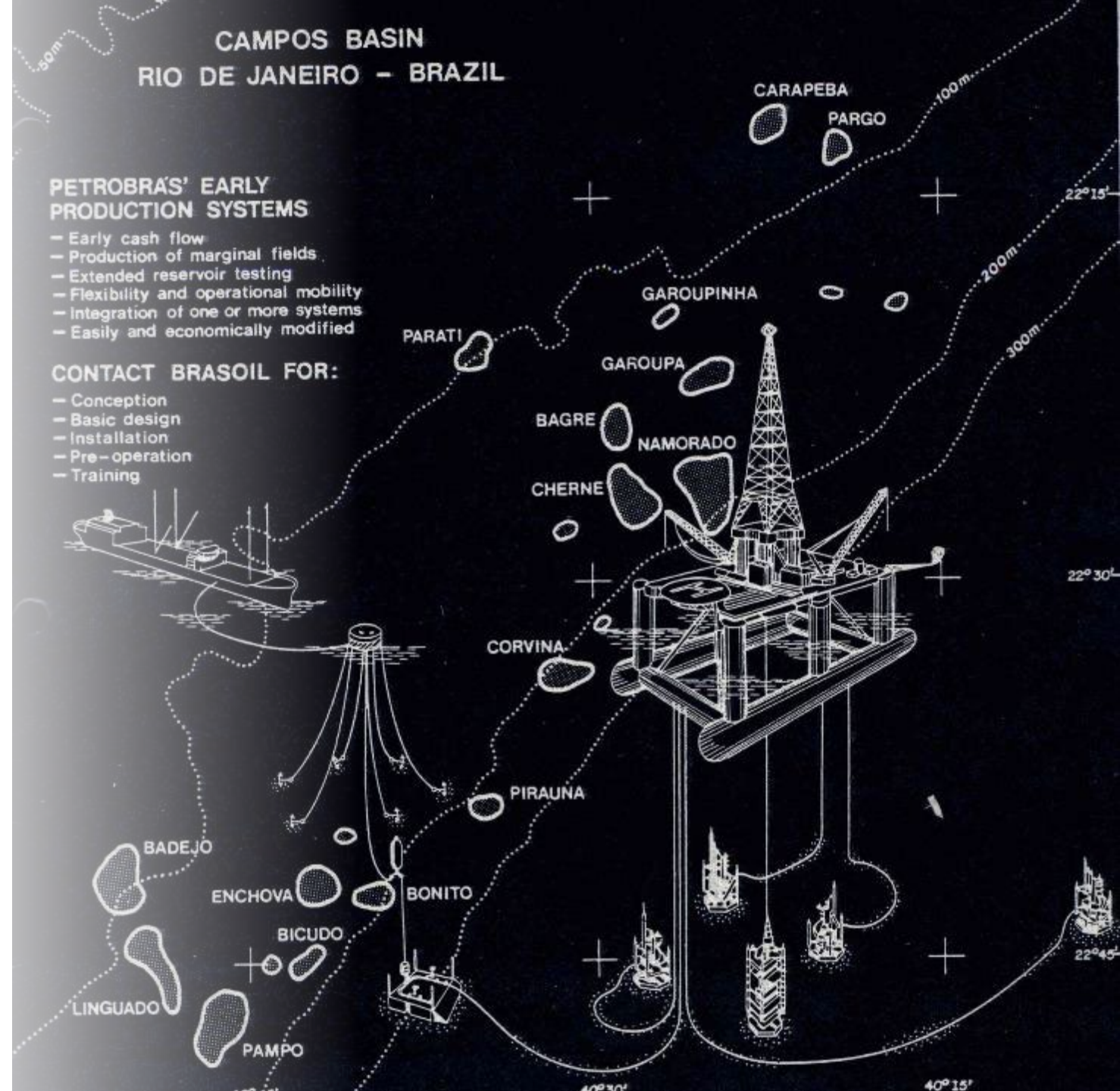


The 1990s



The deeper end

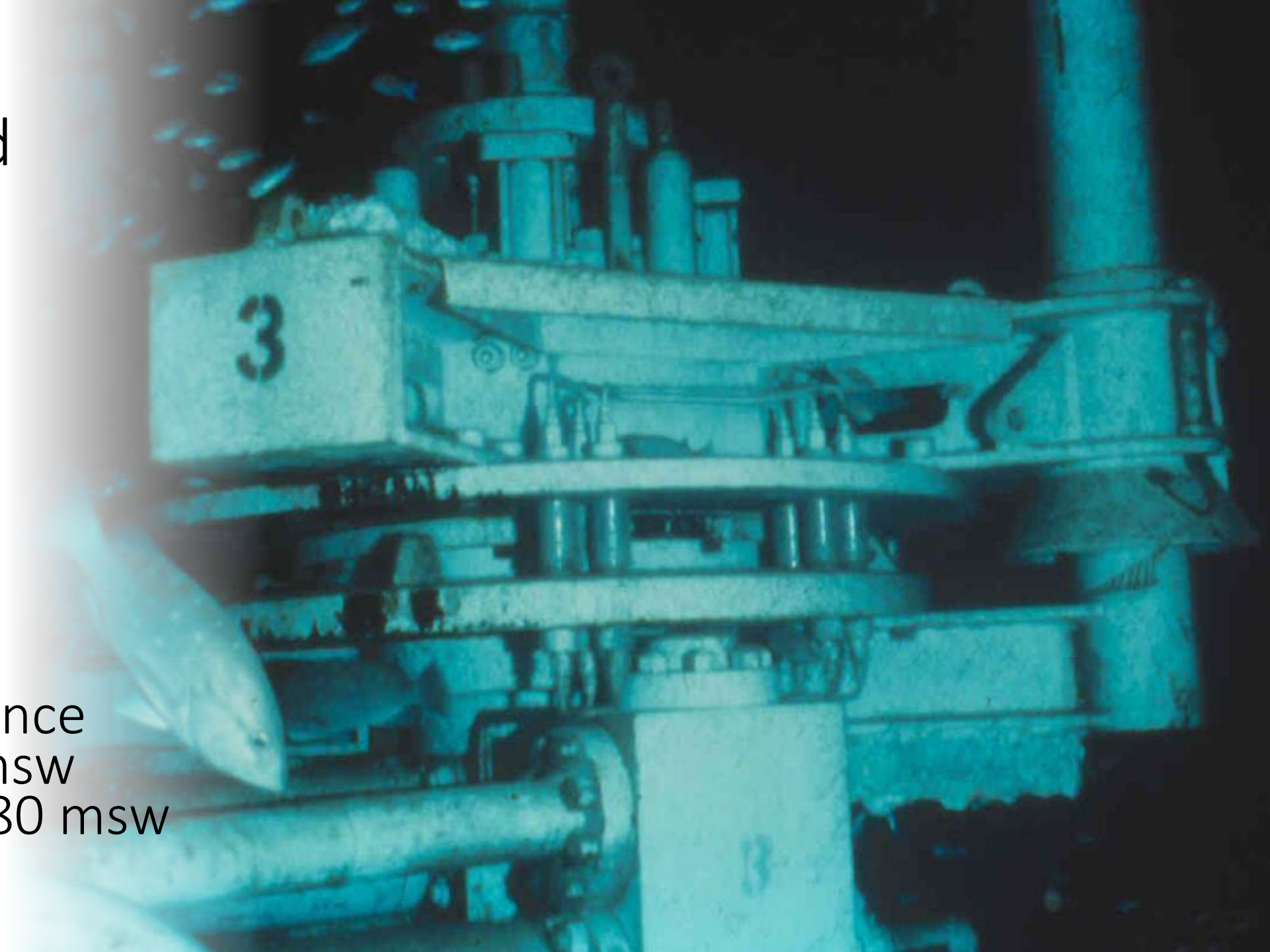
Brazil deep diving
in the campos field



Pirauna 3
