

GTA 31-02-003

APRIL 2010

Special Forces Dive Operations

The proponent of this GTA is the United States Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS). Reviewers and users of this GTA should submit comments and recommended changes to Commander, USAJFKSWCS, ATTN: ADJK-DTD-SF, Fort Bragg, NC 28310-9610, or e-mail them to ADJK-DTD-SF@soc.mil

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**U.S. Army Training Support Centers
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No-Decompression Limits for Shallow Water

No-Decompression Limits and Repetitive Group Designators for Shallow Water Air No-Decompression Dives.

Depth (fsw)	No-Stop Limit (min)	Repetitive Group Designation															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Z
30	371	17	27	38	50	62	76	91	107	125	145	167	193	223	260	307	371
31	334	16	26	37	48	60	73	87	102	119	138	158	182	209	242	282	334
32	304	15	25	35	46	58	70	83	98	114	131	150	172	197	226	261	304
33	281	15	24	34	45	56	67	80	94	109	125	143	163	186	212	243	281
34	256	14	23	33	43	54	65	77	90	104	120	137	155	176	200	228	256
35	232	14	23	32	42	52	63	74	87	100	115	131	148	168	190	215	232
36	212	14	22	31	40	50	61	72	84	97	110	125	142	160	180	204	212
37	197	13	21	30	39	49	59	69	81	93	106	120	136	153	172	193	197
38	184	13	21	29	38	47	57	67	78	90	102	116	131	147	164	184	
39	173	12	20	28	37	46	55	65	76	87	99	112	126	141	157	173	
40	163	12	20	27	36	44	53	63	73	84	95	108	121	135	151	163	
41	155	12	19	27	35	43	52	61	71	81	92	104	117	130	145	155	
42	147	11	19	26	34	42	50	59	69	79	89	101	113	126	140	147	
43	140	11	18	25	33	41	49	58	67	76	87	98	109	122	135	140	
44	134	11	18	25	32	40	48	56	65	74	84	95	106	118	130	134	
45	125	11	17	24	31	39	46	55	63	72	82	92	102	114	125		
46	116	10	17	23	30	38	45	53	61	70	79	89	99	110	116		
47	109	10	16	23	30	37	44	52	60	68	77	87	97	107	109		
48	102	10	16	22	29	36	43	51	58	67	75	84	94	102			
49	97	10	16	22	28	35	42	49	57	65	73	82	91	97			
50	92	9	15	21	28	34	41	48	56	63	71	80	89	92			

No-Decompression Limits for Air Dives

*No-Decompression Limits and Repetitive Group Designators
for No-Decompression Air Dives.*

Depth (fsw)	No-Stop Limit	Repetitive Group Designation															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Z
10	Unlimited	57	101	158	245	426	*										
15	Unlimited	36	60	88	121	163	217	297	449	*							
20	Unlimited	26	43	61	82	106	133	165	205	256	330	461	*				
25	595	20	33	47	62	78	97	117	140	166	198	236	285	354	469	595	
30	371	17	27	38	50	62	76	91	107	125	145	167	193	223	260	307	371
35	232	14	23	32	42	52	63	74	87	100	115	131	148	168	190	215	232
40	163	12	20	27	36	44	53	63	73	84	95	108	121	135	151	163	
45	125	11	17	24	31	39	46	55	63	72	82	92	102	114	125		
50	92	9	15	21	28	34	41	48	56	63	71	80	89	92			
55	74	8	14	19	25	31	37	43	50	56	63	71	74				
60	60	7	12	17	22	28	33	39	45	51	57	60					
70	48	6	10	14	19	23	28	32	37	42	47	48					
80	39	5	9	12	16	20	24	28	32	36	39						
90	30	4	7	11	14	17	21	24	28	30							
100	25	4	6	9	12	15	18	21	25								
110	20	3	6	8	11	14	16	19	20								
120	15	3	5	7	10	12	15										
130	10	2	4	6	9	10											
140	10	2	4	6	8	10											
150	5	2	3	5													
160	5		3	5													
170	5			4	5												
180	5			4	5												
190	5			3	5												

* Highest repetitive group that can be achieved at this depth regardless of bottom time.

Emergency Assistance Checklist

Location

Name/Phone Number

Response Time

AIR TRANSPORTATION

Location

Name/Phone Number

Response Time

SEA TRANSPORTATION

Location

Name/Phone Number

Response Time

HOSPITAL/HYPERBARIC CHAMBER

Location

Name/Phone Number

Response Time

DIVING MEDICAL OFFICER

Location

Name/Phone Number

Response Time

Location

Name/Phone Number

Response Time

COMMUNICATIONS

Location

Name/Phone Number

Response Time

DIVING UNITS

Location

Name/Phone Number

Response Time

COMMAND

Location

Name/Phone Number

Response Time

EMERGENCY CONSULTATION

Duty Phone Numbers 24 Hours a Day

Navy Experimental Dive Unit (NEDU)

Commercial (850) 234-4351

(850) 230-3100

DSN 436-4351

Navy Diving Salvage and Training Center (NDSTC)

