CHAPTER 6

METHODS OF STAYING AFLOAT

6.1 INTRODUCTION

In situations where one must stay in the water for long periods of time, buoyancy is of primary importance. This chapter discusses Personal Flotation Devices (PFD), the use of clothing for inflation, techniques to stay afloat without inflation, and techniques to maintain body heat while floating in cold water.

6.2 PERSONAL FLOTATION DEVICES (PFD)

The PFD is sometimes referred to as a life jacket, life vest, or life preserver. It is the preferred emergency device for staying afloat for long periods of time. A PFD not only helps prevent drowning, but also helps prevent hypothermia (abnormally low body temperature). A well designed properly fitted and adjusted PFD will support an unconscious person's head well above water providing efficient breathing and keep the head, a high heat loss area, from becoming submerged in cold water.

PFD's found aboard Navy ships are either an inherently buoyant type or inflatable. Personnel should be familiar with where PFD's are stored and how to don, adjust, and use each type. When wearing the inflation type, personnel must also additionally know how to orally inflate the device. For proper support, PFD's must be correctly fitted and donned. Improper donning or poor adjustment may not only negate the positive righting movement, but actually position the user's face in the water. Hands-on drills using the PFD are highly recommended. The following narratives describe how to don the Kapok and LPP-1/1A (rubber duck), two of the most common shipboard PFD's.

6.2.1 Donning the Kapok

Pass leg straps through both D rings then back under one ring. Step through leg straps. Secure waist straps with a bowknot. Adjust leg straps snugly. Tie a snug bowknot in the upper chest ties. Pass the left collar tie through right D ring. Pass the right collar tie through left D ring. Tie a snug bowknot. Secure the chest strap snugly with the clip facing in. If the vest is thrown to a survivor in the water it can be donned in the same manner if one sits on the vest for buoyancy and stability.

Fig.8-1 Kapok

6.2.2 Donning the LPP-1/1A

Fasten the belt buckle in front with the pouch in the rear. Adjust the belt to size, and then rotate the pouch to the front. Open the snap fasteners on the pouch and remove and unfold the vest. Place the deflated life preserver over the head and pull down on the inflation lanyard to inflate the LPP-1/1A. To orally inflate, locate the oral inflation valve and unscrew the knurled locking ring. Depress the end of the valve stem and blow into it. If orally inflating in the water, blow only a half a breath into the vest at a time to prevent fatigue or possible water aspiration. Once the vest is inflated, release the end of the valve stem and tighten the knurled locking ring.
5.2.3 Care of PFD’s

PFD’s must be readily available and in good working condition. Store them in a clean, dry area away from salt spray, oil, grease, etc. Inspect them periodically to ensure that they are free of rips, tears, holes, corrosion/rust on buckles, and rotted material. Inspect kapok filled vests to ensure that the vinyl inserts are not damaged. If the kapok is exposed, it will become waterlogged and lose its buoyancy. Inspect inflatable vests carefully for leaks, full carbon dioxide cylinders, and proper function of the inflation unit.

5.3 CLOTHING INFLATION

In the absence of the PFD, survivors should look for any object floating on the surface that provides enough buoyancy to keep the head out of the water in lieu of removing clothing. The survivor should carefully weigh the pros and cons of removing clothing as clothing can protect against hypothermia and offers protection from marine life, fuel oil and sunlight. Clothing can be used to some extent as a makeshift flotation device. To be effective, buoyancy obtained from inflating clothing must be properly positioned and preferably not require the survivor to hold onto it with both hands. Ideal buoyancy will support the head above water even in rough seas.

6.3.1 Shirt and Coveralls Inflation:

A small amount of buoyancy may be obtained by blowing air into a shirt. Tuck the collar inside to help seal around the neck. Tie off the bottom of the shirt or tuck it in, button the top button and blow air into the space between the second and third button. Inflation of the shirt causes a bubble of air to accumulate at the survivor’s back between the shoulder blades. Coveralls can be inflated in a similar manner by blowing into the top of the zipper.

6.3.2 Trouser Inflation:

Trousers offer a considerable amount of buoyancy and can be secured around the neck and waist, freeing the hands. Removing the shoes, boots, trousers and then inflating the trousers requires considerable effort. Survivors should not wait until they are exhausted from treading water or swimming to attempt to inflate their trousers. To inflate trousers, use the survival floating technique to remove shoes or boots. Remove low top shoes by placing the toe of one foot on the heel of the other foot and pushing down. Unlace boots and high-topped shoes before performing this maneuver. The swimmer should remember to breathe at a normal pace while removing the shoes and trousers. A common mistake is for the swimmer to keep the face underwater too long, resulting in a build up of carbon dioxide, a depletion of oxygen, and rapid tiring.

While survival floating, remove the trousers keeping the legs right side out. Tie the two legs together using a square or overhand knot. Tie the knot as close to the end of the trouser legs as possible. Start by tying the first half of the knot about halfway down the legs. Tie the second half near the end of the legs then place the cuffs between the teeth and cinch up the knot by pulling on the middle of the trouser legs.

![Fig. 6-2 Tying Off the Trouser Legs](image)
There are four methods recommended for inflating trousers; over the head, splash, alternate splash, and oral inflation. Lifting trousers over the head is the fastest method, but requires considerable effort and good treading water skills. Blowing air through the waist (oral inflation) requires the least effort, but is the slowest method. Splashing requires more effort than the oral inflation method but is not as fast as the overhead method.

