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# Air Sea Rescue



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## AIR/SEA RESCUE

### ARMY AIR FORCES SCHOOL OF APPLIED TACTICS BOMBARDMENT ACADEMIC DIVISION

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#### INTRODUCTION

The following statements on "Ditching" procedure are taken from AP.2095, Pilots Notes General, September 1, 1942, of the R.A.F. and have been only slightly modified to make them applicable to our plans and equipment. Other information is taken from actual test data and from equipment and kit instructions.

The general sections provide introductions to the subject which is supplemented by sections dealing with Single Seater Planes and Multi-Seater Planes.

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# AIR/SEA RESCUE

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CHAPTER ONE

PREPARATION FOR DITCHING



## Chapter One

### PREPARATION FOR DITCHING

1. CREW TRAINING AND CO-ORDINATION: a. The training and coordination of a crew cannot be over-emphasized, since the worst of conditions must always be anticipated. A forced landing at night on rough seas, with a severe wind, a damaged plane and wounded crew members aboard may have to be effected. All crew members may be partially stunned on the final impact, and so must rely on a sub-conscious knowledge for the co-ordination and effort that will make it possible for a complete exit in 45 to 90 seconds. All members will have to be familiar with each other's duties, and conversant with the drill after exit, - such as pumping the dinghy up, stopping leaks and the handling of emergency equipment.

2. PREVENTION OF DITCHING: a. Many ditchings have taken place which could have been avoided if proper use of manifold pressure, r.p.m. and Air-speed had been made. This means that pilots must be familiar with best range speeds, etc. and the methods of flying multi and single engine aircraft in the event of engine failure.

b. Insure that anti-icing or de-icing equipment, including carburetor and pitot tube devices, are in working order before leaving the ground.

c. Thoroughly understand the operation and limitations of the fuel system, particularly those controls which may have to be used for transferring fuel from one tank to another or for jettisoning it.

d. If height cannot be maintained above a reasonable altitude because of failure of one or

more engines or because of icing-up or other defects, lighten the load of the aircraft by jettisoning:

- (1) The bomb load,
- (2) Fuel not required, to reach a friendly base,
- (3) Guns and ammunition (*if not liable to attack*)
- (4) Camera and any equipment which is not essential for the navigation of the aircraft.

This will also assist in ditching at the lowest possible airspeed.

3. PREPARATION OF AIRPLANE FOR DITCHING: a. If doubt exists in the pilot's mind whether he can reach the coast, preparation for ditching must begin, particularly the radio procedure.

b. If possible, the plane should be ditched near surface craft to facilitate rescue, or near "floats" or buoys. The "floats" are brightly painted platforms in the shape of a ship's hull, about 30 feet long, anchored around the English coast within 5 miles of shore; these "floats" and channel marking buoys, e.g., those at river estuaries, are stocked with rations and emergency equipment.

c. Early preparation for ditching places men in their proper positions and enables the pilot to adjust, trim and lower his flaps without the crew moving about the aircraft.

d. The aircraft should be lightened as much possible by jettisoning bombs, guns, ammunition,

fuel (if possible) and all equipment not essential for navigation of the aircraft. Enough fuel should be retained to make a power landing as this is generally considered preferable. Empty fuel tanks not only lighten the plane but are a considerable contribution to flotation.

Insure that when equipment is jettisoned, it does not hit the tail plane or carry away the aerals.

e. All hatches and openings should be closed to prevent ingress of water and to aid flotation, except those hatches through which escape is to be made - these should be opened because they may become jammed on impact. It is essential for the crew to be free to leave the aircraft without delay after ditching. Escape is always preferably made through top (dorsal) hatches or upper side hatches.

It should, however, be borne in mind that open hatches cause drag and therefore, if the aircraft is being flown at reduced power these upper hatches should not be opened until, at most, 1000 feet is reached.

f. All bulkhead doors must be closed to hinder the flow of water from bow to stern.

g. Some aircraft are fitted with flotation bags which are filled with CO<sub>2</sub> by pulling an operational handle within the fuselage. If these bags are external and on the lower surface of the airplane, they should not be inflated until the plane has come to rest in order to minimize chances of damage or tearing away on impact.

4. PREPARATION OF CREW FOR DITCHING: a. It is vitally necessary for pilots and co-pilots of all types of aircraft to be firmly secured by the

safety harness. This means adjustment of waist and shoulder belts. The safety harness allows quick release after the impact and it is certain that the relatively short time lost and difficulty encountered in releasing the harness is far less serious than the consequences of not being secured.

b. It is vitally important that the crew should be braced for the impact. There are two ideal ditching positions.

In a sitting position feet pointing to the tail of the plane with back and head braced against a solid structure such as the rear of spar or strong bulkhead. If the head comes above the spar or back support being used as a ditching station, it is very important that the head should be clasped in both hands to avoid its being forced back and injured. In this position, the body can withstand forces which are far greater than those expected in ditching, with the exception of forces expected when the aircraft dives straight in.

The second, but less satisfactory ditching position, is to lie upon the floor with the head to the rear and the feet firmly braced against a solid structure. It is necessary to have the knees bent slightly to avoid injury as far as possible, but the limiting factor of this ditching station is the liability of the legs to fracture.

c. In night ditching all bright internal lights should be put out and only the amber lamps used. This will accustom the eyes to the external darkness. All lights should be left on after ditching to facilitate search, in the event of the aircraft's floating for a period.

d. Life vests must be worn at all times with the crotch strap secured. Where there are

small upper ditching exits, vents should not be inflated till immediately after leaving the exit. On aircraft with large upper exits the vest may be inflated or partially inflated before the ditching takes place. Instructions on this point are included in the Dinghy Drills for individual airplanes.

e. Parachutes should be removed before ditching in all cases where practicable, except where the single seater dinghy is attached to the parachute harness.

f. Helmets should be retained for the sake of protection of the head against cold when in the dinghy. The leads should be tucked into the collar of the flying clothing.

g. The dinghy emergency equipment, i. e., radio and ration box should be conveniently near the ditching exits; they should be firmly held or secured during ditching.