Campos field
316 msw

Normam-15

Excursion distance
limited to 15 msw
deeper than 180 msw



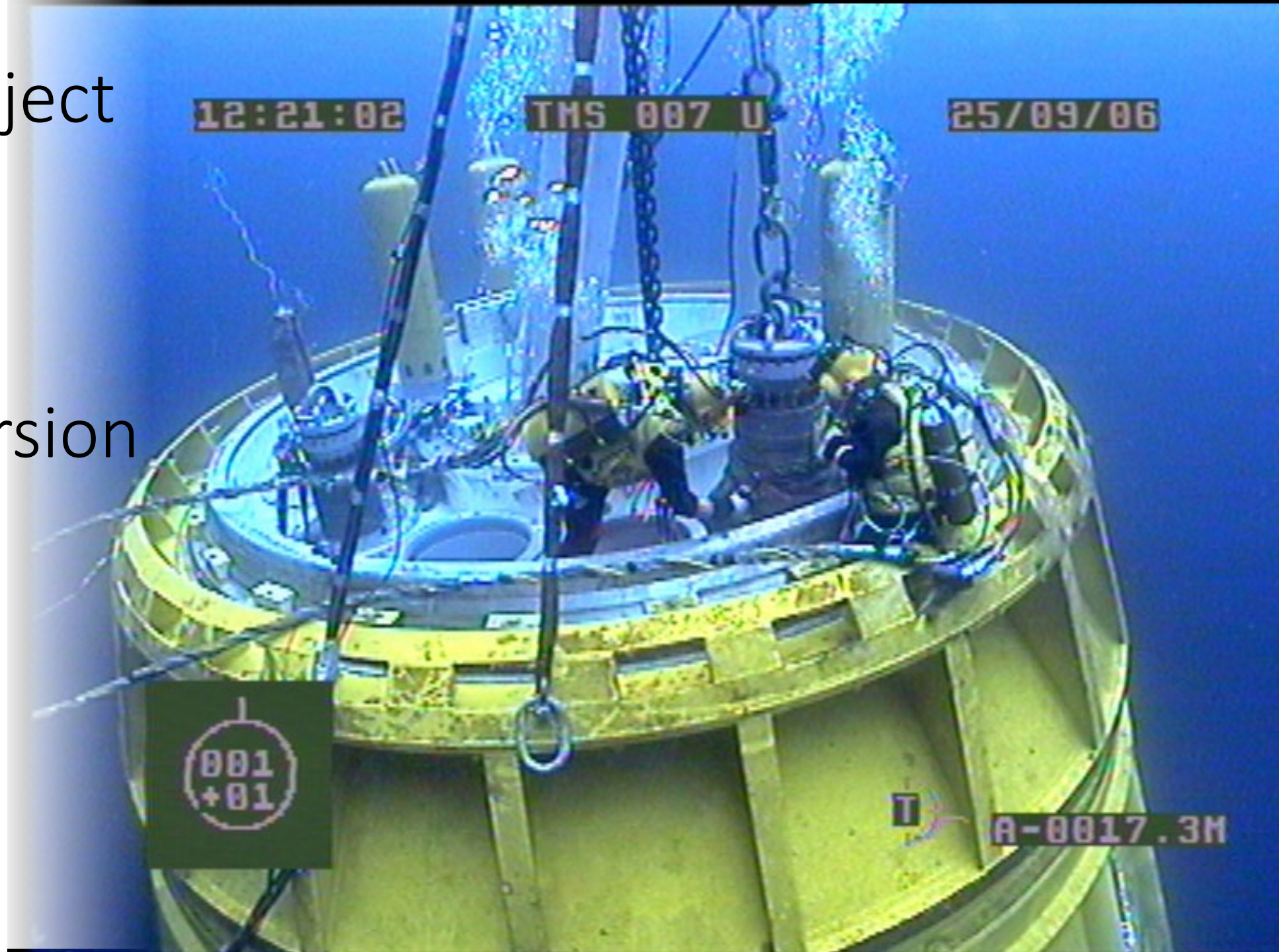
The shallower end

Extending the
