Safer Diving Methodology

The ANDI Perspective

ANDI INTERNATIONAL

by

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Executive Director

Safety begins at the beginning. We are all safe. Every brand of training has evolved from its beginning and is safer than earlier iterations.

Equally so with **ANDI**. This is our 30th year and our history is a part of diving history.

Certain elementary concepts and procedures have been implemented after hard lessons. They are critical to the process. Let me share my perspective.

The beginning of the beginning is ATKEE

A T K E E

- Developing a proper ATTITUDE
- Commitment to quality TRAINING
- Comprehensive KNOWLEDGE
- Adequate Quality EQUIPMENT

- Earned EXPERIENCE

"ATKEE" is key to Safer Diving.

Its importance increases with dive difficulty

Industry research tells us that 57% of all fatalities involve "loss of gas", "out of gas" or "sharing gas".

If we are really focused on diving safety, insure that we always have breathing gas available. Obvious but missing from most methodologies.

Since 1988, **ANDI** trains the novices **at the entry level** to think this way. The RBS is the Redundant Breathing System as originally designated by **ANDI**.

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Redundant Breathing System…. ANDI Labeled

Equipment Labeling Products

Safety begins at the beginning. Quality breathing gas is certainly the beginning. The deeper we dive, the more significant this becomes.

The **ANDI** concept of SafeAir is misunderstood by most. **SafeAir®** is the epitome of proper breathing gas handling from the compressor pre-filter to the diver's mouthpiece. **ANDI** deveoped the first standard for oxygen-compatible-air in 1988.

SafeAir® is a registered trademark of **ANDI**. It is defined as any Oxygen-Enriched Air mixture with O_2 concentrations between 22% and 50% that meet **ANDI**'s gas quality and gas handling specifications.

If is not **SafeAir®** it is only Nitrox

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Gas Nomenclature. Change for the sake of change is illogical. What is Nitrox? What is Heli-Ox? Why change it to Oxy/Nite and Oxy-Hel?

Many accidents occurred due to the "Wrong Mix" scenario. Wrong cylinder. Wrong mixture. Wrong regulator on the correct cylinder. Forgot to switch gas. Wrong gas for the depth.

ANDI developed the cylinder wrap decal, contents tag and D/V labeling to address some of these points.

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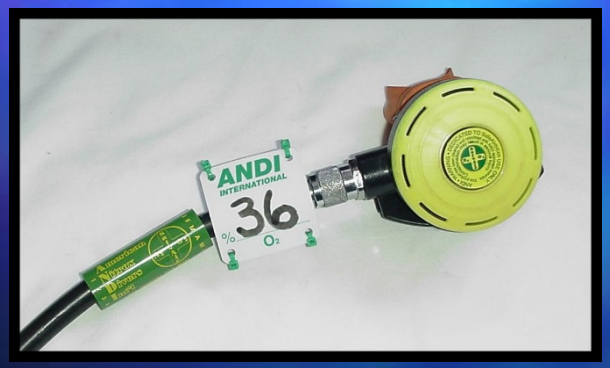
The Gas Switch procedure for technical diving was an obvious need (to us). It eliminates several causes of the "wrong gas scenario".

Anytime that a team member is switching gas or set-point, they signal the team. When performed correctly each member knows what the other is breathing. Fast & easy but a valuable safety back-up.



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Keeping the team together can be problematical in certain conditions; more difficult for newbies. Since the early 70's I have been teaching my students a specific descent procedure that has proved effective. Island Scuba Centers originally used this during ocean wreck diving. **ANDI** adapted this for technical and rebreather diving and it works exceptionally well.

Importantly, this is taught to **all levels** of divers in all of the programs. It is an essential part of **ANDI** training methodology.

ANDI Descent Procedure

ANDI Descent Procedure L2

Before descent – System Check

- 0 m

Signal “OK to Descend”

Stop @ 2 m & Check ….

