Diving Medicine in Special Operations: A Special Tactics Perspective

H. Leo Tanaka, Maj, USAF, MC, SFS, DMO
24TH Special Operations Wing
Air Force Special Tactics

Disclaimer

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24th Special Operations Wing

* The 24 SOW Mission is to: Conduct global air, space, and cyber-enabled special operations across the spectrum of conflict to prepare for, fight and win our nation’s wars. Delivering superior performance to the nation in global access, precision strike, personnel recovery and battlefield surgery.
**Special Tactics Capabilities**

**GLOBAL ACCESS**
- Force Projection
- Assault Zone Reconnaissance
- Environmental Recon/Terrain Analysis

**PRECISION STRIKE**
- Terminal Control/ Guidance Operations
- Interdiction and Strategic Attack
- Direct Action

**PERSONNEL RECOVERY**
- SOF Tailored Recovery: Sensitized Material/ Personnel
- Battlefield Trauma Care
- Technical Rescue

**BATTLEFIELD SURGERY**
- Level I Care Capabilities
- Forward Surgical Operations
- Extended Golden Hour

**COMMAND & CONTROL**
- CONOP Development
- Authorities and Approvals
- Risk Management

**SOF CORE SKILLS + Specialized Air/Ground Integration = Unique Air Solutions for Ground SOF Problems**

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**STT Combat Capabilities**

- Combat Dive (Open/Closed)
- Airborne
- Military Free Fall
- Demolition
- Standard SOF skills
- NREMT Paramedic
- Technical Rescue
- Air Traffic Control
- Precision Fires (JTAC qualified)
- Environmental Reconnaissance

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**ST Diving**

- Requirement
- Numerous Missions Have Involved Rescue/Recovery
- Closed Circuit As Qualification
  - AFI which dictates that Closed Circuit Ops Require DMO/DMT
  - Often not Current
- Anticipate Continued Personnel Recovery/Rescue
Diving Medicine

- Different Types of Diving
  - Open
    - SCUBA
    - FFM (MK 20)
    - Dry Suit
  - Closed Circuit
- Major Medical Conditions
  - DCI
  - AGE
- Medical Requirements
  - Medical Standards
  - Disqualifying Conditions

ST Medicine

- Flight Surgeon
- Physician Assistant
- Independent Duty Medical Technician
  - Nurse
  - Paramedics
  - Medical Admin
  - Ops Psych
  - Social Worker
  - Physical Therapist
  - Athletic Trainer
  - Strength & Conditioning

Why Important?

Video Courtesy of LT Thijs Wingelaar, MD
Dive Medical Physician, Diving and Submarine Medical Center, Royal Netherlands Navy
### Blackhawk Crash

- March 10, 2015: 4 aircrew and 7 special operators on UH-60 lost in bad weather
- Army asked for USAF assistance on day 2; ST dive ops began day 3
- Navy UMO was on scene (stayed at morgue)
- Chamber was up 24/7 during 10 day operation
- 93% of human remains recovered
- 1400 mins of diving performed by 2 teams

### Traditional DMO Pipeline

- Recognition and Treatment of Diving Injuries
  - Navy Standards
  - Chamber Time
  - Course for HMO/USA
- Naval Diving and Salvage Training Center
  - SCUBA
  - FFM MK 20
  - KM 37 Hard Hat, Surface Supplied
  - (Just Added Closed Circuit Fam)
  - Course for UMO/USN, DMO/USA

### AFSOC ST DMO Pipeline

- NOAA Diver Modules 1-3
  - SCUBA
  - Full Face Mask
  - Drysuit
  - Nitrox
  - Special Tasks (lift bags, search and recovery, pneumatic tools)
- Recognition & Treatment of Diving Injuries (NDSTC)
  - Navy Standards
  - Chamber Time
- Familiarization for MK 25
  - Medicine
  - Building Rig and Diving
Operational Effects

- Closed Circuit Dive Mishap
- USAF Combat Diver on Vacation
- Special Tactics Assessment and Selection
- Special Tactics Pre-Scuba Course
- Thai Cave Mission

SOF Closed Circuit Case

- Who: Special Operator
- What: Possible O2 toxicity, DCS type II, treated for DCS as was worst possible scenario
- When: Autumn timeframe
- Where: East Coast
- Why: During a night 1500M Dragernavigation dive, diver surfaced with a headache and tunnel vision. He was given a neurological exam by the DMT, and at first they did not notice any neurological deficiencies. He became increasingly irritable, and the DMT continued neuro exams. When taken to shore, the DMT noticed a “deficiency with his gait,” and then another deficiency with his finger to nose test. They placed him on O2 and he immediately started to feel nauseous. Due to having 2 neurological deficiencies, he was taken to the chamber.