CHAPTER TWO  
DITCHING PROCEDURE



## Chapter Two

### DITCHING PROCEDURE

#### 1. WIND SPEED AND DIRECTION, SURFACE CONDITIONS AND ALTITUDE IN RELATION TO DITCHING:

a. At least an elementary understanding of sea conditions must be gained to obtain full advantage from the notes on handling the airplane, which follow in the next paragraph. It should be remembered that Naval Air Arm and Boat pilots are continuously associated with the sea and have, therefore, a decided advantage over the land plane pilot who usually has not the experience.

b. In the absence of any fixed mark (*land, lightship, etc.*) or floating object not underway, the pilot can only judge his motion relative to the motion of the water.

c. WIND DIRECTION: (1) Waves always move down-wind except when close inshore and in fast flowing estuaries. Waves are the direct result of the wind which creates them and maintains them, and the line of wind can be taken to be at right angles to the lines of the wave crests.

(2) If there is sufficient wind, waves break and they break down-wind. This can be readily observed from a low altitude. If the aircraft is flown at right angles to the breaking waves the direction of drift will be apparent.

(3) If there is enough wind to blow the spray off the wave crests the direction in which the spray moves is a reliable index.

(4) *Swell* is an undulating movement of the surface, caused by past or distant disturbances or action of the wind. It does not necessarily

move with the wind and it has no breaking crests. If the wind is blowing across the swell a cross-sea is created with the waves (*which are moving down-wind*) running on the swell. In these conditions the pilot must choose that direction along the swell which will make the approach as near into the wind as possible.

(5) Smoke from ships is also a useful guide. Smoke naturally drifts with the wind and if this drift could be observed, the direction would be indicated. However, the mistake should not be made of supposing that the wind direction is along the trail of the smoke. The trail is the resultant of the wind speed and direction, *and the ship's forward motion*. Therefore, the wind direction is somewhere between the forward path of the ship and the smoke trail. Only when the wind is blowing in a similar direction to the forward motion of the ship will the smoke be a reliable indication of the direction; it will be from astern.

(6) If low enough, it is possible to calculate the direction of the wind by observing the sails of surface craft. A reasonable indication of speed can also be gained by observing the set of the sails. Where the surface is not broken up it is possible to watch gusts rippling the surface in great sweeps, which indicate the wind direction.

(7) Sometimes the effect of wind on the surface of the sea is to produce a series of lines, known as "wind lanes" which appear as alternate strips of light and shade. This is a reliable indication of surface wind direction.

d. WIND SPEED: (1) The roughness of the sea is an indication of the strength of the wind, if it has been blowing at the same strength in the

same direction for sometime. In general the indication is as follows:

- (a) A few white crests . . . . . 10 to 20 m.p.h.
- (b) Many white crests . . . . . 20 to 30 m.p.h.
- (c) Streaks of foam along the waters . 30 to 40 m.p.h.
- (d) Spray from the crests . . . . . 40 to 50 m.p.h.

(2) The wind will be stronger than the appearance of the sea suggests, if it is freshening, blowing off a nearby shore, running with tide or swell, and during heavy rain.

(3) Breaking waves may be due to shallow water and in such circumstances must not be used as a means of calculating wind speed and direction.

(4) When flying over the sea, pilots should not leave the estimation of W.S. and D. till an emergency arises. They should always have in mind the state of the wind and sea, just as when over the land they bear in mind the main features of the country and the effect the wind has upon their tracks.

e. ALTITUDE: (1) In a calm sea there may be little or no wind, so that it is essential to ditch with the lowest IAS possible. Such a sea is deceptive with regard to judgment of height, particularly if the surface is "glassy". If there are ripples upon the surface, judgment of height is improved.

(2) Altimeter: The aneroid altimeter is quite unreliable as an indicator of close approach to the sea. The trailing aerial can be used, the radio operator signalling the pilot when the current drops on the weight hitting the sea. An alternative method is to engage the aerial with an insulated hook held in the hand, when the impact

of the weight on the sea will be felt. This procedure can only be carried out where a suitable ditching station is very near to the R/O's position. This method must never be used where the radio is in the nose of the aircraft.

2. HANDLING OF LANDPLANES IN DITCHING: a. USE OF FLAPS: The flaps should be lowered to reduce the speed at which the aircraft can approach and touchdown. It is better to use a medium setting and not to lower them fully because little, if any, further reduction of speed is obtainable by so doing, while the rate of descent is increased and the aircraft approaches more nose down; a steep nose down descent is dangerous if the sea is met sooner than expected, and in addition, increases the height needed to flatten out.

*(NOTE: There is now a large body of evidence to show that flaps do not cause an appreciable diving tendency, with the possible exception of the Hudson and Ventura which have strong and effective flaps; this is because flaps are almost immediately torn off in contact with the water. On the other hand all the evidence shows the importance of reducing speed to the minimum, especially in the case of the single engine fighter.)*

b. USE OF ENGINES: (1) If one engine of a twin engine aircraft is available, a little power should be used to flatten the approach; however, the engine should not be used to such an extent that the aircraft cannot be turned against it right down to the stall, with a margin of rudder power in hand. On no account, should the engine be opened up during the final stages of ditching. The power that can be used will depend on the characteristics of the type; on some types it may be inadvisable to use the engine at all.

(2) If two engines are available on one side, the inner engine should be used.

(3) If the power is, for instance, inner port and outer starboard, it will be possible to use considerable power, adjusting the throttles so that little rudder is needed. This case approximates that in (4).

(4) If power is available symmetrically, it should be used, to full if necessary, with two engines out of four - to secure the flattest possible approach and the slowest possible touch-down. The slipstreams over wings and tail will aid considerably in reducing speed and retaining control.

(5) The value of power is ditching is so great that the pilot should always ditch before fuel is quite exhausted, when it is certain that the coast cannot be reached.

(6) Assuming that symmetrical power is not available the normal glide approach speed should be used. This will insure control and some margin of speed after flattening out to allow the pilot to choose the best spot for ditching on the swell.

c. APPROACH: In a steep swell the pilot should generally ditch along the top of the swell. He should ditch up-wind in a long (*shallow*) ocean swell; further, if ditching along the swell would involve alighting with a very strong cross-wind, the aircraft should be ditched into wind.