6.3.2.1 Over the Head Method:

While treading water, place the trousers on the surface in back of you, fly open and facing down, waist open with the seat facing up. With one hand on the top of the waistband on each side of the fly, raise the trousers straight over the head by straightening the arms. Once the trousers are out of the water, quickly force them down in front of you until the waistband is underwater. Care must be taken to raise the trousers high enough to force air into the waist on the way down.

Fig. 6-3 Over The Head Inflation

6.3.2.2 Splashing Method:

The trousers may be inflated by splashing air into them. Place trousers on the surface of the water in front of you fly facing down. Place one hand on the waistband and hold it about two inches underwater. Raise the other hand above the surface and with a sweeping motion splash air into the trousers.

Fig. 6-4 Splashing Method

6.3.2.3 Alternate splashing Method:

The trousers may be inflated by splashing air into them. Place trousers over the head at the surface of the water in front of you fly facing down. Place one hand on the waistband and hold it about two inches underwater in front of you. Raise the other hand above the surface and with a sweeping motion splash air into the trousers.

Fig. 6-5 Alternate splashing method

6.3.2.4 Oral Inflation:

The trousers may be inflated orally while using the survival floating technique. Spread the trousers on the surface in front of you with the fly closed and facing down. Hold the waistband open using both hands. The waistband should be about two inches underwater. Take a breath and submerge, placing the waistband on the forehead. Blow about half a breath into the trousers until full. Blowing all of the breath into the trousers may result in water aspiration.

Fig. 6-6 Oral Inflation
6.3.2.5 Securing the Trousers.

When the trousers are inflated, remove the belt and put it through the center loop in back of the trousers. With the fly facing you, put your head through the opening between the legs. Wrap the belt around your waist and secure it. If the belt is not long enough, simply cinch up the waist opening and hold the trousers with one hand.

6.3.2.6 Keeping the Trousers Inflated.

The trousers should be kept wet by splashing water on them periodically. If the trousers are allowed to dry out, they may leak. Air can be forced into trousers by placing your mouth against the material and blowing forcefully. Another method to keep trousers inflated is to open the waist and splash air into the trousers.

6.4 STAYING AT THE SURFACE WITHOUT FLOTATION DEVICES

The ability to remain on the surface of the water, without a flotation device, in a position that allows comfortable breathing without tiring is an important skill to learn. The facedown method in this text is effective for personnel who are wearing restrictive or negatively buoyant organizational clothing. The techniques of resting on the surface of the water using minimum amount of energy necessary to continue breathing can be used to catch your breath following vigorous swimming or to conserve energy. Caution must be used where the water temperature is cold (for most people, 72 degrees Fahrenheit or below). Placing the head in cold water will rapidly cool the body, eventually leading to hypothermia. Survival swimmers in cold water should quickly assess the situation and use whatever is at hand to provide buoyancy to keep their head out of the water. In cold water, the survival floating techniques described below should be used only as last resort to enable the swimmer to catch his breath or to implement some form of flotation.

6.5 SURVIVAL FLOAT

6.5.1 Body Position

Place the face in the water; chin at chest, with the back of the head just breaking the surface. The upper back and shoulders are underwater, horizontal to the surface, and the arms are at the surface with the elbows bent and hands separated slightly. Bend the waist with the hips underwater, lower than the upper body, and the legs dangling beneath. Variations for individual buoyancy can be accomplished by adjusting the legs by drawing them up toward the chest or extending them out and adjusting the arms by extending them or drawing them in towards the chest. These actions balance the floater around the chest, the center of buoyancy. A common fault is for swimmers to cock their head back, lifting their chin off their chest. This "face forward" position causes the hips to shift lower and the body to assume a more vertical position.

6.5.2 Breathing

The swimmer should pivot at the neck, lifting the chin off the chest until the mouth clears the surface. The waist should remain bent, keeping the shoulders in the same near horizontal position to the surface. As the mouth clears the surface, the swimmer exhales quickly and forcefully through the mouth and nose. The inhalation is performed through the mouth and consists of a deep full breath of air. After the inhalation is completed, the head is lowered to the resting position (chin on the chest). It is important for every breath to be a good, complete exchange of air deep into the lungs. A common fault is for swimmers to breathe off the top of their lungs. This "shallow breathing" causes swimmers to fatigue rapidly. The breathing cycle (breaths per minute) must be compatible with the amount of oxygen required to supplement the expended effort. A momentary pause (one to five seconds) occurs while the face is underwater. No attempt should be made to hold a breath for any set period of time; breathe as needed. The breathing cycle will gradually slow down after vigorous activity declines. Energy spent supporting the head above the water while taking several breaths is energy wasted; floaters should place their face back into the water as soon as they have accomplished a good air exchange.
A common fault in breathing includes straightening the waist rather than pivoting at the neck when inhaling. Straightening the waist alters the body position to a more vertical position requiring more effort to breathe.

6.5.3 Coordination:

Support the head while breathing with a broad sculling motion of the arms. The sculling motion of the arms is coordinated with the breathing to provide maximum lift when needed. The arms remain near the surface and move on a plane parallel to the surface. The hands press outward (palms facing out) with the hands tilted approximately 45 degrees, thumbs down. Exhalation begins about the time the mouth clears the surface. The scull continues as the breath exchange is completed. The hands press out to a point near the width of the shoulders. At this point, the palms are rotated facing inward, thumbs up, and returned to the starting point. Swimmers who have positive buoyancy (float with back of head on the surface with lungs full and body in proper position) should scull only when supporting the head while breathing. Negatively buoyant swimmers or swimmers wearing negatively buoyant equipment may need to scull continuously or use the legs for additional support while breathing. The most efficient kick is the modified frog kick, which is described in detail in Chapter 7. Deliver the thrust with the legs while the head is up for breathing. Only one or two short, quick kicks are required to support the head while breathing.