work capacity of
expensive DSVs



Alvheim project
Norway
14 msw

4 msw excursion
distance



1999

The Norsok Standards

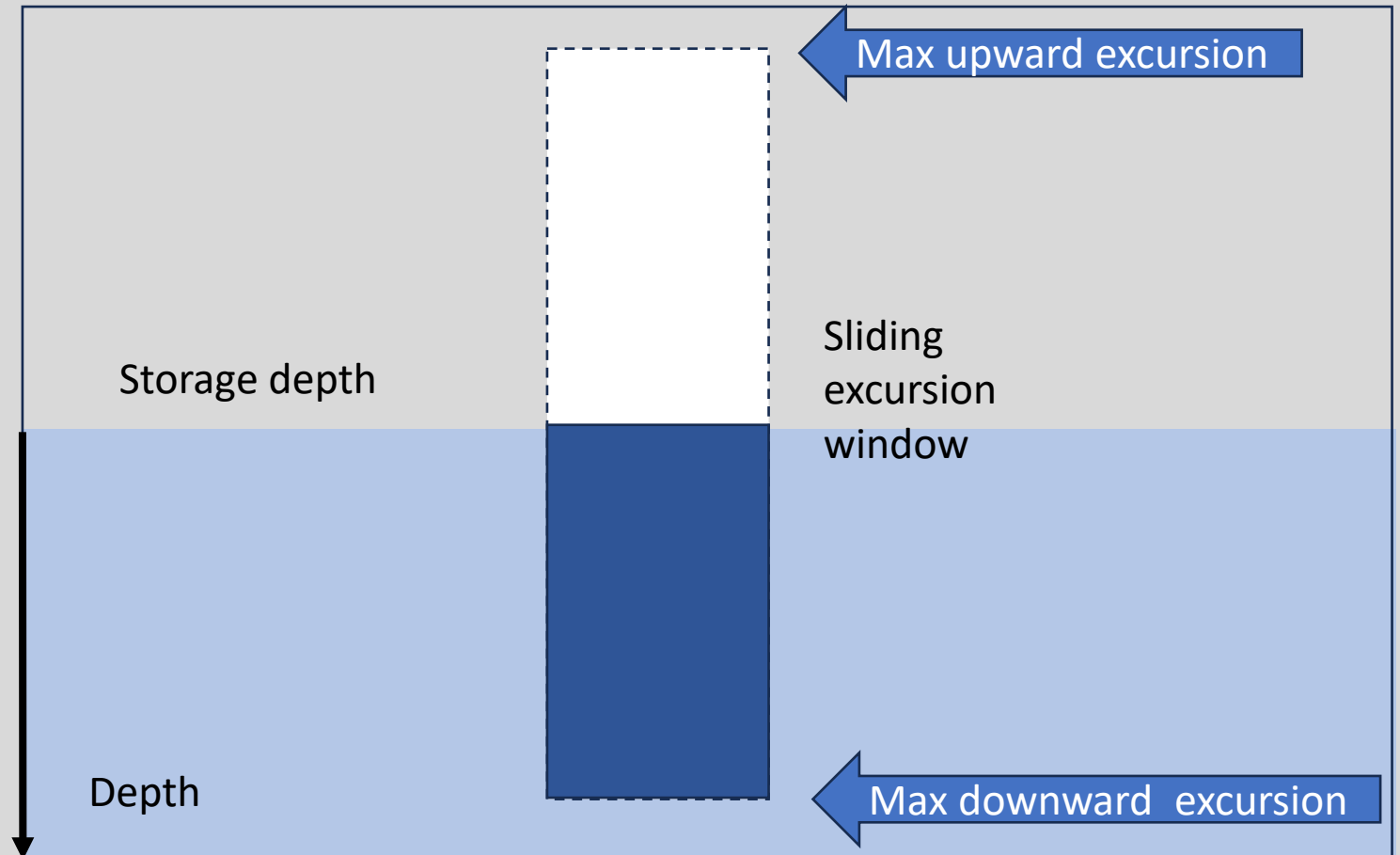
Storage depth (msw)	Ascending distance (msw)	Descending distance (msw)
40 to 59	8	8
60 to 79	9	9
80 to 99	10	10
100 to 119	11	11
120 to 139	12	12
140 to 180	13	13