Commercial (850) 234-4651

DSN 436-4651

Environmental Checklist

Date: _____

Surface

Atmosphere

Visibility: _____

Sunrise (set): _____

Moonrise (set): _____

Temperature (air): _____

Humidity: _____

Barometer: _____

Precipitation: _____

Cloud Description: _____

Percent Cover: _____

Wind Direction: _____

Wind Force (knots): _____

Other: _____

Sea Surface

Sea State: _____

Wave Action: _____

Height: _____

Length: _____

Direction: _____

Current: _____

Direction: _____

Velocity: _____

Type: _____

Surf. Visibility: _____

Surf. Water Temp.: _____

Local Characteristics:

Environmental Checklist (Continued)

Subsurface

Underwater and Bottom Depth: _____

Water Temperature:

_____ depth _____

_____ depth _____

_____ depth _____

_____ bottom _____

Thermoclines: _____

Current:

Direction: _____

Source: _____

Velocity: _____

Pattern: _____

Tides:

High Water: _____ / _____ Time

Low Water: _____ / _____ Time

Ebb Dir.: _____ Vel. _____

Flood Dir.: _____ Vel. _____

Visibility Underwater:

ft. _____ at _____ depth

ft. _____ at _____ depth

ft. _____ at _____ depth

Visibility Bottom:

ft. _____ at _____ depth

Bottom Type:

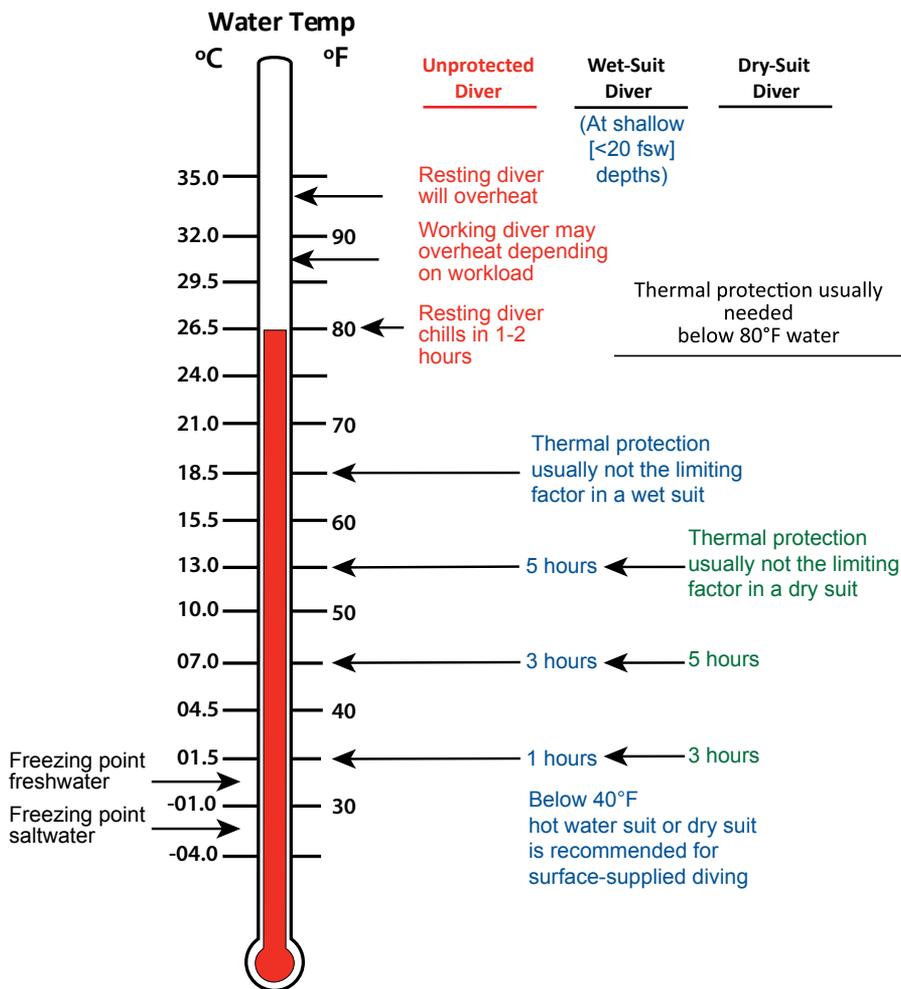
Obstructions: _____

Marine Life: _____

Other Data: _____

Note: A meteorological detachment may be requested from the local meteorological support activity.

Water Temperature Protection Chart



This chart can be used as a guide for planning dives in cold water. The dive durations listed for each suit are not rules or limits. Instead, they represent dive times that will challenge the average diver wearing the thermal protection listed but will have a minimal chance of producing significant hypothermia. Actual dive durations may be longer or shorter than those listed because of operational considerations and/or individual tolerance.

Diving Safety and Planning Checklist

STEPS IN PLANNING OF DIVING OPERATIONS.

Detailed, advanced planning is the foundation of diving safety.

A. ANALYZE THE MISSION FOR SAFETY.

- Ensure mission objective is defined.
- Determine that nondiving means of mission accomplishment have been considered and eliminated as inappropriate.
- Coordinate emergency assistance.
- Review relevant Naval Warfare Publications (NWP) and OPNAV instructions.