In ditching across the swell the aircraft should be put down on an upslope toward the top.

When ditching across wind along the swell, drift should be taken off by side-slipping up wind

as the sea is approached and in this case, also, the aircraft ditched on the upslope of the swell.

When ditching by moonlight, if the direction of approach is not fixed by wind or swell, it is advantageous to ditch toward the moon.

d. TOUCHDOWN: WARNING - The open sea always appears from the air to be much calmer than is the case.

(1) Apart from choosing the best point at which to ditch, the pilot should hold off till he loses all excess speed above the stall and so strike the sea at normal three point landing attitude (*slow landing attitude for tricycles*).

(2) If the aircraft alights tail down in a three pointer attitude (*as it should*) there will be a primary slight impact as the rear of the aircraft strikes. This will be followed by a severe impact with violent deceleration in most cases. In a short, moderate or calm sea there will be a tendency to bounce, especially if the alighting has been made too fast; when this occurs the control column should be held hard back. In the average short sea the tail should touch the crest of a wave and as soon as it does so the nose should be kept up as much as possible. This should cause the forebody to touch down approximately under the center of gravity on the next wave-crest. As the aircraft comes to rest the nose will bury, but if the alighting has been carried out correctly the effect of the nose burying will be minimized and the structure may not collapse.

(3) In the case of the single engine fighter aircraft the tendency to dive will be greater and the deceleration may be more severe. Usually bomber aircraft may be expected to float

for a minimum period of one minute. Single engine fighters seldom remain on the surface for more than 20 seconds, and the average time is between five and ten seconds.

3. PROCEDURE AFTER DESCENT: a. DINGHY RELEASE: Operate the manual release of the dinghy as soon as the aircraft comes to rest but not before. The manual release should not be gripped before or during the ditching to avoid inadvertent release as a result of the impact. If this mistake is made the dinghy will balloon out while there is still way on, and it may thus break free and drift out of reach.

b. LEAVING THE PLANE: On emerging, inflate the life vest if not already inflated. Do not be surprised to find that waves may be breaking over the aircraft. If they are large, it is possible to be swept off. If the aircraft has a life line attached to the inside of the hatch, make use of it, otherwise hold on to the outside of the hatch and await a favorable moment to board the dinghy, but by doing so, take care not to block the escape hatch, or to hinder the tempo of the ditching procedure to any great extent.

c. INVERTED DINGHY: If the dinghy should inflate inverted, endeavor should be made to right it from the wind if the aircraft is not sinking rapidly. If righting is to be attempted, do not jump on the inverted dinghy, as doing so expels air trapped beneath it and makes righting more difficult.

d. BOARDING THE DINGHY: To avoid the consequences of exposure it is important not to get wetter than is absolutely necessary. But wet clothes must NOT be taken off. It is far warmer with wet clothes on than off. In hot weather this

may not apply so far as cold is concerned but the body should be covered against the sun.

e. During ditching the flaps are almost invariably torn off, leaving sharp projecting surfaces; for this reason the dinghy should be launched off the end of the wing. If this is not possible, great care should be taken to avoid tearing the dinghy on the torn surfaces of the trailing edge.

f. If the ditching has been made into wind the dinghy will float toward the tail plane and the boarding should not be difficult. If a cross wind ditching has been made the aircraft will tend to swing into the wind. If the dinghy is on the upwind side of the aircraft, there is danger of its becoming wedged beneath the wings as the aircraft rolls and swings into wind. On the other hand, if the dinghy is on the down-wind side there is danger of getting beneath the fuselage or tail plane which may be thrashing up and down as the aircraft weathercocks into the wind. Look out for jagged edges which may puncture the dinghy. Do not jump but climb into the dinghy, thereby preventing damage to the fabric. One man already in the dinghy can be of great assistance to those in the water who require helping aboard.

g. All the above actions concerned with boarding the dinghy are comparatively simple if the life jacket is fully inflated. If this jacket has been partly inflated by mouth it is important to insure that the mouth valve is closed before using the CO<sub>2</sub> bottle. A non-swimmer, even with full winter flying clothing, can feel quite confident in a fully inflated jacket, provided the crotch strap is secure.

h. Once aboard the dinghy, it is the duty of the men detailed by the Captain to check whether

there are any leaks; these should be repaired immediately with the provided leak stoppers or patching material.

i. When every one is aboard, the dinghy captain (pilot or co-pilot) should call the roll, give the order to cast off and the crew should paddle away from the aircraft. If the aircraft floats, keep nearby to increase the chance of being spotted. However, do not remain fast to the aircraft where there is any chance of the dinghy being punctured or damaged by the rise and fall of the aircraft.

j. There is a painter (rope) which attaches the dinghy to the aircraft. It is made light intentionally, in order that it shall break if the aircraft sinks while the dinghy is still attached.



CHAPTER THREE

RESCUE



## Chapter Three

### RESCUE

1. CHANCES OF RESCUE: a. Providing the wireless operator makes a correct and early transmission on the correct section when airborne, and has used I.F.F., there is every hope that a rescue will be achieved. The dinghy radio, used in the correct manner, adds enormously to the chance of rescue. The importance of insuring that this equipment reaches the dinghy after ditching, cannot be too highly stressed. It is the duty of the whole crew to know where this equipment is stowed so that in any event, it reaches the dinghy.

b. If the above actions have been taken, the crew can be assured that rescue will eventually arrive. It is also pointed out, however, that rescue can be achieved on very much less information being made available, but without adequate information, valuable time may be lost.

2. SIGNAL EQUIPMENT: a. Any other type of communication system available should, of course, be used. Flares should be used judiciously, not wasted. Pyrotechnics and pyrotechnic pistols should be kept as dry as possible. A mirror or polished bottom of a can (*first aid container*) may be of help in signalling aircraft. A powerful whistle is occasionally of use to make location known to a searching launch. Remember a dinghy in the sea is a small object and difficult to keep in sight from the air—devices such as tying dinghies together and providing a larger object for detection are helpful to search craft.