Evolution
since the
2000s



The sliding excursion window defined on the last 12 hours deepest depth

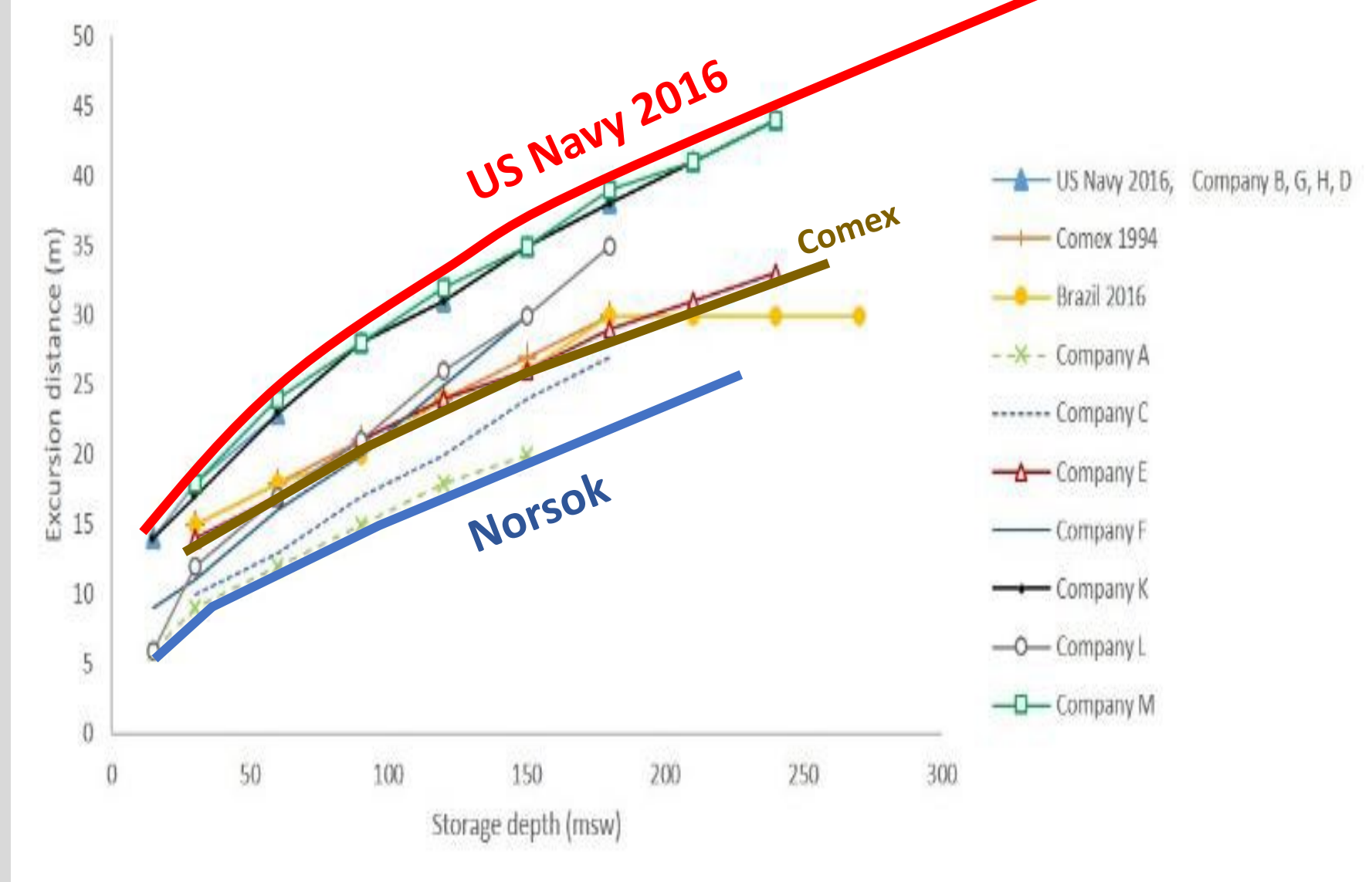


Current practice