6.6 BACK FLOAT

The back float is effective only in calm water, and can be hazardous in rough seas. If a wave breaks over the face when one is laying on his/her back, water may enter the nostrils causing the floater to aspirate water. Poor swimmers or non-swimmers often prefer the back float because they are uncomfortable putting their face into the water because they have not been trained in proper breath control. The facedown float mentioned above is almost always the superior method to stay afloat without additional buoyancy assistance. To perform the back float, lie on your back. Leg heavy individuals can lay flat by bending at the knees or extending the arms over the head. Individual body composition, organizational clothing or equipment often makes the floater negatively buoyant. In these cases gentle kicking of the legs and sculling of the arms may be required to keep afloat.
6.7 MAINTAINING BODY HEAT WHILE FLOATING IN COLD WATER

6.7.1 Heat Escape Lessening Posture (H.E.L.P.)

Since water is a good conductor of heat, and most of the body’s heat is lost through the head, placing the head in cold water will rapidly reduce the body’s core temperature. Other key heat loss areas are the sides of the chest, the neck, and the groin.

The H.E.L.P technique is a method of floating which protects these high heat loss areas. This technique almost always requires the survivor to use auxiliary flotation such as a lifejacket or survival vest.

To execute the H.E.L.P technique, if possible cross your legs at the ankles and draw your knees up to the chest, keep your face forward and out of the water. Cross arms keeping the upper arms tucked close to the sides of the body and the lower arms crossed over the chest.

Fig. 6-10 H.E.L.P. Position

6.7.2 Huddle Position

This position conserves heat and protects high heat loss areas with two or more persons. The huddle position almost always requires auxiliary buoyancy. To execute the huddle, put your arms over each other’s shoulders so that the sides of your chests are together, if possible, intertwine legs.

Fig. 6-11 Huddle Position

SUMMARY

The PFD provides the survivor with the greatest opportunity to survive accidental water entry. Personnel who work in or near the water should always wear a PFD or be able to procure one at a moment’s notice. The PFD also provides the best chance of the survivor being able to efficiently execute H.E.L.P and huddle techniques to reduce the chances of hypothermia. Techniques to utilize clothing for inflation or to survival float without buoyancy offer disadvantages that would not warrant consideration if one were wearing the PFD.
CHAPTER 7
TREADING WATER

7.1 INTRODUCTION

Treading water allows the survivor to check the surface for floating objects, other survivors, rescue craft, etc. You may need to tread water to catch your breath following sudden submergence into cold water, to activate flotation equipment, to get rid of unwanted bulky equipment, or to signal rescue craft.

Supporting the head out of the water requires considerable effort, especially when fully clothed. Survivors should quickly remove negatively buoyant equipment and kick off low cut dress shoes. In cold water clothes offer thermal protection, and consideration should be made to the benefits of leaving them on. High-top laced boots can be removed using the survival floating technique. Jumpsuits and other coverall type garments are too difficult to remove and should be left on.

7.2 TREADING WATER BODY POSITION

The best body position keeps most of the body underwater and allows the survivor to breathe freely. Starting from a vertical position, the swimmer leans forward slightly and tilts the head back. The chin is just clear of the water with the head held vertically, face forward. The knees are drawn up until the swimmer is in a comfortable, almost sitting, and position with the legs beneath the chest. The arms remain on the surface to scull on a plane parallel to the surface.

7.3 ARM ACTION

The arms scull on a "near horizontal" plane parallel to the surface. Start with the elbows bent, hands in front of the face, separated one to two inches. Tilt hands approximately 45 degrees, thumbs down, and scull outward with the hands, forearms, and upper arms to a point where the hands separate approximately shoulder width. At this hands rotate approximately 45 degrees, thumbs up, and scull back to the start position. This action provides continuous lift and very little drag resistance.

7.4 LEG ACTION

Several kicks are available to the treader, some more efficient for certain situations:

7.4.1 MODIFIED FROGGKICK

This kick is strong and is effective with high top lace boots and long pants. This kick is taught primarily in aviation water survival programs. The leg action is similar to the breaststroke kick except that it is performed in a vertical body position.

To execute this kick, bend at the waist in a sitting position with both knees underneath the chest separated about shoulder width. The power phase and recovery of the kick is executed primarily with the calves and feet and requires little hip and thigh movement. Both legs kick and recover simultaneously. During the power phase the knees are kept inboard of the calves and feet. The kick is executed by moving the feet 90 degrees to the calves and pushing sideward and downward on the water with the insides of the calves and the insides and soles of the feet. The last act of the power phase is to "whip" the feet into a position in line with the ankles, toes pointed, in preparation for the recovery. The recovery of the legs is executed by pointing the feet in line with the ankles, and drawing feet and calves upward towards the buttocks. This puts the treader in a position where the knees are inboard of the calves and feet, postured to begin the power phase. The leg action is continuous, with the recovery slow, and the thrust just vigorous enough to support the head above the water. Care should be taken not to kick by straightening the thighs and extending the legs until the knees are straight. This causes bobbing and raises the swimmer too high out of the water. The following figures illustrate this kick.