B. IDENTIFY AND ANALYZE POTENTIAL HAZARDS.

- Natural Hazards:
 1. Atmospheric:
 - Exposure of personnel to extreme conditions.
 - Adverse exposure of equipment and supplies to elements.
 - Delays or disruption caused by weather.
 2. Surface:
 - Sea sickness.
 - Water entry and exit.
 - Handling of heavy equipment in rough seas.
 - Maintaining location in tides and currents.
 - Ice, flotsam, kelp, and petroleum in the water.
 - Delays or disruption caused by sea state.
 3. Underwater and Bottom:
 - Depth that exceeds diving limits or limits of available equipment.
 - Exposure to cold temperatures.
 - Dangerous marine life.
 - Tides and currents.
 - Limited visibility.
 - Bottom obstructions.
 - Ice (underwater pressure ridges, loss of entry hole, loss of orientation, etc.).
 - Dangerous bottom conditions (mud, drop-offs, etc.).
- On-Site Hazards:
 - Local marine traffic or other conflicting naval operations.
 - Other conflicting commercial operations.
 - High-powered, active sonar.
 - Radiation contamination and other pollution (chemical, sewer outfalls, etc.).
- Mission Hazards:
 - Decompression sickness.
 - Communications problems.
 - Drowning.
 - Other trauma (injuries).
 - Hostile action.
- Object Hazards:
 - Entrapment and entanglement.
 - Shifting or working of object.
 - Explosives or other ordnance.

Diving Safety and Planning Checklist (Continued)

C. SELECT EQUIPMENT, PERSONNEL, AND EMERGENCY PROCEDURES.

- Diving Personnel:
 - 1. Assign a complete and properly qualified diving team.
 - 2. Assign the right man to the right task.
 - 3. Verify that each member of the diving team is properly trained and qualified for the equipment and depths involved.
 - 4. Determine that each man is physically fit to dive, paying attention to—
 - General condition and any evidence of fatigue.
 - Record of last medical exam.
 - Ears and sinuses.
 - Severe cold or flu.
 - Use of stimulants or intoxicants.
 - 5. Observe divers for emotional readiness to dive:
 - Motivation and professional attitude.
 - Stability (no noticeably unusual or erratic behavior).
- Diving Equipment:
 - 1. Verify that diving gear chosen and diving techniques are adequate and authorized for mission and particular task.
 - 2. Verify that equipment and diving technique are proper for depth involved.
 - 3. Verify that life support equipment has been tested and approved for U.S. Navy use.
 - 4. Determine that all necessary support equipment and tools are readily available and are best for accomplishing job efficiently and safely.
 - 5. Determine that all related support equipment, such as winches, boats, cranes, and floats, are operable, safe, and under control of trained personnel.
 - 6. Check that all diving equipment has been properly maintained (with appropriate records); ensure equipment is in full operating condition.
- Emergency Equipment:
 - 1. Obtain suitable communications equipment with sufficient capability to reach outside help; check all communications for proper operation.
 - 2. Verify that a recompression chamber is ready for use or notify the nearest command with one that its use may be required within a given time frame.
 - 3. Verify that a completely stocked first aid kit is at hand.
 - 4. If oxygen will be used as standby first aid, verify that the tank is full and properly pressurized and that masks, valves, and other accessories are fully operable.
 - 5. If a resuscitator will be used, check apparatus for function.
 - 6. Check that fire-fighting equipment is readily available and in full operating condition.
 - 7. Verify that emergency transportation is either standing by or on immediate call.
- Emergency Procedures:
 - 1. Know how to obtain medical assistance immediately.
 - 2. For each potential emergency situation, assign specific tasks to the diving team and support personnel.
 - 3. Complete and post Emergency Assistance Checklist; ensure that all personnel are familiar with it.
 - 4. Verify that an up-to-date copy of U.S. Navy Decompression Tables is available.
 - 5. Ensure that all divers, boat crews, and other support personnel understand all diver hand signals.

Diving Safety and Planning Checklist (Continued)

- 6. Predetermine distress signals and call-signs.
- 7. Ensure that all divers have removed anything from their mouths that they might choke on during a dive (gum, dentures, tobacco).
- 8. Thoroughly drill all personnel in emergency procedures, with particular attention to cross-training; drills should include:
 - Emergency recompression.
 - Rapid undressing.
 - Fire.
 - First aid.
 - Rapid dressing.
 - Embolism.
 - Restoration of breathing.
 - Near-drowning.
 - Electric shock.
 - Blowup.
 - Entrapment.
 - Lost diver.