- 2 m

System leaks, Buoyancy control, Buddy contact, Equipment location & security, Correct Gas

Signal “OK to Descend”

Equalize at your own rate.

- 5 m

Stop @ 5 m & Check ….

Buddy Contact & Equalization

Signal “OK to Descend”

Equalize at your own rate.

-10 m

Stop @ 10 m & Check …. all of above

Signal “OK to Descend” & Stay together

We call this the “2-5-10” or “5-15-30” Descent. It is the same for <u>all</u> ANDI training.

ANDI Descent Procedure L2

Before descent – System Check

- 0

Signal "OK to Descend"

Stop @ 5 ft & Check ….

- 5 ft

System leaks, Buoyancy control, Buddy contact, Equipment location & security, Correct Gas

Signal "OK to Descend"

Equalize at your own rate.

Stop @ 15 ft & Check ….

Buddy Contact & Equalization

Signal "OK to Descend"

Equalize at your own rate.

- 15 ft

Stop @ 30 ft & Check …. all of above

Signal "OK to Descend" & Stay together

-30 ft

We call this the "5-15-30" or "2-5-10" Descent.
It is the same for <u>all</u> ANDI training.

ANDI Descent Procedure – L3-5

Before descent – System Check

- 0 m

Signal “OK to Descend”

Stop @ 2 m & Check ….

- 2 m

System leaks, Buoyancy control, attitude, Buddy contact, Equipment location & security
Correct gas

Signal “OK to Descend”

Equalize at your own rate.

- 5 m

Pause @ 5 m & Check ….

Buddy Contact & Equalization

Signal “OK to Descend”

Equalize at your own rate.

-10 m

Pause @ 10 m & Check ….. buddy contact

Equipment location & security

Signal “OK to Descend” & Stay together

ANDI Descent Procedure - CCR

Before descent – System Check

- 0 m

Signal “OK to Descend”

Stop @ 2 m & Check ….

- 2 m

System leaks, Buoyancy control, Buddy contact, Equipment security & Correct PO2

Signal “OK to Descend”

Pause @ 5 m & Check ….

All of above + Equalization & Counter-lung volume

Signal “OK to Descend”

- 5 m

Stop @ 10 m & Check …. all of above, Perform ANDI Gas Switch Procedure & Switch Set-point to target setting

Signal “OK to Descend”