3. LINDHOLME RESCUE GEAR: a. On sighting a dinghy, rescue aircraft will normally drop a smoke float in the vicinity of the dinghy to mark it.

obtain a fix and signal for surface vessels or flying boat a/c to come and pick up the crew. Supplies may also be dropped and they will most likely be in the form of the Lindholme gear.

b. This apparatus consists of five containers joined together by 70 yard lengths of cord and kapok floats, which are dropped down-wind of the distressed crew. The middle of one of these containers opens up into a very large (*J type*) dinghy. The remaining cartons contain food, water, medical supplies, dry clothing, "Everhot" bags, cigarettes, matches, etc.

c. When this gear is dropped, proceed as follows:

(1) Paddle or drift toward Lindholme dinghy until you either reach the dinghy or the connecting rope with kapok floats between the containers which you must catch by hand.

(2) Haul in the connecting rope, following the direction of the arrows, until your dinghy is alongside the J-type dinghy.

(NOTE: The containers and kapok floats are marked with red arrows, indicating the direction of the J-type dinghy.)

(3) When you have reached the J-type dinghy, secure your old one to it.

(4) Haul in the supply containers by pulling ropes across the outside of dinghy (*do not litter the dinghy with ropes - leave them in the sea*). Turn each container upside down to empty water into sea and lift container into dinghy. Remove pins securing webbing straps and remove straps through slots. Pull inner container

out of outer container and place it in dinghy. Pass webbing straps through noose at end of rope and slots in outer container. Repin straps to outer container and place empty container in sea. Repeat for other container.

(5) Unbuckle webbing straps at top of four inner containers, remove sealing tapes and lids and carefully remove contents, throwing straw packing into sea. Leave sleeping suits (*in water-cases*) in dinghy, put all remaining supplies back into two containers. Replace lids of all containers and rebuckle the straps.

*(NOTE: The empty containers and your old dinghy floating in the sea will help you to be more easily spotted.)*

Tie empty containers to ropes and place in sea.

4. PROVISIONS FOR RESCUE: a. During the past two years the organization of Air/Sea Rescue has been greatly built up and improved so that there are now not only high speed launches, motor launches and lifeboats to be called upon to help distressed crews in the water, but in addition, amphibian aircraft and two engine squadrons doing full time Air/Sea Rescue Work.

5. AFTER RESCUE: a. When the rescue craft comes alongside; do not assume that you will be able to get aboard easily. Remember that if you have been at sea for several days you will be very weak. Allow the crew of the rescue craft to give you their fullest assistance; they will realize you need it.

b. If a Naval, R.A.F. craft, or Allied merchantman effects the rescue, they will know whom to inform by signal.

(1) The following example is all the information required for transmission by neutral or enemy rescue craft:

Name, rank, number and service (*Not Unit*) ditched on (*date*); rescued from dinghy.

The receiving station will know to whom the information should be passed.

(2) Directly the above action has been taken, turn in and rest for as long as possible.

(3) The different motion of the rescue craft may bring on sea-sickness and this is another reason why rest must be taken.

c. REMEMBER - *If you have given S.O.S. or any distress signal indicating that you may ditch, and are then able to make land and do not ditch the aircraft, make certain that Air/Sea rescue service is notified of this as soon as possible. Many hours of fruitless search will be wasted and aircraft may be lost in the effort, if prompt notification of your safe landing is not given.*

CHAPTER FOUR

GENERAL INSTRUCTIONS REGARDING DITCHING



## Chapter Four

### GENERAL INSTRUCTIONS REGARDING DITCHING

1. SUMMARY: a. In the event of a forced descent onto the sea ("*Ditching*") it has been learned by experience and by experiment that it is important to jettison all excess weight (*bombs, guns, etc.*), approach the water in a three-pointer attitude with tail well down, into the wind (*across the waves*) if the wind is strong and along the top of the swell if the wind is light. It is advisable to use power if available. Ditching involves decelerative forces which are usually greater than those involved in crash landings on land - therefore, minimum speed at moment of impact is essential. To this end, it is generally advisable to use flaps at about medium setting. Remember the open sea always appears from the air to be calmer than it actually is.

b. To insure the maximum flotation, all external openings should be tightly closed, *except* the hatches which are to be used for escape. These should preferably be top or upper side hatches. All bulkhead doors must be closed to hinder the flow of water from bow to stern.

c. In order to best withstand the impact:

(1) Pilots and co-pilots must have safety harnesses (*including shoulder belts, if installed*) firmly fastened.

(2) Remaining crew member should be placed high up near the center of the gravity of the ship, braced in one of two positions.

(a) In a sitting position, feet toward the tail of the plane; back, head and buttocks

firmly braced against a solid structure such as a bulkhead; if the bulkhead is deficient in the region of the head, the head should be bent forward and clasped in both hands to support it.

(b) Lying on the floor, head to the rear of the plane and feet firmly braced against a solid structure, with the knees slightly bent.

d. Parachutes should be removed. Winter flying boots should be removed but *no* other items of clothing are to be taken off. Life vests are to be worn *over* flying clothing (*no matter what type*) and inflated either before or immediately after leaving the aircraft, in accordance with instructions of dinghy drills for individual types of planes.

e. Two impacts will be felt, the first when the tail strikes, the second main impact when the body of the aircraft hits the water. Hold positions until after the second impact.

f. The most essential items of dinghy equipment are:

(1) Communication equipment: Flares and Radio.

(2) Drinking water (*canned water is in the emergency ration box*).

It should be the responsibility of every crew member to see that these are gotten into the dinghy.

g. One of the best assurances of rescue is correct and early transmission on the correct section while still airborne.

h. Single engined fighters generally float for five to ten seconds. The average bombardment

airplane remains afloat about one minute. Thus, the lives of the crew depend on familiarity with their dinghy equipment (so that important items are not left behind) and rapid, well executed dinghy procedure. This means frequent and conscientious dinghy drill.