D. ESTABLISH SAFE DIVING OPERATIONAL PROCEDURES.

- Complete Planning, Organization, and Coordination Activities:
 - 1. Ensure that other means of accomplishing mission have been considered before deciding to use divers.
 - 2. Ensure that contingency planning has been conducted.
 - 3. Carefully state goals and tasks of each mission, and develop a flexible plan of operations (dive plan).
 - 4. Completely brief the diving team and support personnel.
 - 5. Designate a master diver or properly qualified diving supervisor to be in charge of the mission.
 - 6. Designate a recorder/timekeeper and verify that he understands his duties and responsibilities.
 - 7. Determine the exact depth at the job site through the use of a lead line, pneumofathometer, or commercial depth sounder.
 - 8. Verify existence of an adequate supply of compressed air available for all planned diving operations plus an adequate reserve for emergencies.
 - 9. Ensure that no operations or actions on part of diving team, support personnel, technicians, boat crew, or winch operators take place without the knowledge of and by the direct command of the diving supervisor.
 - 10. Minimize bottom time through planning, briefing, training, organization, and other preparations. Water depth and the condition of the diver (especially fatigue), rather than the amount of work to be done, shall govern diver's bottom time.
 - 11. Keep current decompression tables on hand, and use them in all planning and scheduling of diving operations.
 - 12. Instruct all divers and support personnel not to cut any lines until approved by the diving supervisor.
 - 13. Ensure that the ship, boat, or diving craft is securely moored and in position to permit the safest and most efficient operations (exceptions are emergency and critical ship repairs).
 - 14. Verify that, when using surface-supplied techniques, the ship, boat, or diving craft has at least a two-point moor.
 - 15. Ensure that, when conducting SCUBA operations in hazardous conditions, a boat can be quickly cast off and moved to a diver in distress.
- Perform Diving Safety Procedures, and Establish Safety Measures:
 - 1. Ensure that each diver checks his own equipment in addition to checks made by tenders, technicians, or other support personnel.
 - 2. Designate a standby diver for all diving operations; the standby diver shall be dressed to the necessary level and ready to enter the water if needed.

Diving Safety and Planning Checklist (Continued)

- 3. Assign buddy divers, when required, for all SCUBA operations.
 - 4. Take precautions to prevent divers from being fouled on bottom. If work is conducted inside a wreck or other structure, assign a team of divers to accomplish task. One diver enters the wreck and the other tends his lines from the point of entry.
 - 5. When using explosives, take measures to ensure that no charge shall be fired while divers are in water.
 - 6. Use safety procedures as outlined in relevant naval publications for all underwater cutting and welding operations.
 - 7. Brief all divers and deck personnel on the planned decompression schedules for each particular dive. Check provisions for decompressing the diver.
 - 8. Verify that the ship, boat, or diving craft is displaying proper signals, flags, day shapes, or lights to indicate diving operations are in progress. (Consult publications governing international or inland rules, international/inland local signals, and U.S. Navy communications instructions.)
 - 9. Ensure that protection against harmful marine life has been provided.
 - 10. Check that the quality of the diver's air supply is periodically and thoroughly tested to ensure purity.
 - 11. Thoroughly brief the boat crew.
 - 12. Verify that proper safety and operational equipment is aboard small diving boats or craft.
- Notify Proper Parties That Dive Operations are Ready to Commence:
- 1. Diving officer.
 - 2. Commanding officer.
 - 3. Area commander.
 - 4. Officer of the deck/day.
 - 5. Command duty officer or commanding officer of ships alongside.
 - 6. Bridge to ensure that ship's personnel do not—
 - Turn the propeller or thrusters.
 - Get underway.
 - Activate active sonar or other electronics.
 - Drop heavy items overboard.
 - Shift the moor.
 - 7. Ship duty officer to ensure that ship's personnel do not—
 - Activate sea discharges or suction.
 - Operate bow, stern, planes, or rudder.
 - Operate vents or torpedo shutters.
 - Turn propellers.
 - 8. Other interested parties and commands:
 - Harbormaster/port services officer.
 - Command duty officers.
 - Officers in tactical command.
 - Cognizant U.S. Navy organizations.
 - U.S. Coast Guard (if broadcast warning to civilians is required).
 - 9. Notify facilities having recompression chambers and sources of emergency transportation that diving operations are underway and their assistance may be needed.