-10 m

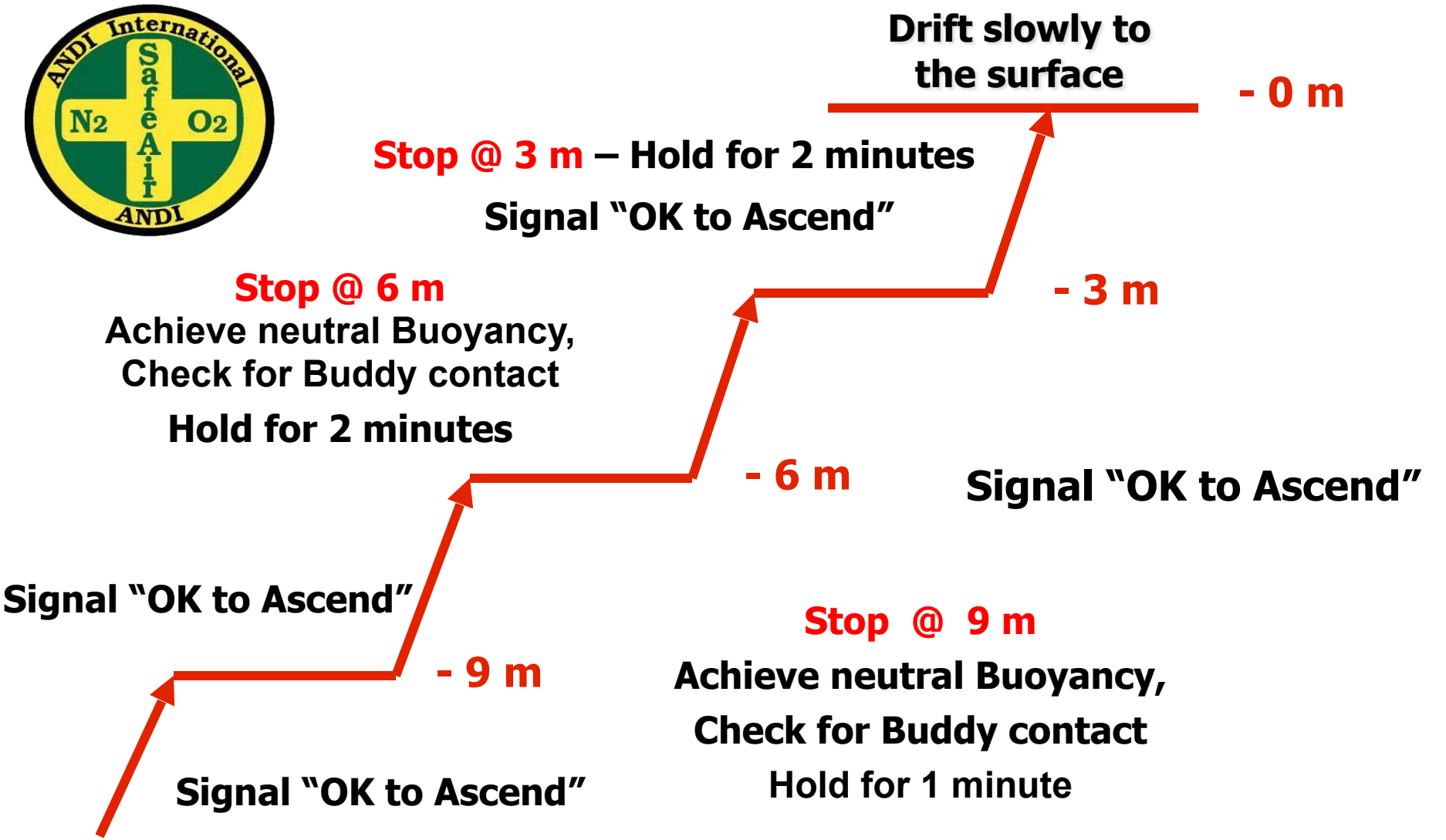
The evolution to safer diving procedures told us that every dive is a decompression dive. During the 1970"s a study of existing tables proved them unreliable as "unearned hits" were common. This illustrated the need for slower ascents and even "safety stops".

My early diving consisted of two Stop-Required dives per day. We also did stops deeper than required. Results: perfect safety record. Early support for safer tech diving, contrary to the industry norms.

The **ANDI Ascent Procedure** is the result.

Importantly, this is taught to all levels of divers in all of the programs. It is an essential part of **ANDI** training methodology.

ANDI Ascent Procedure – L2



ANDI Ascent Procedure – L3-5

Drift slowly to the surface

- 0 m

Stop @ 3 m – Neutral Buoyancy
Complete the Required Stop

Signal "OK to Ascend"

- 3 m

Stop @ 6 m – Neutral Buoyancy
Perform ANDI Gas Switch Procedure
(if required)
& Complete the Required Stop

- 6 m

Signal "OK to Ascend"

Signal "OK to Ascend"

- 9 m

Stop @ 9 m
Achieve neutral Buoyancy,
Check for Buddy contact
Complete the Required Stop

Signal "OK to Ascend"

ANDI Ascent Procedure - CCR

Drift slowly to the surface

- 0 m

Stop @ 3 m – Hold for 2 minutes

Signal "OK to Ascend"

Perform *ANDI* Gas Switch Procedure to to 0.7 or less

- 3 m

Stop @ 6 m – Hold for 2 minutes

Perform **ANDI** Gas Switch Procedure

& Switch Set-point to 1.45 or less

- 6 m

Signal "OK to Ascend"

Signal "OK to Ascend"

Stop @ 9 m - Hold for 1 minute

Achieve neutral Buoyancy,

Check Buddy contact & Handsets

- 9 m

Signal "OK to Ascend"

Sharing Gas

It doesn't matter whether you breathe from & donate the long hose or keep your short hose for you and donate the long hose. Donate the hose from the left side or donate from the right side clipped; keep or give-away what's in your mouth. As long as every member of the **experienced diver** team reacts the same way. Practice & practice.