7-1
7.4.2 ROTARY OR EGGBEATER KICK

This is the most powerful of all treading water kicks. Similar to the modified frog kick, it is effective while wearing high top lace boots and pants. As it is difficult to master, water survival programs seldom teach this kick. It is used almost exclusively for water polo and synchronized swimming. The power phase and recovery of this kick is identical to the modified frog kick explained above, with the exception being that each leg recovers and kicks alternately, not simultaneously.

7.4.3 MODIFIED SCISSORS KICK

This is an easy to learn natural motion kick but ineffective when wearing high top lace boots. The resistance and drag of long pants further reduce its effectiveness. This modified scissors kick is commonly taught by civilian agencies teaching students dressed in swimsuits with no shoes or boots.

In the sitting body position, the treader separates one thigh forward and one thigh aft knees underneath the chest. The kick is executed primarily with the feet and calves, thighs almost stationary. At the start of the power phase, the forward foot is bent at a right angle to the calf toes pointed up, the aft foot is in line with the calf, toes pointed aft.

The power phase is performed by a simultaneous kick of both legs. The bottom of the forward foot and inside of the calf should press backward and downward with the foot whipping down to a position in line with the calf. The aft leg presses downward and forward with the top of the foot and calf, with the foot whipping to a position at a right angle to the calf.

During the recovery, the forward foot and calf are eased forward and upward with the foot at a right angle to the calf. The aft calf and foot are eased backward and upward with the toe pointed and the foot returning to a position in line with the calf. The leg action is continuous, with the recovery slow, and the thrust just vigorous enough to support the head above the water. Care should be taken not to kick down, straightening the thighs and extending the legs until the knees are straight. This causes bobbing and raises the swimmer too high out of the water.
7.5 COORDINATION

Modified Frog kick:

The inward scull of the arms is timed with the power phase of the kick, and the outward sculling (maximum lift) timed with the recovery of the legs.

Rotary Kick:

Arm action not paired with kick.

Modified Scissors Kicks:

Opposite of modified frog kick. The outward scull of the arms is timed with the power phase of the kick, and the inward sculling timed with the recovery of the legs.

7.6 BREATHING

The swimmer should inhale and exhale as needed to match the physical demands of treading. No attempt should be made to hold one's breath, or interrupt the breathing cycle to augment buoyancy.
CHAPTER 8
SURVIVAL SWIMMING

8.1 INTRODUCTION

The decision to swim in open water must be carefully thought out and well planned. Swimming even short distances in open water may be dangerous if the water is cold, there is a strong current, or if there is rough wave action. In the case of accidental water entry, it is often most logical to stay near the site of water entry to aid in recovery and to conserve energy by floating.

8.2 TERMINOLOGY

The following definitions will assist then reading the descriptions of the survival strokes:

8.2.1 Catch:

A recovery movement of arms or legs executed just before the power phase in which the arm or leg is initially positioned to make contact with the water to begin the power phase.

8.2.2 Power Phase:

A movement(s) of arms or legs of a swimming stroke which generates propulsion through the water.

8.2.3 Recovery:

A movement(s) of arms or legs of a swimming stroke which returns the arm/leg to the power phase.

8.2.4 Timing:

The coordination of all movements necessary to perform an efficient swim stroke.

8.3 BREAST STROKE

The breaststroke is generally considered the best survival stroke when one must swim in open water. The advantages of this stroke include good forward visibility, controlled breathing (the ability to take a breath during the trough of a wave and to return the head into the water during the crest) when swimming in choppy seas; a powerful kick while wearing boots or shoes, and an efficient energy-conserving glide.

8.3.1 Body Position:

The start and glide position is facedown and streamlined with the waist straight, legs together and extended, and arms stretched in front of the head with palms approximately 6 to 8 inches below the surface. The head is positioned with the ears between the upper-arms and the waterline near the hairline.

![Fig. 8-1 Breaststroke Body Position]
8.3.2 Arm Action (power phase):

Starting from the glide position, angle the hands slightly downward, turning the palms outward about 45 degrees to the water's surface. With the arms straight, the palms are sculled out until the hands are positioned wider than the shoulders. This is the "catch" position.

![Fig. 8-2A Arm Action Power Phase](image)

From this position, bend the elbows and pull with the hands downward and outward until they pass under the elbows with forearms vertical.

![Fig. 8-2C Arm Action Power Phase](image)

From this position, rotate the wrists, sculling the hands inward, upward, and slightly aft until the palms are below the chin facing each other and nearly touching.

![Fig. 8-2D Arm Action Power Phase](image)

The elbows should be higher than the hands and lower than the shoulders for effective propulsion. Elbows should point outward, not aft, and should not be allowed to move beyond the shoulders.
8.3.3 Arm Action (recovery):

Recover the arms immediately after the power phase. After the hands are sculled in together, move the elbows inward, towards each other. After this motion, with palms angled toward each other, extend the arms forward to the glide position rotating the wrists until the palms are down.

Fig. 8-3A Arm Action Recovery

Fig. 8-3B Arm Action Recovery

8.3.4 Kick:

From the glide, the leg recovery begins by bending the hips and knees and bringing the heels up toward the buttocks.