Divers Propulsion Device (DPD) Troubleshooting Guide

- Check battery status indicator. If any LEDs are lit, the battery has enough power to operate the thruster.
- Check all connections to the battery box.
- Check that the throttle key is installed under the throttle lever.
- Make sure terminals are clean and corrosion free. If corrosion is found, clean, rinse, dry, and apply silicon spray.
- Remove the throttle key and spin the prop by hand to confirm that the prop turns freely.
- Thruster fails to run or lacks power. Reset the battery by removing the throttle key from under the throttle handle. Wait 10 seconds and reinstall.
- Thruster loses power after a short running time. Check battery charge; if low, restore to full charge.
- Thruster runs but no thrust. Check for proper prop installation, and replace prop or tighten as appropriate. Minor damage: sand or file to restore a smooth edge. Major damage: replace propeller and drive pin. Remove thruster from DPD. Support prop shaft across a bench vise and tap drive pin through.
- Bent pin: cut pin flush at prop shaft and tap drive pin through.
- Inspect steering cable and linkages for damage. Replace if damaged.
- Inspect steering cable for damage. If no damage is found, apply lubricant to both ends.
- Thruster will not turn or hard to turn. Confirm tiller arm is tight on thruster shaft. Tighten if loose.
- Inspect stern plane cable and linkages for damage. Replace if damaged.
- Stern plane will not move or is hard to move. Inspect stern plane cable for damage. If no damage is found, apply lubricant to both ends, and test again.
- Turn off charger. Unplug charger cable from battery and charger. Reconnect and retry.
- Connect charger to different battery and retry.
- Charger red fault light is illuminated. Connect battery to different charger and retry.
- Momentarily move the throttle position to “wake up” the BSI.
- Confirm key plug is inserted in the battery’s charging port.
- Confirm BSI cable is correctly connected to the battery.
- BSI LEDs are not illuminated. Check that the throttle key is installed under the throttle lever. BSI may need recalibrating. Run battery completely down to shut off condition to reset BSI calibration.
- BSI not illuminating all green LEDs when fully charged. If problem persists, replace BSI.
- DPD is not neutrally buoyant. Confirm cargo is neutrally buoyant at all water depths.
- DPD was neutrally buoyant on the surface but sinks when dived deeper. Cargo was incorrectly ballasted and/or a compressible volume was used to ballast the vehicle. Trim the DPD again with an incompressible volume.
- DPD needs significant vertical control input to travel straight and level. Driver/passenger not keeping tight to the vehicle and generating excessive drag. Tuck tighter into the vehicle. Cargo was incorrectly ballasted and/or a compressible was causing control correction and induced drag. Trim the DPD again with an incompressible volume.
- DPD does not travel at top speed or range is reduced. Driver/passenger not keeping tight to the vehicle and generating excessive drag. Tuck tighter into the vehicle.

Haskel O2 Booster System

26968 Operation Procedures

WARNING:

The Haskel O2 Booster System is utilized for the compression of high-percentage oxygen; do not use this equipment unless properly trained on usage and familiar with oxygen safety and hazards. Smoking is not permitted in any area where oxygen is stored, handled, or used. Keep all organic materials and other flammable substances away from possible contact with oxygen.

1. Inspect all equipment. Ensure all bottles and hoses are within their current hydrostatic test date. Ensure all critical gauges are within calibration. Ensure all open oxygen boundaries are masked over, plugged, and/or double bagged. Ensure oxygen is aviator's grade.

NOTE: Do not proceed if any safety hazards exist!

2. Ensure area meets the requirements of oxygen safety.
3. Close all valves.
4. Attach handwheel of oxygen supply line to k-bottle, and ensure bleeder valve beneath gauge is closed. Attach quick-connect fitting on other end of oxygen supply line to the Haskel pump.
5. Attach threaded fitting of oxygen fill line to the Amron charging panel (black box); ensure the bleeder valve and all color-coded handwheels on the black box are closed. Attach the quick-connect fitting on the oxygen fill line to the Haskel pump.
6. Attach the first stage of air driveline to the twin-80 SCUBA tanks. Ensure pressure gauge is attached to the high-pressure port (stamped H.P.). The filter bowl on the Haskel pump is only rated for 150 pounds per square inch gauge (psig); ensure air driveline is in a low-pressure port. Attach the quick-connect fitting of air driveline to the Haskel pump.
7. Ensure k-bottle and twin-80 SCUBA tanks are secured. Inspect all quick-connect fittings. Ensure high-pressure lines are whipped and ends secured with snap-links.
8. Attach up to six LAR V oxygen bottles to the Amron black box color-coded fill lines. Keep oxygen bottle valve caps and fill-line plugs together and clean.
9. Slowly open LAR V bottles (rapid pressurization of oxygen can cause a flashover damaging personnel or equipment), and place in dip tank. Inspect for leaks (bubbles).
10. Slowly open each color-coded handwheel on the Amron black box to equalize the LAR V bottle pressure.
11. Slowly open the k-bottle valve, and allow system to equalize.
12. Ensure bleeder valve (wing nut) at bottom of filter bowl on Haskel pump is closed. Open the valve on the first stage of twin-80 SCUBA tanks (turn on air).
13. Open the blue handwheel to the right of the filter bowl on the Haskel pump allowing the jamming process to begin. (Compression release noise will be heard.)
14. Jam LAR V bottles to 200 Bar (2,900 psig). Close blue handwheel, stopping the air drive.
15. Close all LAR V bottle valves.
16. Close all color-coded handwheels on Armon black box.
17. Close oxygen k-bottle valve.
18. LAR V bottles cannot be removed from fill lines until lines are bled down. Open the bleeder valve on the Amron box slowly; this will bleed the oxygen supply line and Haskel pump down. Slowly open each color-coded handwheel individually, and bleed the fill line down.