2. SINGLE SEATER AIRPLANES: a. On striking the water, single engine fighter planes have a greater tendency to dive than bombers and consequently, the deceleration may be more severe. Diving of the aircraft, however, does not necessarily involve serious injury to the pilot.

b. Single engine fighters seldom remain on the surface for more than twenty seconds and the average time is five to ten seconds. Therefore, if height allows, single seater aircraft should be abandoned by parachute in preference to ditching. This does not preclude the decision of flying toward a ship to a friendly coast at the expense of not being able to bail out.

3. MULTI-SEATER AIRPLANES: a. When forced descent is necessitated over the sea, the decision as to whether the aircraft should be ditched or the crew bail out with individual dinghies will be made by the pilot. This decision will depend on:

(1) TYPE OF PLANE: In general heavy bombers have the best ditching characteristics, i.e., can be set down on water with good chance of survival of crew; medium bombers have fair ditching qualities. Light, fast bombers have the poorest characteristics. Therefore - if altitude permits - light bombers should preferably be abandoned in air and individual dinghies used.

(2) CHANCES OF SURVIVAL: When men bail out with individual dinghy packs onto the sea,

chances are small that they will, while in their dinghies, be able to make contact with each other. In the airplane dinghies there will be a relatively large quantity of water, rations, flares, etc., which are impossible to include in the individual dinghy packs. From the standpoint of survival, therefore, it is always preferable to keep the crew members together in the large airplane dinghy. Further, if rescue is delayed, discomforts and discouragement are much better withstood by men in a group than individually.

(3) CHANCES OF RESCUE: These are less with individual dinghies than with the larger airplane dinghies because of the greater difficulty in spotting from the air and absence of dinghy radio. So, unless abandonment is very close to shore, the chances of rescue are definitely better if crew members are gathered in the airplane dinghy.

b. Abandonment of aircraft in the air without individual dinghy, i. e., with only a life vest should always be a procedure of *last* choice. The chances of rescue are generally small and the effects of the water and exposure are severe. This is particularly true if the water is cold, in which case life cannot be maintained for more than one to two hours.

4. PROCEDURES FOR PLANES NOW IN USE: a. HEAVY BOMBARDMENT AIRPLANES - B-17E, B-17F, and B-24D: Because of their better ditching characteristics and large crew, these planes should be ditched in preference to abandonment in the air. In those occasional cases where the aircraft must be abandoned over water, e. g., in case of fire, the individual dinghy pack will be used. In case of such abandonment, radio signals while airborne will be of inestimable value in aiding rescue.

b. MEDIUM BOMBARDMENT AIRPLANES - B-25C, B-26B: In this type of aircraft the pilot's decision will depend on the individual circumstances. In general, it is preferable to ditch the plane if:

(1) There is sufficient time for the crew members aft of the bombay to come forward and take ditching positions, (*crew trained in dinghy drill should require no more than one to two minutes to do this*) and:

(2) The pilot has reasonable control of the aircraft.

If the pilot does not have control of the plane or there is not time to take ditching positions and height permits - the crew should bail out and use individual dinghies.

c. LIGHT BOMBARDMENT AIRPLANES - A-20 SERIES: If altitude permits, the aircraft should be abandoned in the air and individual dinghies used in preference to ditching.

d. TROOP TRANSPORT AIRPLANES - C-47 and C-51: (1) The decision in these types of planes will necessarily be governed by individual circumstances, i. e., number of crew on board, available dinghies and distances from shore. Although there are very few reports of ditching of these types of planes, it appears probable that they have good ditching characteristics because of the relative stability of structure and absence of weak underportions such as perspex nose and bombay.

(2) The large door on the rear port side will probably not be available for escape so crew members, passengers and dinghy equipment must be passed out the small hatches in the mid-fuselage and the top hatch over the pilot's compartment.

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(3) It is therefore essential that all crew members be thoroughly familiar with the dinghy and dinghy equipment and have frequent drill. The carried troops should be given instructions routinely and prior to each flight. Special attention should be given to placing an experienced flying officer or non-commissioned officer in charge of the troops to maintain discipline in case of an emergency such as ditching of the airplane.

(4) EQUIPMENT NOTE: Technical Orders No. 01-40-NC-1 for the C-47 (Section II), of 1 November, 1942 provides for stowage of one B-8 and two A-2 Life Rafts.

5. RADIO PROCEDURE: a. WHEN THE PILOT BELIEVES DESCENT INTO THE SEA IS IMMINENT (*i.e.*, within the next ten minutes), he should order the radio operator to transmit immediately, S.O.S. call to the control station of the MF D/F section assigned.

b. To avoid costly delay in beginning transmission on the proper MF D/F frequency, it is important that the operator tune his liaison transmitter to this frequency before take-off on an over-water flight. If it is an operational mission, this tuning should be done, if possible, four or five hours before take-off, so as not to forewarn the enemy.

c. All stations in the MF D/F section will take bearings on transmissions made to the control station of the section. This enables them to obtain a "fix", or exact position of the aircraft in distress. This and other information received is relayed to the Air / Sea Rescue Service.

d. When the pilot considers it unlikely that he will reach the coast, and yet a descent into the sea is not imminent, he should order the radio operator to:

(1) Begin transmitting at once on the MF D/F frequency assigned, reporting the nature of the distress.

(2) Include other information such as height, course and speed, using signals from Table I, and direction and speed of wind (*SWT*).

(3) Request a fix (*QTF*), followed by a continuous dash of fifteen seconds, to enable all stations to take an accurate bearing. If time permits, this should be repeated at intervals to enable the control D/F station to plot successive positions, thus accurately determining the course and ground speed, so that rescue raft can be dispatched to the probable point of descent.

(4) When finally ordered to his ditching station, the radio operator should screw the *radio key down*, so that a continuous dash will be transmitted until the antenna strikes the water.