Fig. 8-4A Breaststroke Kick

Fig. 8-4B Breaststroke Kick

Once heels are at the buttocks, gradually separate the knees and heels until the knees are separated about hip-width and the feet are outside the knees just below the surface. To perform the power phase, rotate the ankles outward to engage the water with the soles of the feet and with a continuous "whipping" action, press the feet outward and backward, returning the legs to the glide position.

Fig. 8-4C Breaststroke Kick
The propulsive action of the legs should begin slowly and speed up to the completion of the kick. The strongest propulsion is accomplished by drawing the feet as far forward as one can without losing proper body position.

![Fig. 8-4D Breaststroke Kick](image)

8.3.5 **Breathing:**

The head is lifted at the beginning of the power phase of the arms. The head should be lifted with only the neck muscles, just high enough for the mouth to clear the water for a breath. The head is returned into the water, face down, during the recovery and glide. Inhalation should occur from the mouth, and exhalation should occur from the mouth and nose. Exhale slowly and steadily mostly through the mouth, from the arm recovery until just before the head lifts for the next breath. At this point, explosively exhale the last breath of air and lift the head again for the next breath. In rough seas, the exhalation and inhalation can occur after the head surfaces to ensure that the swimmer does not aspirate water.

8.3.6 **Timing:**

Following a glide held just long enough to prevent the loss of forward momentum, arms and legs perform alternately. As the arms begin their power phase, the legs begin their recovery; as the arms begin their recovery, the legs begin their propulsion. Reminding swimmers to "pull and breathe, kick and glide" assists in developing proper coordination.

8.3.7 **Navy Arm Action Modifications:**

The weight of operational equipment often requires a wide sculling action of the arms during the power phase to allow more upward force to elevate the head sufficiently to get a breath. Unlike the normal breaststroke arm action, this arm action generates very little forward movement. Instruction of this arm action is frequently seen in Navy commands that train aviators to swim.

8.3.8 **Navy Kick Modifications:**

Many Navy commands teach a modification of the breaststroke kick, called the frog kick. This kick is similar to the breaststroke kick with the major difference being that the thighs and knees are rotated out, not under, during the recovery. This action places the swimmer’s legs in a position similar to the stance of a Sumo wrestler with knees, thighs and feet rotated out and in the same plane as the torso. Propulsion is performed by kicking outward and backward with only the bottom of the feet, making the frog kick not as powerful as the breaststroke kick. Many swimmers, however, prefer the frog kick because its executed with a comfortable rotation of the thighs and knees and produces little knee stress when wearing boots.
Common Errors With The Breaststroke:

<table>
<thead>
<tr>
<th>Error</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arms pulling too far down and other arm problems.</td>
<td>Practice with leg buoy.</td>
</tr>
<tr>
<td>Head lifting to breathe during arm recovery (head sinking).</td>
<td>Practice arm and head actions while standing in waist-deep water.</td>
</tr>
<tr>
<td>Head lifted during glide.</td>
<td>Practice arm and head actions while standing in waist-deep water.</td>
</tr>
<tr>
<td>Improper breathing and fatigue.</td>
<td>(See Chapter 5)</td>
</tr>
<tr>
<td>Scissors kick with one or both legs.</td>
<td>Kickboard/wall practice. Emphasize avoidance of kicking with the top of the foot.</td>
</tr>
<tr>
<td>Legs, feet and trunk too low.</td>
<td>Emphasize head and body position.</td>
</tr>
<tr>
<td>Knees and thighs too far under</td>
<td>Kickboard/wall practice. Emphasize proper kick.</td>
</tr>
<tr>
<td>Timing</td>
<td>Emphasize &quot;pull and breathe, kick and glide&quot;.</td>
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8.4 SIDESTROKE

The sidestroke is useful when towing equipment, a victim, or to swim if one arm is injured. It provides good sideward visibility but very little forward visibility. The sidestroke kick, called the scissors kick, is less effective when wearing boots because of the loss of ankle movement. It does not offer good breath control when swimming in rough seas.

8.4.1 Body Position:

To perform the sidestroke, lie on either the left or right side. During the glide, the head, back and legs are straight with the legs fully extended and together with the toes pointed. The bottom arm is extended in front of the swimmer parallel to the surface with the palm down, in line with the body, a few inches below the surface of the water. The top arm is fully extended aft with the hand above the thigh. The head lies with the face just high enough to clear the mouth and nose above the water. The bottom ear rests in the water close to the shoulder. The head and back are kept in line throughout the stroke.

![Fig. 8-5 Sidestroke Body Position](image-url)
8.4.2 Arm Action:

The arms work alternately with different motions for both. While the top arm executes its power phase, the bottom arm executes the recovery phase and vice versa.

8.4.3 Top Arm:

 Recover the top arm by drawing the forearm along the body until the hand is approximately in front of the shoulder of the bottom arm. Keep the palm down angled slightly forward. During the power phase, push the top hand downward slightly and then aft, close to the side of the body, as it returns to the glide position. Start the power phase with the wrist flexed and finish with the wrist extended such that the palm is always facing toward the feet.

Fig. 8-6A Sidestroke Top Arm Action

Fig. 8-6B Sidestroke Top Arm Action

8.4.4 Bottom Arm:

From the glide position, rotate the bottom arm slightly placing the palm down and angled slightly outward. From this "catch", bend the elbow and sweep the hand downward slightly and aft until the hand almost reaches the upper chest. After this power phase, without hesitation, recover the arm by rotating the shoulder and dropping the elbow. Move the hand under the bottom ear until the fingers point forward. Slide the bottom arm forward, rotating it such that the palm is down for the glide position.