Haskel O2 Booster System

26968 Operation Procedures (Continued)

19. Individually remove LAR V bottles from fill lines. Replace line plugs, gauge LAR V bottles, and replace bottle valve caps.
20. Repeat steps until all LAR V bottles are jammed. Bleed filter bowl every 10 minutes.
21. Upon completion of jamming, ensure all valves are closed. Bleed all lines down. Disconnect quick-connect fitting of oxygen supply line, and double-bag both ends of quick-connect fitting. Disconnect handwheel from k-bottle and double-bag it. Replace port plug on k-bottle valve.
22. Disconnect the quick-connect fitting on the oxygen fill line. Double-bag both ends of the quick-connect fitting. Disconnect the oxygen fill line from Amron black box and double-bag it. Replace threaded cap on Amron black box connection point.
23. Disconnect air driveline from Haskel pump. Disconnect the first stage manifold from twin-80 SCUBA tanks.
24. Secure all lines in Haskel pump support box, ensuring gauges are padded.

EMERGENCY PROCEDURES:

1. Close oxygen k-bottle valve.
2. Close all other valves.
3. Bleed down entire system.
4. Make correction/repair, seek assistance, or assess damage.

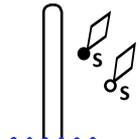
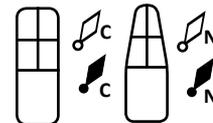
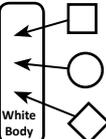
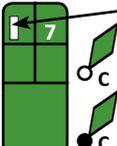
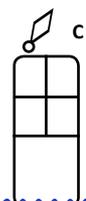
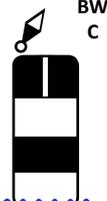
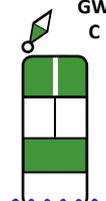
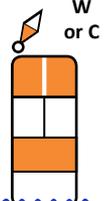
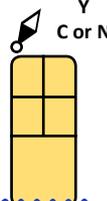
NOTE: Never leave running system unattended.

REFERENCES:

United States Navy Dive Manual, Version 6, 15 April 2008

Field Manual 3-05.212, Special Forces Waterborne Operations, 30 September 2009

Buoys

<p>Older Charts</p> 	<p>Newer Charts</p> 	 <p>Mooring Buoys</p>	 <p>Spar Buoy</p>	 <p>Can Buoy Nun Buoy</p>
<p>Diamond Below Circle/Dot Does Not Mean Buoy is Upside Down</p>				
 <p>White Body</p>	<p>Information: These may give place names, directions, and distances.</p> <p>Controlled Area: An orange circle with black lettering, used to control or prohibit boating activities: 5 miles per hour. No Fishing, and No Boats.</p> <p>Danger: These may tell you about specific dangers, such as rocks, dams, and underwater cables.</p>			
	<p>Light</p> <p>Channel Marker: Green color on the left side of the channel as individual "returns from the sea."</p>			<p>Channel Marker: Red color on the right side of the channel as individual "returns from the sea." Nuns are marked with even numbers.</p>
<p>Generally speaking, green markers are kept to the RIGHT when leaving a harbor and red markers are kept to the RIGHT when returning to harbor, thus coining the phrase, "Red, Right, Returning."</p>				
 <p>W C or N</p> <p>Anchorage</p>	 <p>BW C</p> <p>Fishnet Area</p>	 <p>GW C</p> <p>Dredging</p>	 <p>W or C</p> <p>Special Purpose</p>	 <p>Y C or N</p> <p>Quarantine Anchorage</p>

Types of Buoys

The basic symbol for a buoy is a diamond and small circle. Older charts will show a dot instead of the circle. The diamond may be above, below, or alongside the circle or dot. The small circle or dot denotes the approximate position of the buoy mooring. Some charts will use the diamond to draw attention to the position of the circle or dot and to describe the aid. The various types of buoys are as follows:

- Nun Buoys. These are conical in shape, painted solid red, and mark the right side of the channel when individual is entering from seaward.
- Can Buoys. These are cylindrical in shape and are painted solid green or black. They indicate the left side of the channel when one is entering from seaward (green) and mark the left side of rivers and intracoastal waterways (black).

Buoys (Continued)

Sound Buoys

The four basic types are as follows:

- **Bell** is sounded by the motion of sea.
- **Gong** is similar to a bell buoy but with sets of gongs that sound dissimilar tones.
- **Whistle** is a tube mechanism that sounds by the rising and falling motion of the buoy at sea, making a loud, moaning sound.
- Horn has an electrically sounded horn at regular intervals.

Additional features on buoys include sound signals, radar reflectors, numbers or letters, or any combination of these features. Bells and horns are spelled out; radar reflectors are abbreviated "Ra Ref;" whistles are abbreviated "WHIS;" and numbers or letters painted on buoys are shown in quotation marks, for example "8."

Buoy Symbols

Nautical charts will show the buoy type by the initials of its shape; for example, nun buoys (N) and can buoys (C). A mooring (anchor) buoy is the only one that is not indicated by the diamond and circle or dot. This symbol is a trapezoid (a figure having two parallel and two nonparallel sides) and a circle. If the aid is painted red, the diamond will usually be indicated in red on the chart; if the aid is painted black, the diamond will be black. There are five other color patterns used on buoys. These buoys have no lateral significance; that is, they do not mark port or starboard. Although the buoys may not be numbered, they may be lettered.

The primary function of buoys is to warn the navigator of some danger, obstruction, or change in the bottom. A navigator may also use buoys to help mark his location on a chart, which aids in establishing his position. However, he should not rely solely on buoys or other floating objects for fixes because they are not immovable objects.