But…… How do we train the newbie? Is this the same for our tech dive team?

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Sharing Gas

Any psychologist will explain that we must over learn an emergency-reaction drill so that we can perform correctly under stress.

Newly learned skills are often discarded for earlier versions. It would be a major improvement if there **were no earlier** versions.

ANDI trains all levels with the same basic procedures for gas sharing, gas switching, descents, ascents and more.

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Pressure Monitor

When I began my diving career there was an equipment debate that received much attention. The question was,

"Is this new product, the submersible pressure gauge a necessary item? We have had good service from the Reserve valve. Do we need the extra hose, failure points and expense?"

Really? Yes….. this was a training debate for 6 years.

Pressure Monitors must be fitted on each primary breathing system if the gas is part of the dive plan. A bail-out gas is not but deco gas is part of the dive plan.

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CCR Procedures

Checklists … Finally we all agree. A necessary part, not only of the training but of the actual pre-dive procedure.

Another **ANDI** Standard ….. Every CCR team member must be able to donate and accept gas into the loop. Regulators must be fitted with compatible inflator hoses.

Long championed by **ANDI**, these are now part of the Rebreather Training Council minimum standards.

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“Deep Stops”

How about “deep stops”?

There is an evolution here as I mentioned earlier.

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History

In 1990 ANDI was working with Carmellan Research and American Underwater Products (Oceanic) on evaluating software to be used in electronic CCR's.

This software was programmed to incorporate a "deep stop" that was heretofore untested in explorational and recreational diving.

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History

- Two factors triggered the software- mandated deep stop.
  - The diver was ascending.
  - 50% of the maximum depth was reached
- A required 2 minute stop was performed as the CCR adjusted the breathing mix to 1.6 ata. The algorithm also required short stops at each 3m interval. SOP today but a bit weird in 1990.

- This system proved to be more and more valid as zero recorded hits occurred despite what was then considered very extreme profiles.

History

ANDI employed the "Living Laboratory" method. Deep stops became part of our diving protocol although we were not totally clear on why it was working so well.

When the RGBM decompression algorithm became a topic of discussion and became available, ANDI was receptive to implementation.

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History

In 2003, ANDI made a decision after our initial evaluations by the ITD Board to change the ANDI DivePlanner software algorithm which was solely Haldanian-based to the variable RGBM model.

The ANDI -Gap DivePlanner

was implemented into our training methodology in February 2005.