CHAPTER FIVE

"PREPARE FOR DITCHING"



## Chapter Five

### "PREPARE FOR DITCHING"

1. **CREW PREPARATION FOR DITCHING:** a. If doubt exists in the captain's mind whether he can reach the coast, preparation for ditching *Must* begin, particularly the radio procedure.

b. If height cannot be maintained about 1000 feet, the crew should move to their ditching stations in order that the pilot may be able to re-adjust trim, and lower his flaps without the crew moving about the aircraft.

c. The executive order is "Prepare for Ditching, Prepare for Ditching", which must only be given by the pilot. The order will be acknowledged by the whole crew on the intercom with the answer "Co-pilot Ditching", "Navigator Ditching", etc. in the prescribed order. In addition, the pilot should routinely give the preliminary ditching signal - (*five or six short rings*).

d. The preparation for ditching is thus begun on a co-ordinated basis and the pilot is assured that his crew is aware of the situation and, if they have practiced the drill, that they know what to do and do it.

e. The pilot's duty is to co-ordinate the work of his crew, but the crew should act on his executive order "Prepare for Ditching" without further orders from him being necessary, other than his order to the Radio Operator to move to his ditching station and the final warning of the impending impact, "Brace for Ditching". One long ring on the alarm bell is the corresponding bell signal for "Brace for

Ditching". This final warning to brace is important. Crew members cannot be expected to maintain a braced position indefinitely.

2. THE PILOT'S RESPONSIBILITY: a. It is the personal responsibility of the pilot:

- (1) To insure that the bombs and containers are jettisoned and the doors closed again.
- (2) To insure that the member of the crew detailed in the drill, assists him to secure his safety harness.
- (3) To check that the undercarriage is up.
- (4) To lower flaps to the ditching setting.
- (5) To order the radio operator to his ditching station, since it is important for him to remain at the set as long as possible.
- (6) To warn the crew when ditching is imminent. ("*Brace for Ditching*").

(7) If at night, switch on the landing lamp and the upper identification lamp (*if this does not cause reflections which upset vision*). It is important to remember that although the surface may be seen in the beam of the landing lamp, judgement of height may not be correct.

3. THE CO-PILOT: a. The responsibilities of the Co-Pilot are as follows:

- (1) At the specific order of the pilot, jettisons the bombs and closes bomb doors.

- (2) If time is available - destroys the bombsight and all secret papers.
- (3) Takes ditching position.

The bombs are jettisoned to lighten the aircraft and to assist in reducing the airspeed at impact; this loss of extra weight will contribute considerably to flotation. If there is any danger of the doors being open when the aircraft hits the water it is better to keep the bombs on board "safe". Thirty seconds must be allowed for opening and closing of bomb doors.

4. THE NAVIGATOR: a. The Navigator's responsibilities are:

- (1) Should have a constant appreciation of WS & D and his DR and fixed position. He should always be well aware of fuel consumption in relation to his ETA.

- (2) If time is available the navigator at the pilot's executive order will:
  - (a) Calculate position.
  - (b) Pass DR position to R/O with course, height and speed maintained.
  - (c) Receive fixes and bearings from R/O.
  - (d) Calculate estimated position of ditching and pass to R/O.
  - (e) Inform pilot of surface WS & D.
  - (f) Destroy secret papers; collect maps, compass and celestial equipment.

(3) Takes ditching position.

5. RADIO OPERATOR: a. On the pilot's executive order "Prepare for Ditching", the radio operator will:

(1) Transmit without delay on the frequency of the MD D/F section allotted.

(2) Switch I.F.F. to emergency position.

(3) Receive estimated position of ditching from navigator and transmit this to the MD D-F control station.

(4) If airplane recovers from its trouble and the pilot considers it likely that a safe landing will be made, cancel the distress call.

(5) If time permits, destroy verification tables, beacon schedule, beam approach data, tables of call signs and frequencies, and all codes or syko cards.

(6) On order from pilot to move to ditching station, screw the radio key down, and take ditching position.

6. THE REMAINDER OF THE CREW: a. The other members of the crew will:

(1) Jettison guns, ammunition and loose equipment in order to lighten the aircraft. Insure that when equipment is jettisoned, it does not hit the tail plane or carry away the I.F.F. aeriels.

(2) Open escape hatches, close all bulk-head doors to minimize flow of water from bow to stern and collect dinghy equipment.

(3) Take ditching positions.

b. The crew must not relax or release themselves in their ditching stations until the aircraft has come to rest. The first impact of the tail can be mistaken for the shock against which they are on guard, but it will be followed by a greater shock as the nose strikes the water, after a correct three pointer tail down ditching.

(NOTE: Serious casualties have occurred in crews who have not taken up proper ditching stations or where they have relaxed before the final impact. Also, some crews have thought that they knew better ditching stations than those laid down in the official drill; this has also resulted in casualties. It is pointed out that these drills are drawn up from experience of previous ditchings with the help of operational pilots and technical officers of squadrons, groups and commands, and with the advice of the Air/Sea Rescue Service. Such advice and instructions should not be lightly disregarded. If there are apparent defects in the official drill, the attention of higher authority must be drawn to the fact. There is still much to learn concerning ditching and improvements in drill can still be made.)

c. Aircraft may slew to one side after impact especially after a down wind or cross wind ditching. In most dinghy drills the ditching stations provide for this contingency.

7. INJURED CREW MEMBERS: a. Crew members who have been previously injured by gunfire receive first consideration in preparation for ditching. They are to be assisted to their ditching stations and their life vests inflated for them.

b. Generally the best ditching position for an injured crew member is with back and head firmly braced against a forward bulkhead or strong supporting structure. In the event he does not have such a regularly assigned position, he should change positions with another man.

c. This is particularly true in a leg or thigh injury suspected of being a fracture. In such a case the ditching position which involves lying on the floor with feet braced forward would, on impact, result in great displacement of bone fragments and severe injury.

CHAPTER SIX

LIFE RAFT EQUIPMENT



## Chapter Six

### LIFE RAFT EQUIPMENT

1. The following equipment will be used in Bombardment Airplanes:

a. Life Raft - (*Dinghy*) - Type A-8, 1000 pounds capacity, Specification number 94-40420.

(1) This is a five man raft; in most planes it is released and inflated with CO<sub>2</sub> by a handle inside the fuselage. If the automatic release does not function, the dinghy stowage can be opened from the top of the airplane and the CO<sub>2</sub> release cord pulled by hand.