Buoy Lights

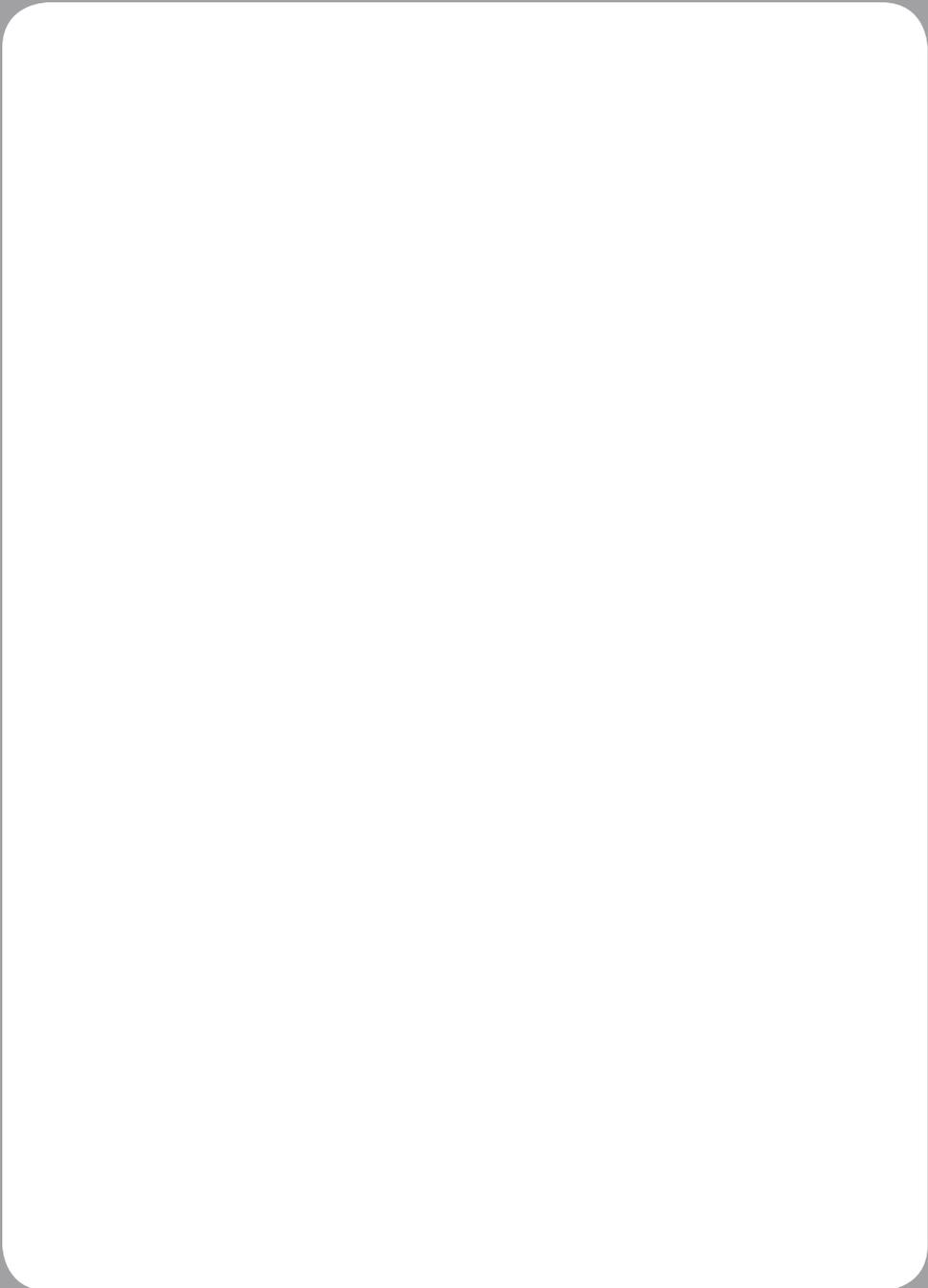
If a buoy is lighted, a magenta (nautical purple) disc will be overprinted on the circle. The characteristic of the light and its color will be indicated on the chart. Buoy lights can be either red, green, or white. The letters R or G are used for red and green lights. The absence of a letter indicates a white light. The light phase characteristics and the meanings of abbreviations used to describe them are shown below. Each color is used as follows:

- **Red Lights.** They appear on red aids (nun buoys) or red and black horizontally banded aids with the topmost band red.
- **Green Lights.** These appear on black aids (can buoys) or red and black horizontally banded aids with the topmost band black.
- **White Lights.** These appear on any color buoy. The purpose of the aid being indicated by its color, number, or light-phase characteristic.