Fig. 8-6C Sidestroke Bottom Arm Action

Fig. 8-6D Sidestroke Bottom Arm Action
8.4.5 **Kick:**

The kick is called the scissors kick because the legs separate fore and aft, on one plane, like a pair of scissors. The recovery of both legs begins after the glide position by flexing slightly at the hips, bending the knees, and drawing the heels slowly towards the buttocks. Care must be taken during this movement to keep the knees close together, not allowing the bottom knee to drop down. To prepare for the power phase, the legs separate fore and aft. The top leg moves forward, knee leading, until the thigh is approximately 45 degrees to the body. The foot is flexed, pointing up toward the knee. The bottom leg extends aft, slightly to the rear of the swimmer's trunk, with the knee bent and the foot pointed. Just before the power phase the legs are separated similar to a giant stride. From this position both legs press backward returning to the extended position. As one moves the top foot backward, the ankle moves from a flexed position to a toes-pointed position. The power of the scissors kick is delivered by pushing back on the water with the top of the top foot and the top of the bottom foot. After the power phase, do not let the feet pass each other and keep the toes pointed to streamline during the glide.

![Fig. 8-7 Sidestroke Scissors Kick](image)

8.4.6 **Breathing:**

Breathe with each stroke. Inhale through the mouth during the recovery of the top arm and legs and exhale from the mouth and nose during their power phase.

8.4.7 **Timing:**

The recovery and power phase of the top arm and legs work alternately to the recovery and power phase of the bottom arm. Following a glide, held just long enough to prevent the loss of forward momentum, the top arm and legs begin their recovery while the bottom arm begins its power phase. After the power phase of the top arm and the legs, the recovery of the bottom arm is complete, and all motion is stopped as the swimmer glides.

![Fig. 8-8 Sidestroke Timing](image)
8.4.8 **Navy Head Position Modifications:**

When wearing operational equipment, one must often turn the face directly upward, vice side-wards, such that the mouth is clear of the water in order to take a breath. This modification is frequently seen in commands training aviators to swim.

8.4.9 **Navy Kick Modifications:**

Most civilian agencies train students to extend the top leg forward and the bottom leg aft during the leg recovery of the scissors kick. An alternative kick, the "inverted scissors kick" whereby the bottom leg extends forward and the top leg extends aft is taught at many Navy commands. Both kicks are effective and the inverted scissors kick is often useful when towing victims or gear.

**Common Errors with the Sidestroke:**

<table>
<thead>
<tr>
<th>Error</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushing down with the bottom arm.</td>
<td>Land drills</td>
</tr>
<tr>
<td>Pulling too far with the bottom arm.</td>
<td>A poor glide is commonly seen with this error. Land drills.</td>
</tr>
<tr>
<td>Arms not performing recovery and power phase alternately.</td>
<td>Land drills. Stress how arm action is similar to picking apples and putting them into a basket</td>
</tr>
<tr>
<td>Lifted head.</td>
<td>Emphasize laying head in water.</td>
</tr>
<tr>
<td>Dropping the bottom leg (breast stroke kick).</td>
<td>Land drills/kickboard/wall practice.</td>
</tr>
<tr>
<td>Legs separating up and down during recovery.</td>
<td>Land drills/kickboard/wall practice.</td>
</tr>
<tr>
<td>Top ankle not flexed during leg recovery.</td>
<td>Land drills/kickboard/wall practice. Say position of top leg is similar to striding over a hurdle</td>
</tr>
<tr>
<td>Waist bent too much.</td>
<td>Focus on proper kick mechanics. Land drills, kickboard/wall practice.</td>
</tr>
<tr>
<td>Swimmer lying on stomach.</td>
<td>Focus on proper body position.</td>
</tr>
</tbody>
</table>
8.5 COMBAT SIDESTROKE

The combat sidestroke is a variation of the sidestroke commonly seen with Special Warfare swimming programs. It is faster than the normal sidestroke, offers good forward and sideward visibility, and has excellent controlled breathing when swimming in rough seas. It is identical to the normal sidestroke with exceptions being head position and breathing. During this stroke the swimmer rotates his/her head to the side and inhales during the recovery of the top arm, and then places the face into the water during the propulsion of the top arm and the propulsive phase of the kick. This breathing and head action is repeated with each stroke. The head rotation and breathing of this stroke is similar to the crawl stroke.

![Fig. 8-9 Combat Sidestroke](image)

8.5.1 Kick Modification:

When using fins with this stroke, the swimmer utilizes the flutter kick.

Common Errors With The Combat Sidestroke

**Error**

Improper breathing and fatigue.

Other problems.

8.6 ELEMENTARY BACKSTROKE:

The elementary backstroke offers the swimmer an effective kick while wearing boots and an energy-conserving glide. Disadvantages include difficulty seeing where one is going and the inability to control one's breathing in rough seas.

8.6.1 Body Position:

To begin arm and leg actions one lays in a streamlined back glide position. The body is face up in a near horizontal position with the back of the head resting in the water. The waist is straight, hips and thighs near the surface slightly lower than the head and shoulders, and the arms extended along the body with palms against the thighs. The legs are fully extended with the toes pointed.