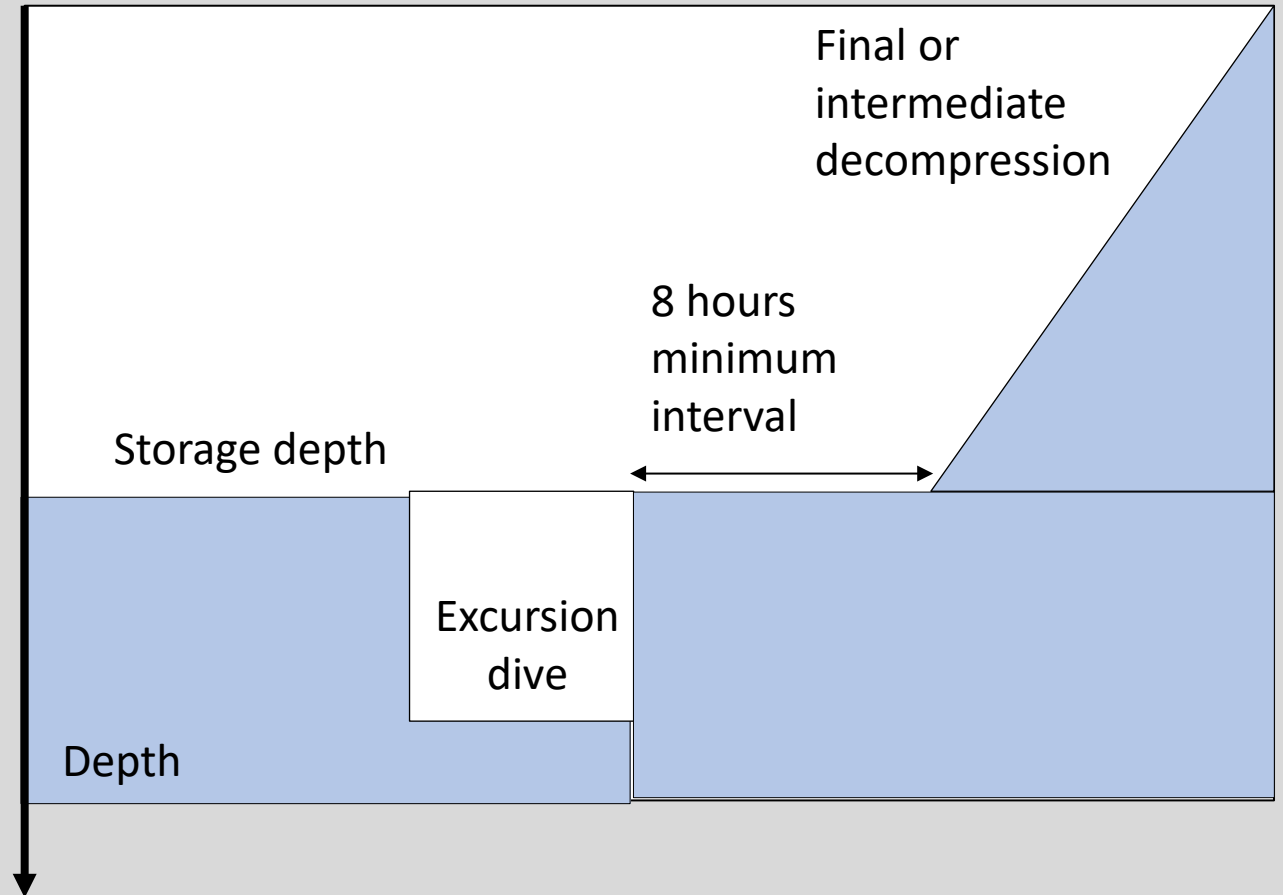
The current practice

Extended or Maximal excursions

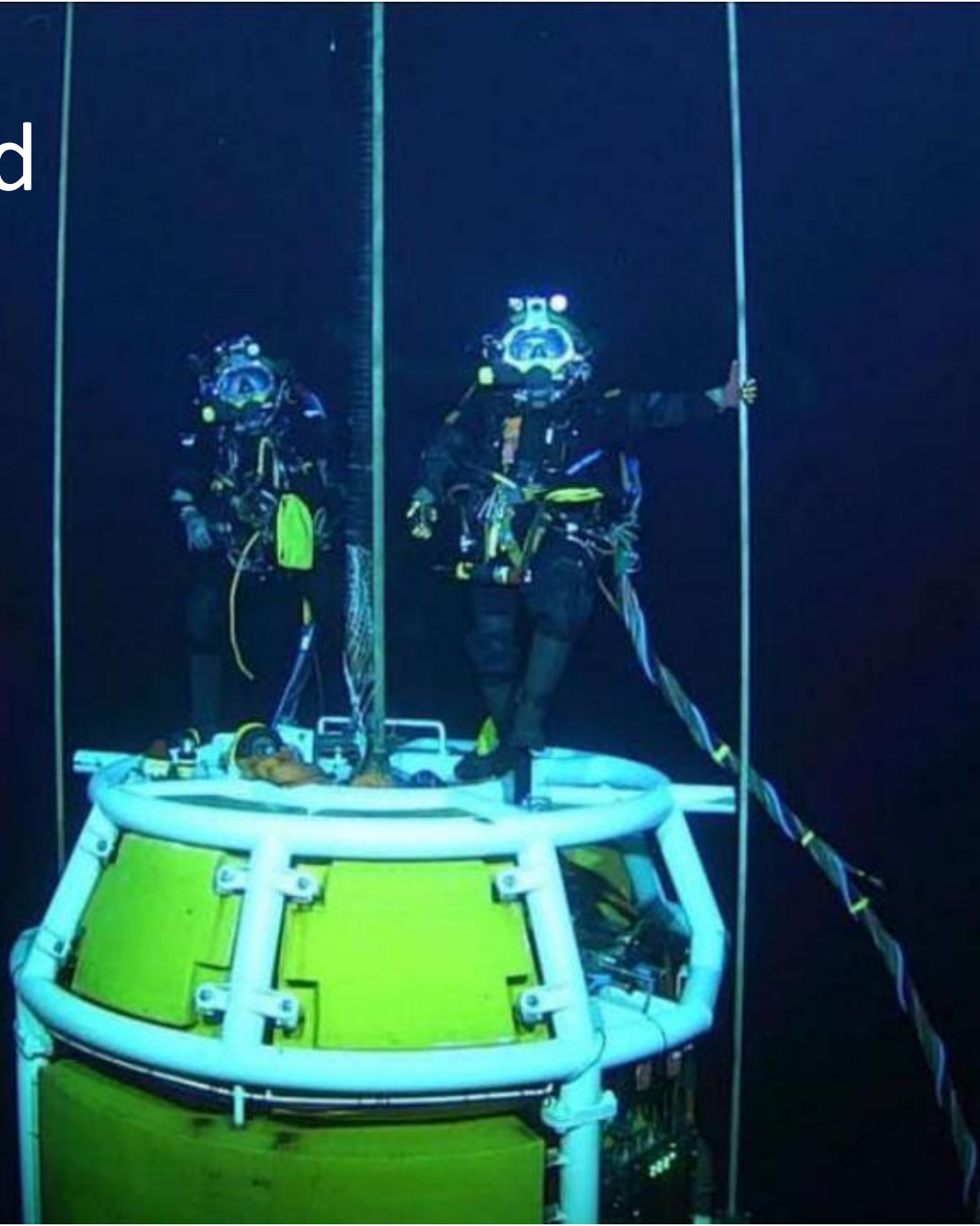


Policies

A minimum decompression hold of 8 hours



Lessons learned



Current
excursion
procedures are
the result of a
little bit of
sciences
(a long time ago)



But mostly of
commercial pressure
(seeking flexibility)