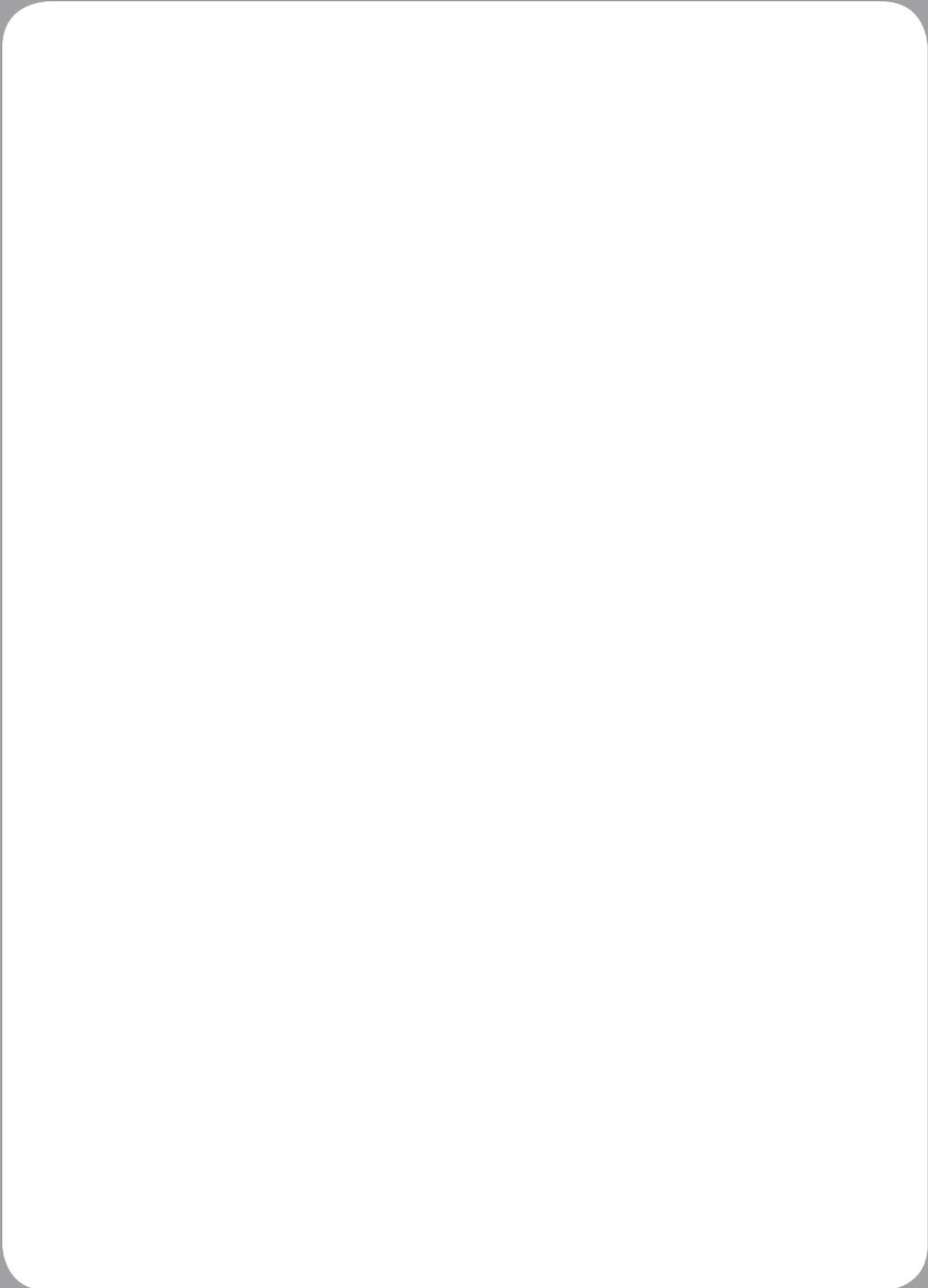
Buoys (Continued)

Abbreviations	Class of Light	Description	Illustration
F	Fixed	A continuous nonblinking light	
F. Fl	Fixed and Flashing	A continuous light, varied at regular intervals by flashes of greater brilliance.	
F. Gp. Fl	Fixed and Group Flashing	A continuous light, varied by groups of two or more flashes.	
Fl.	Flashing	A light that flashes at regular intervals of not less than 2 seconds and whose period of darkness exceeds the period of light.	
Gp. Fl.	Group Flashing	A light that sends out groups of two or more flashes at regular intervals.	
Gp. Fl. (1+2)	Composite Group Flashing	A flashing light in which the flashes are combined in alternating groups of different numbers.	
Mo. (A)	Morse Code	A flashing light which blinks signal letters in Morse Code. The letter "A" in Morse Code: (one short and one long flash).	
Qk. Fl.	Quick Flashing	A light that flashes 60 times or more a minute, used only on buoys and beacons.	
I. Qk. Fl.	Interrupted Quick Flashing	A light in which 5 seconds of quick flashes is followed by 5 seconds of darkness.	
E.Int.	Equal Interval	A light with equal periods of light and darkness.	
Occ.	Occlusions	A light that is eclipsed at regular intervals, but whose period of light is always greater than the duration of darkness.	
Gp. Occ.	Group Occlusions	A light with regular spaced groups of two or more occlusions.	
Gp. Occ. (2+3)	Composite Group Occlusions	A light with combinations in alternate groups of different numbers.	

Notes



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