![Fig. 8-10 Elementary Backstroke Body Position](image)
8.6.2 Arm Action (recovery):

Beginning from the glide position with arms at sides, bend the elbows and draw both hands up towards the shoulders as if drawing a line along both sides of the torso with the thumbnails. Keep hands and arms just below the surface of the water. Continue to draw the hands along the sides of the body until they reach the armpits. From the armpits, point the fingers outward from the shoulders with palms facing back toward the feet. With fingers leading, extend the arms out sideward until the hands reach upward no farther than the top of the head. Imagine a 12-hour clock with one's head at 12:00, one's feet at 6:00, and one's arms as the hands of the clock, the left arm extends no further up than 2:00 and the right arm extends no further up than 10:00. Recovery motions should be executed slowly with emphasis on reducing drag.

8.6.3 Arm Action (power phase):

When arms and hands reach the 10:00 and 2:00 position, the palms and inside of the arms push aft in a broad sweeping motion, elbows straight or slightly bent, returning arms to the glide position. The power phase must be strong enough to smoothly propel the body forward.

8.6.4 Kick (recovery):

Beginning from the glide position with legs together and extended, while keeping the waist straight, bend the knees and drop the heels downward. During this motion the knees spread apart about as wide as the hips. The next motion is to rotate the knees inward, without spreading them wider, placing the heels to a point under and outside the knees. The last step of the recovery is to flex the ankles and turn the feet outward to position for the "catch". Recovery motions should be smooth and continuous.

8.6.5 Kick (power phase):

The power of the kick is generated by pushing aft with a rounded motion with the inside of the calves and the soles of the feet. At the end of the kick the legs are returned to the toes-pointed glide position. The kick starts slowly and speeds up at the finish.
8.6.6 **Breathing:**

Inhalation occurs with the recovery of arms and legs, and exhalation occurs with the power phase and glide.

8.6.7 **Timing:**

Following a glide, held just long enough to prevent the loss of forward momentum, arms begin their recovery just before the legs. The power phases of the arms and legs occur in unison. After the power phase, arms and legs rest in a streamlined position as the swimmer glides.

Fig. 8-14 Elementary Backstroke Timing

8.6.8 **Navy Kick Modifications:**

Many Navy commands teach a modification of the breast stroke kick, called the frog kick. Some swimmers find the frog kick easier to learn because it is executed with a more natural rotation of the thighs and knees and produces little knee stress while wearing boots.

8.6.9 **Arm Modification:**

When swimming this stroke utilizing the frog kick rather than the breaststroke kick, the swimmer must reach farther up with hands and arms to allow simultaneous power phase of arms and legs.

**Common Problems With The Elementary Backstroke**

**Error**

Bent waist.

Back arched too much.

**Correction**

Emphasize proper body position.

Commonly causes face to submerge. Emphasize proper body position.

8-11
Error

Head up.

Water washing over face during recovery or pull of arms

Improper kick with pointed feet.

Arms reaching too high.

Arms/hands breaking the surface.

Timing problems

Correction

Tell swimmer to lay head back.

Focus on proper head position and attention to proper arm action.


Land drills, pull buoys.

Land drills, pull buoys.

Land drills.

8.7 CRAWL STROKE:

The crawl stroke is the fastest of all strokes and is effective in survival situations when speed is required. It may also be utilized if one's legs are injured. The crawl stroke offers poor forward visibility and is fatiguing to swim with operational clothing.

8.7.1 Body Position:

The body is prone, near horizontal, and chest down. Depending on one's buoyancy, the head should be positioned with the waterline between the eyebrows and hairline. Personnel with little buoyancy may need to lower the head to raise the hips to straighten the body to improve kicking efficiency. The legs are extended aft, feet together, toes pointed, held just below the surface. Body roll, a rotation around the midline extending along the whole body, is an important aspect of a proper crawl stroke. Body roll results from the high recovery of an arm, the down sweep of the other arm and the sideways force of the kick produced when the legs roll with the body. Body roll assists a relaxed high elbow recovery, improves arm propulsion, helps maintain efficient body position, and aids effective breathing.

Fig. 8-15 Crawl Body Position

8.7.2 Arm Action:

The arms generate the predominance of the stroke’s propulsion. Correct timing, body roll and smooth transition from the power phase to the recovery are the components of an effective arm stroke. Arms work alternately, but not completely opposite of each other, as the recovering arm starts to catch up with the stroking arm at the end of the recovery.
8.7.3 Arm Action (power phase):

Viewing the swimmer from above, the left hand traces a lengthened "S" shape in the water and the right arm traces a reverse "S". The arm speed accelerates as the hand travels through the "S" shape, with the fastest speed at the bottom of the "S" which is the end of the pull. After the body is rolled and the arm is fully extended during the recovery, flex the wrist (palm facing aft) and sweep the hand down and slightly out, just outside the shoulder. This position is where the swimmer first "catches" the water and is the top of the "S". The elbow should be higher than the hand at the start of the pull and should remain higher throughout the arm pull.

As the arm action continues, the elbow bends to a maximum of 90 degrees and the hand and arm sweep back toward the feet with the hand passing just under and near the chest along, but not crossing, the centerline of the body. During this motion, pitch your hand inward and keep you wrist nearly straight. This segment of the arm action is the diagonal part of the "S". The last part of the "S" is performed by straightening the arm and pressing the hand straight back toward the feet while moving it along the side of the body. Bend the wrist back to keep the palm pushing toward the feet. Keep this press going to the full extent of the reach with the power phase ending when the thumb touches the thigh.