The day before, 19 OCT the team did chamber training with other military divers, with max dive at 130 feet. This dive was also one of the reasons why they wanted to rule out DCS. Max depth and bottom time for the dive where the incident occurred was 18 feet for 15 minutes. This was the 5th Closed Circuit navigation dive of the day. They did 2 x 500m day nav dives, 1 x 1500m day nav dive, and 1 x 500m night nav dive prior. Total time on O2 for the day was 125 minutes.

No DCI in Closed Circuit

- May Dive up to 20 FSW for up to 240 mins, OR maximum of 50 FSW for 10 minutes.
- Before diving, purge procedure required to ensure breathing 100% O2
- If purge is done properly, nitrogen has been removed from circuit and DCS risk lowered
- Primary concerns are O2 Toxicity or possibly AGE
- Oxygen “off-effect”
- If combat diver has increased physical exertion, can potentially have retained CO2 in rig
ST Combat Diver on Vacation

- ST member went on vacation to Europe
- Stayed beyond No Decompression limits
- Developed extremity pain that worsened
- Went to chamber

Assessment and Selection

- Hurlburt Field, STTS
  - All Officer selections
  - All Enlisted cross-trainee selections
- Cases of Dyspnea
  - Candidates who looked “fine” had SpO2 70-80%
  - Equipment Failure of pulse ox monitor?
- Physical Exam Initially “Normal”
- Forced Expiration reveals rales that increased
- Taken to ER

Pulmonary Edema in ER

- Classic symptoms: Dyspnea, Hemoptysis
- Classic signs: Hypoxia, Rales (wet)
- Typical cause: Cardiogenic
- Treatment: Positive Pressure
- Diuresis
Pulmonary Edema in SOF

- Assessments (Pool Sessions)
  - Swimming Induced Pulmonary Edema (SIPE)
  - Immersion Pulmonary Edema

Snorkel Pulmonary Edema

- Negative Pressure Pulmonary Edema

Incidence of SIPE

- <10% of candidates develop
- Spectrum of disease
- Some need inpatient care
- Risk Factors
  - Temperature
  - Fluid Intake
  - Activity
- Symptoms
- Signs
Loss of Consciousness

- During Underwaters
- “Shallow Water Blackout”
- Hypoxic Loss of Consciousness
- Not usually indicative of underlying disease

Thai Cave Mission

- June 23, 2018
- 08-10 JULY 2018
- 12 Thai boys and their soccer coach trapped in flooded cave system
- 320 STS/31 RQS tasked to assist with rescue/recovery

Open Source Reporting
Thai Cave Diagram

Staging Points

<table>
<thead>
<tr>
<th>Section</th>
<th>Approx. Distance</th>
<th>Current Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 → 8</td>
<td>350m</td>
<td>All underwater</td>
</tr>
<tr>
<td>8 → 7</td>
<td>150m</td>
<td>Dry</td>
</tr>
<tr>
<td>7 → 6</td>
<td>250m</td>
<td>All underwater</td>
</tr>
<tr>
<td>6 → 5</td>
<td>350m</td>
<td>Airspace overhead, swimmable</td>
</tr>
<tr>
<td>5 → 4</td>
<td>200m</td>
<td>All underwater</td>
</tr>
<tr>
<td>4 → 3</td>
<td>150m</td>
<td>All underwater</td>
</tr>
</tbody>
</table>

Thai Cave Dive Med

- AFSOC medics on ground
- PJs and CCTs diving SCUBA from Chamber 3
- Closest Chamber is Bangkok
- Hypothermia (water temp 6°C)
- Illnesses
- FFM on unconscious diver
- Rescuer Fatality
- Near Drowning of Second Thai Diver

Thai Cave Mission

- Tham Luang Cave Rescue
- MSgt Derek Anderson (PJ)
- 1530-1600
- Ballroom B
- Track 2: TEMS
**Dive Med Impacts on Mission**

24 SOW Dive Medicine Statement
Provide Special Tactics medics for rapid global employment to enable full spectrum combat dive operations

- Decades of dive experience operationally
- Traditionally relied on Navy for support, Special Tactics DMO can fulfill dive medical support for future operations, allowing freedom of maneuver

* Initial training costs for 1x DMO ~ $1.5K
* Annual training costs for 1x DMO ~ $200
* Time to produce DMO ~ 6 wks
* Manning across force currently is roughly at 20%

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**Future**

- AFI 10-3501 Rewrite Ongoing
- DMT Pipeline
  - 5 weeks dry
  - Marine Combat Diver
- Portable Chamber
  - US Navy
  - USAF
  - DAN
  - Aircraft Carriers/Subs
- UHM fellowship trained expert

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- LCDR Brian Keuski
- LT Christopher Manganello