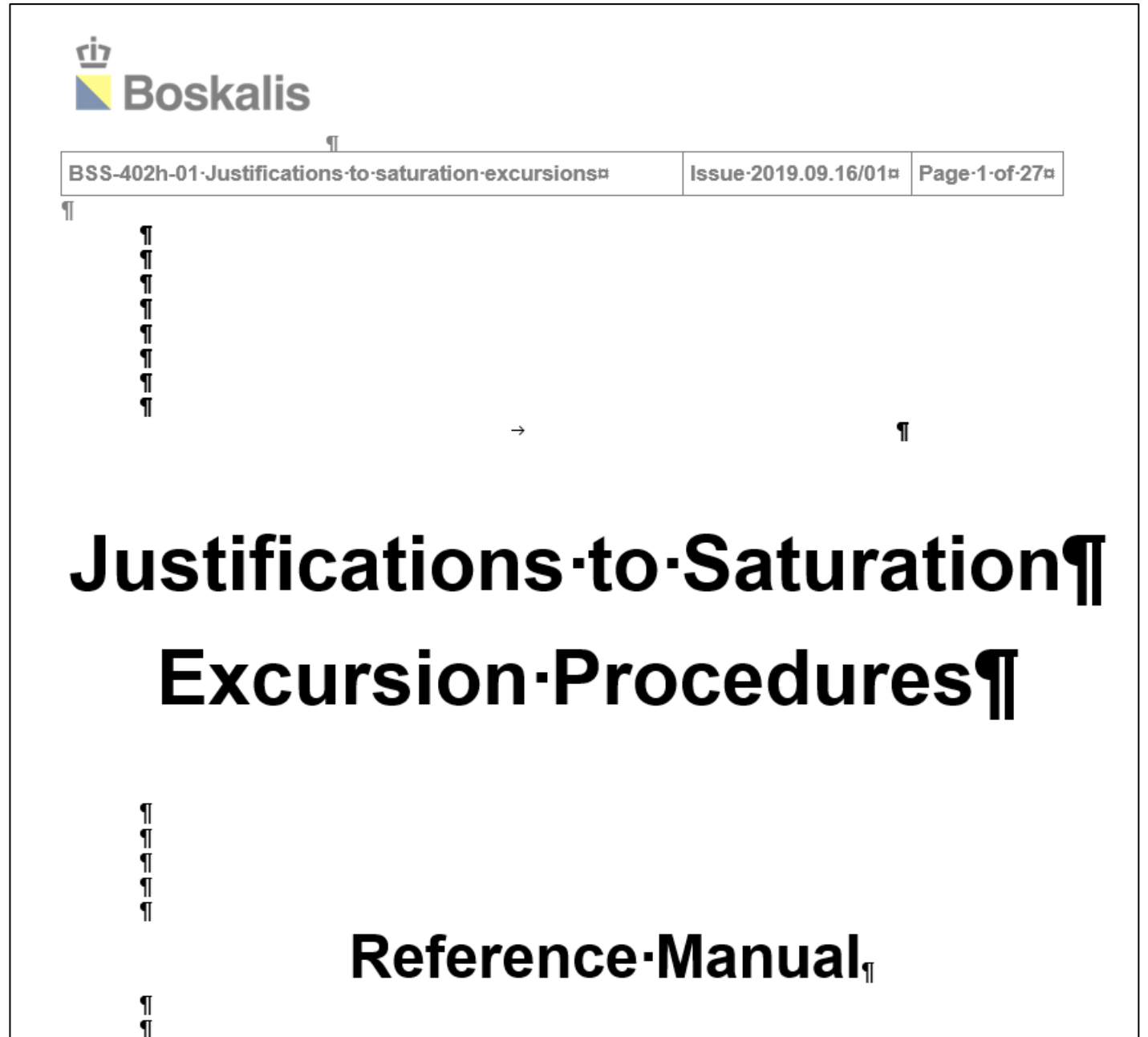
The empirical approach was predominant

(Diving supervisors' talent)



Recommendation 1

Companies must document the history and evolution of their diving procedures



Recommendation 2

Companies should
implement divers
monitoring to collect
data

August 2022
Total Energies
Tyra project, Denmark
Boskalis Atlantis



Evaluation of North Sea saturation procedures through divers monitoring
Jean-Pierre Imbert, Axel Barbaud, Sian Stevens, Craig Miller, Hilary Peace, Helene Rossin, Alain Letourneur, Philip Bryson, Bo Damsgaard, Costantino Balestra