(2) This raft was developed to provide a multi-place life raft for long over-water flights. It is installed in life-raft compartments to provide for automatic ejection and may also be carried inside the airplane in the carrying case provided. Accessories provided with this life-raft are:

- (a) One pyrotechnic pistol with five distress signals.
- (b) Seven cans emergency drinking water.
- (c) Three sea markers (*fluorescein dye for coloring water as a rescue signal*).
- (d) Nine packages Type K Rations (*five dinners, four breakfasts*).
- (e) One flashlight.
- (f) One Scout Knife.
- (g) One police whistle.

- (h) One first-aid kit.
- (i) One emergency fishing kit.
- (j) One paulin for use as sail
- (k) One paulin for water catching, signal shade and camouflage.
- (l) Three oars.
- (m) One hand pump with hose.
- (n) One repair kit.
- (o) One bailing bucket.
- (p) Four bullet hole plugs.
- (q) Forty feet seventy-five pound test cord.
- (r) One sea anchor (*for controlling drift*).

2. CARE OF SIGNAL EQUIPMENT: a. The pyrotechnic pistol and flares are important items of dinghy equipment and must be stowed inside the raft. Stowing of the pistol and flares (*except for additional flares*) in the Emergency Ration Pack or leaving this equipment loose in the aircraft on the assumption that it will be gathered up by individual crew members is undesirable. Further, care must be taken that the extra flares (*carried in Emergency Ration Pack*) are of a calibre corresponding to the pyrotechnic pistol carried in the dinghy.

3. EMERGENCY RADIO SET - SCR 578-A: a. This apparatus consists of two parts:

(1) The Radio Transmitter (BC-778-A) which is roughly cube shaped - 9 x 11 x 12 inches - and has an attached parachute in a side pocket.

(2) Accessory Bag (BG-109-A) which contains a cylindrical Signal Box 88 inches long and 7/5 inches in diameter. This box contains:

- (a) One box kite (kite 278-A).
- (b) Two balloons (M-278-A).
- (c) Two hydrogen generators (M-308-A).
- (d) One signal lamp (M-308-A).
- (e) Extra roll of antenna wire (W-148)

b. Total weight of equipment - 33 lbs.

These two parts, the radio transmitter and Signal Box are both essential parts of the emergency radio unit. They should be fastened together by the straps which are provided and stowed in the designated portion of the aircraft. They will float on immersion into water.

c. To each Emergency Radio Set (attached to connecting strap between transmitter and signal box) will be tied a 15 ft. length of light ( $\frac{1}{2}$  inch) rope. The free end of this rope will have a slip-knot so it may easily be secured onto the arm of the crewman removing it from the plane after ditching. When not in use this rope will be neatly tied up in an easily detachable roll.

d. The Box Kite is designed to carry the antenna wire if a wind is blowing; the balloon holds up the antenna wire if the wind velocity is too low to fly a kite.

e. The radio transmitter and associated equipment are simple to operate, permitting inexperienced personnel with no knowledge of radio transmission to use the equipment.

f. The signal lamp can be keyed either manually or automatically. No radio transmission takes place when the signal lamp is used.

g. These are two precautions to be observed when using this equipment:

(1) Care should be exercised when the hydrogen generator is in use as hydrogen gas is explosive around flames or sparks.

(2) Do not attempt to operate this equipment or have the aerial up if severe lightning is occurring - it may result in serious injury to personnel.

#### 4. INSTRUCTIONS - EMERGENCY SET SCR 578-A:

a. Instructions for use of this radio are printed on the equipment and also contained in the instruction book inside the cylindrical Signal Box. To prepare for operation, proceed as follows:

(1) Take the set out of the bag and immediately strap it securely to some part of the raft.

(2) Unscrew the cap on top of the set. Take the crank out of its well, first releasing the locking key, insert in socket on top of the set, and tighten thumb nut. *Don't drop crank.* There is no spare.

(3) Open door in front of set, first removing cotter key, and pull out a few feet of antenna wire from the reel.

(4) Set slight tension on the brake by turning the BRAKE knob clockwise.

(5) (a) Use kite whenever possible, i.e., when wind is from 7 to 50 miles per hour.

(b) Use balloon if kite cannot be flown, i.e., if wind is less than 7 miles per hour.

(6) (a) Take kite from tubular bag and spread by pushing spreaders outward from center till they lock. *Don't allow spreader to snap open.* It may tear fabric.

(b) Take balloon can, gas generator, and inflation tube from tubular bag, open balloon and attach antenna wire *at once*.

(7) (a) Attach antenna wire swivel to one of two eyelets on the kite, according to wind speed indicated on kite.

(b) Remove top and bottom plugs from gas generator can, screw inflation tube into top of generator. Wet blunt needle of tube and insert into balloon valve. Hold generator in water up to lower red line for ten minutes.

(8) (a) Stand up in boat, wait for a gust, toss kite in air, fly kite with slack in antenna wire till it can be flown from the reel with the brake. If kite falls in water, pull in slowly, dry kite, and try again.

(b) Slowly lower generator in water to upper red line. Control rate of inflation by rate of lowering generator. When balloon is full, put rubber stopper in valve, unscrew inflation tube, and throw generator away.

(9) Release antenna slowly all the way, as far as possible, then tie loose end of cord to life raft to take the pull of the kite or balloon. Take antenna lead-in from set and clip to antenna. (See Figure 1 on card to left of crank socket.)

(10) Strap transmitter between legs. Unscrew cap marked *Ground*, take out reel, unreel wire, and throw all ground wire into the water.

(11) Don't allow antenna to sag into water. This grounds antenna and no signals will be heard.

b. OPERATION: (1) Turn selector switch to "Auto 1" unless in North Sea. (This sends S.O.S.) In North Sea turn switch to "Auto 2". (This sends AA.)

(2) Rotate crank clockwise till "Speed Indicator" light burns brightly (about 72 r.p.m.) Allow 20 seconds for tubes to warm up. Keep light burning steadily.

(3) Turn "Tuning" control to produce maximum brilliancy of "Tune to Brightest" lamp.