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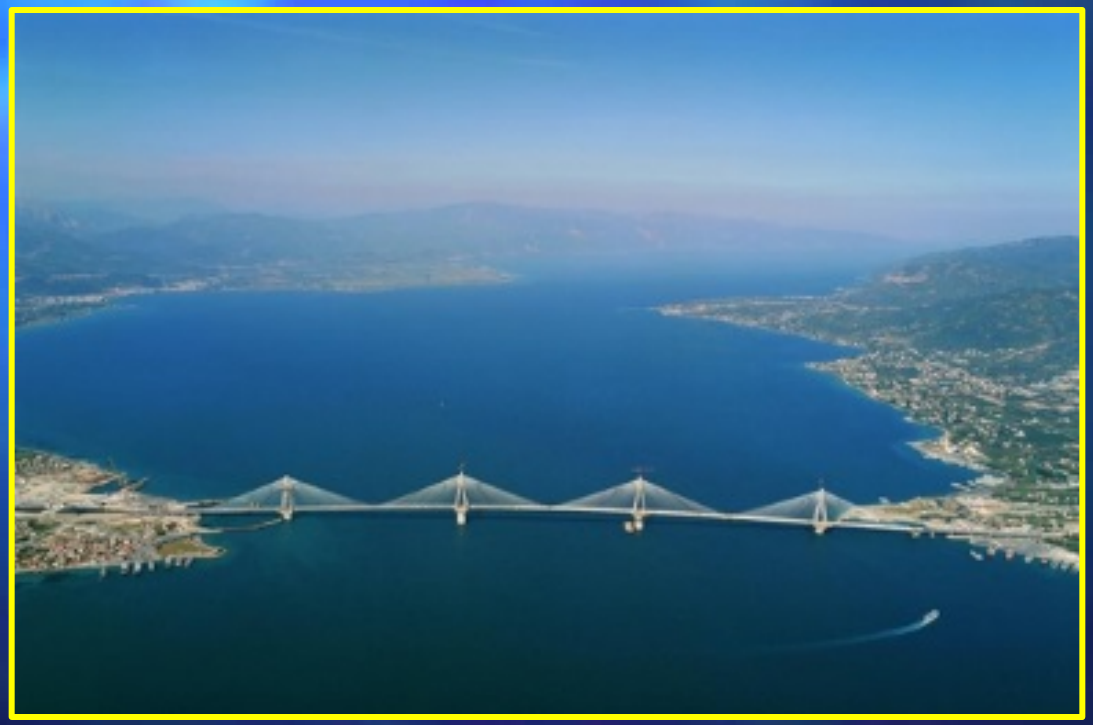
Data Collection & Experience

In 1999, ANDI trained a team of commercial divers for the building of the Rio Antirrio Bridge

Data Collection & Experience

Rio Antirrio Bridge

The world's longest multi-span, cable-stayed bridge. It crosses the Gulf of Corinth near Patras, linking the town of Rio on the Peloponnese to Antirrio on mainland Greece.



Data Collection & Experience

Rio Antirrio Bridge

Constructed using the ANDI System

ProDive Hellas completed

5472 SafeAir/Nitrox

1145 Tri-Mix dives

0 dives using Air

Depths 0-78m

Zero DCI symptoms

Zero accidents

Data Collection & Experience

2004

Israeli Navy

ANDI was selected to train all of the deep divers and sub-mariners.

ANDI built the gas dispensing system at the Yaltham – Haifa Navy base.

Ed Betts continues as the team's technical advisor

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Data Collection & Experience

From 2004 - 08

More than 1,000 dives completed 60m – 103m

Zero incidents

Israeli Navy

continues to use the ANDI Training System

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Data Collection & Experience

Shipwreck Consortium

ANDI was appointed as the diving supervisor for the archeological and treasure salvage project.

ANDI selects, supervises & trains all of the divers.

Data Collection & Experience

Shipwreck Consortium

18 divers

870 dives to date

Depths to 64m

Zero incidents

Data Collection & Experience

Twilight Zone Expedition - 2004

14 divers

63 dives

12 males / 2 females

Ages 23 - 61

Depths to 156m

17 dives >500 fsw

Zero incidents

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Data Collection & Experience

Twilight Zone

Expedition

A huge success

5 new species discovered

Photo of juvenile Coelacanth

1st Stop – 92m

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Implementation of ANDI-Gap DivePlanner within the ANDI System

We are not scientists, research physiologists or mathematicians. We are engineers, instructors and working divers. What works for us is what we will use.

Zero bends incidents on our expeditions, operations and training courses.

Zero claims made against our insurance program in our entire history.

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Conclusion

We estimate that although ANDI is operating beyond the average dive depth and difficulty, our safety record proves that we are VERY, VERY lucky!

Decompression technology is still more an art and a bit less than a science. Admitting that we are not "the experts", ANDI will continue to use this methodology in our art and strive to better understand the science.

Conclusion

These methods and procedures have served us well.

We are pleased to have had the opportunity to share them with you and hope that you will consider incorporating them into your programs.

Thank you .....

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Leaders in Safer Diving

(for 30 years)