Fig. 8-16 Crawl Arm Action Power Phase

8.7.4 Arm Action (recovery):

Recovery motions should be smooth and relaxed to rest the arm and hand muscles and to produce even, continuous movement. After completion of the power phase, the elbow is bent and lifted from the water high enough to clear the hand from the water, little finger first, palm rotated toward the leg. The elbow is then moved forward toward the head with the forearm hanging down. When the elbow lines up with the shoulder, the hand is swung forward, and the arm begins to straighten. Before the arm fully extends, with the elbow bent slightly, enter the hand into the water in front of the shoulder, index finger first, with the entire arm rotated in such that the thumb is turned down. The elbow should be kept higher than the rest of the arm and should enter the water last. At this time the body is rolling along its axis on the same side as the recovering arm, assisting a smooth entry of the arm into the water in preparation for "catch" of the power phase.

Fig. 8-17 Crawl Arm Action Recovery Phase
8.7.5 Kick:

Legs kick up and down or "flutter" with the heels just breaking the surface of the water and the legs rolling with the body. The kick originates from the hips and thighs with the knees straight or slightly flexed depending on what phase of the kick they are in. Ankles are loose and relaxed throughout the kick. Maintaining loose ankles throughout the kick is a crucial component of an effective kick. Legs work alternately, when one leg is kicking down, the "downbeat", and the other leg is kicking up, the "upbeat". Kick (power phase): The downbeat is the power phase of the kick. The downbeat begins at the hip with the thigh kicking downward while the calf and foot are still moving upward. For most of the downbeat, the knee is slightly flexed. Propulsion occurs when the leg is straightened. Straightening your leg initiates a motion, which continues through the whole leg and ends with the feet. At the end of the kick, with the feet turned slightly inward, the foot snaps downward, generating a motion as if one were kicking a soccer ball.

8.7.6 Kick (recovery):

The upbeat is the recovery phase. The leg stays nearly straight during the upbeat. The leg is raised toward the surface until the heel just breaks the surface in preparation for the downbeat. The distance the feet separate during the kick depends on the length of the swimmer's legs with normal feet separation ranges being 12 to 18 inches. The number of kicks per arm cycle varies.

The number of kicks is measured for one arm cycle; the time one arm starts to pull to the time it starts to pull on the next stroke. Generally more kicks per arm cycle occur during faster, shorter swims and less kicks per arm cycle for longer, slower swims. Most common are two to six kicks per arm cycle.

8.7.7 Breathing:

Breathing occurs by turning the head and inhaling during the recovery of one arm. Breathing should not include a pause or hesitation of the arm action. Swimmers may breathe with each arm cycle, every 1 and 1/2 arm cycles alternating sides, or every other arm cycle. The swimmer should choose a breathing cycle that meets the physical demands of the swim and is comfortable to perform. Begin the turn of the head as the arm on the breathing side starts to pull. The mouth clears the water at the end of the pull, and inhalation occurs at the start of the arm's recovery. The face is returned to the water when the arm recovers forward. When inhaling, the swimmer should keep the forehead slightly higher than the chin with the opposite ear in the water. This head position allows the swimmer to breathe in a trough created as the head moves through the water. Body roll further assists the swimmer to turn the head to breathe.

Exhalation occurs slowly through the mouth and nose between head turns and is completed underwater. When the mouth surfaces, inhale through the mouth. Inhaling large amounts of air is unnecessary as the opportunity to breathe occurs frequently with each arm stroke.
8.7.8 **Timing:**

The arms stroke continuously, the legs kick continuously, breathing occurs with the recovery of an arm and the body rolls to the left and right matched with the recovery of one arm and the down sweep of the other arm.

8.7.9 **Navy Breathing Modifications:**

To avoid aspiration of water in rough seas exhalation begins as the head begins to turn and finishes with the mouth at the surface. Inhalation should be a quick bite of air as the head begins to rotate back to the face down position.

**Common Problems With The Crawl Stroke**

<table>
<thead>
<tr>
<th>Error</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breathing problems (coughing, fatigue, etc.)</td>
<td>See Chapter 5.</td>
</tr>
<tr>
<td>Swimming with head too high.</td>
<td>Indicates breathing problems. See Chapter 5 use kickboard, or side of pool breathing drills.</td>
</tr>
<tr>
<td>Swimming with head too low.</td>
<td>Tell students to raise the head.</td>
</tr>
<tr>
<td>Head bobbing, not turning.</td>
<td>See Chapter 5 if students have breathing problems, Use kickboard, or side of pool breathing drills.</td>
</tr>
<tr>
<td>Hands out of the water first during arm recovery.</td>
<td>Emphasize high elbow recovery. Pull buoy practice.</td>
</tr>
<tr>
<td>Straight arm recovery.</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Forearms and hands dragging during arm recovery.</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Straight arm pull (no &quot;S&quot;).</td>
<td>Emphasize &quot;S&quot;. Pull buoy practice.</td>
</tr>
<tr>
<td>Bent knees during recovery.</td>
<td>Kickboard/wall practice. Kicking with swim fins also helpful.</td>
</tr>
<tr>
<td>No body roll.</td>
<td>Emphasize roll focusing on its occurring with the recovery of one arm and the down-sweep of the other arm.</td>
</tr>
</tbody>
</table>

**SUMMARY**

If the decision is made to swim in a survival situation, mastery of swimming strokes will increase one's chances of survival by offering the most efficient propulsion with the least expenditure of energy. The energy saved by efficient swimming may be needed later to produce body heat, climb into a raft, or activate signal and rescue devices.