(4) Send in proper "Auto" position for five minutes. Rest. Turn switch to "Manual". Use key to send call letters of plane (or identification numbers if call letters are not known) followed by known or estimated location, using Continental Code shown on card to left of crank socket.

(5) Try to send so as to include the 3-minute International silent periods starting 15 minutes and 45 minutes after each hour (Greenwich time). Keep cranking. Change hands or operators frequently, if possible, to avoid tiring. Keep on the air as much as possible.

(6) At night the signal lamp may be plugged into socket above tuning knob. Turn switch so that "Light" is in "Manual" position and send with manual key as described above (4). This should be done only if it is thought friendly vessels are within sight. No antenna or ground is needed with light.

c. CAUTIONS: (1) *Work carefully - Take it easy - keep at it- Take frequent short rests.*

(2) *Don't use Balloon in hot sun unless absolutely necessary. Heat expands gas and will explode balloon if fully inflated during heat of day.*

(3) *Don't spill contents of gas generator- it will burn. If spilled on skin, eyes, clothing, or raft, flush promptly with water.*

(4) *Don't smoke or use open flame while inflating Balloon. Hydrogen gas is explosive.*

(5) *Don't use set if severe lightning is occurring. Antenna will attract lightning and may result in severe shock.*

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CHAPTER SEVEN  
AFLOAT AT SEA



## Chapter Seven

### AFLOAT AT SEA

1. DINGHY DRILL: a. There are three critical periods in ditching:

(1) The actual handling of the aircraft onto the water - this is the sole responsibility of the pilot.

(2) Preparation by crew to insure their safety on impact.

(3) After ditching the abandonment of the aircraft in an orderly manner in the very shortest time possible *with the dinghy equipment*.

b. This cannot be done well in a training fuselage in a hangar without much practice. Far less can it be expected to carry out an efficient drill in an emergency after crew members have sustained a severe impact and the fuselage filling with water *unless* the drill is perfect. The lives of the entire crew depend on the correct execution. A very large number of crews have thus saved themselves and finally been rescued by surface craft.

c. Dinghy drill shall be practiced at least once a week. To see that this is carried out and in a correct manner is the responsibility of unit commanders and pilots of individual aircraft.

d. Personnel should be familiar not only with their own function but that of other crew members so that even though one man in the crew is missing or injured all the emergency equipment reaches the dinghy.

2. DINGHY EQUIPMENT: a. From the experience of survivors of previous ditchings it was found

that when extra items of dinghy equipment were carried, men frequently took these along and did not have time to remove the more essential items, such as the dinghy ration packs, from the aircraft. Consequently, stowage of equipment other than that laid down is absolutely forbidden. The dinghy stowage is designed to take only certain equipment. If the amount of this equipment is increased, the stowage cover may break free in flight (*which has happened in the past*) with consequent tangling of the dinghy around the elevators, and resulting in loss of life.

b. Equipment should all be very thoroughly and carefully packed and inspected before over-water flights are to be made. Make certain that everything is conveniently placed and securely lashed down. There should be no loose articles in the raft, since they may be very easily lost if the raft capsizes, or a landing is made at night. Make certain that the CO<sub>2</sub> bottles are charged and operative, and that all valves in the raft are securely closed. This has not been done in some cases, and with serious consequences. Use plenty of talc on repacking so that no parts stick and tear later. Seal the raft with a very light wire, and if ever found broken, completely inspect and repack entire raft.

c. All signal equipment, radio, whistles, signal pistols and cartridges, mirror, lights, smoke candles and flares should be stowed where easily accessible. Although many items are not normally provided, if there is time, others may be taken from the plane.

3. ABOARD THE LIFE-RAFT: a. Practice using the signal mirror so that it may be aimed quickly and accurately when rescue planes are sighted.

b. If the sun is bright, rig a sunshade as quickly as possible, then keep cool. You may stand the heat better if you have had a sun-tan already, but don't try to get one in the raft. Too much moisture will be lost that cannot be replaced. Always keep your body well covered. Wear your cap and sun glasses.

c. Use the sea anchor even if the sea and wind are mild. It will help stabilize the raft and will keep it pointed into the wind and waves to prevent capsizing. It may be necessary to use the sea anchor even while sailing, to prevent the stern from rising.

d. If there is considerable drift and the resulting change of position is undesirable, spread the sea marker so that air or surface search craft may follow the trail. This will be very necessary in heavy seas. Don't waste the marker - use it wisely.

4. RATIONING OF FOOD AND WATER: a. The crew must be prepared to remain at sea for at least six days, although this seldom happens. The number of days over six, for which the Captain makes provision, will depend on the distance from shore and the success of aircraft and dinghy radio signals.

b. Rationing is the duty of the dinghy Captain who takes personal charge of the stores. In the stores there are generally:

- (1) Water,
- (2) Solid Food,
- (3) Energy Tablets.

c. Nothing should be issued during the first twenty-four hours. After that, give equal

amounts to last the six days or longer. Issue half the daily ration (*food and water*) morning and evening; food should be issued before water. Keep empty tins - making a large hole in their tops - as receptacles for storage of rain water.

d. For the preservation of life, water is much more valuable than food. It is of the greatest importance that all available drinking water reach the dinghy and that care be taken to avoid any loss. Men can live only several days without water, but can survive six weeks or longer without food.

e. Before going on a long overwater flight, drink all of the water you can hold, - saturate yourself. If forced down you can stand a water shortage longer. If you can't take the water from the plane to the rafts, drink it before you reach a low altitude.

f. Supplement your water ration by catching rain water with the sail or tarpaulin. Use the blue side, rather than the orange, as the dye seems a little more stable, and may not contaminate the water. Rinse the tarpaulin off before saving any water, so as to remove the salt spray.

g. When catching rain water, drink all you can hold. Your body will store it better than you can anywhere else. There will be no ill effects and you will feel better. Some of it may become contaminated, so don't hesitate to drink all that is left after the reliable emptied cans have been filled. If it has been sometime since you have had any water at all, start by drinking only small amounts at a time, to avoid possibility of getting sick.

b. All crew members should try to maintain normal weights or even a few pounds above. If

forced down at sea, anyone who is underweight, is far more liable to suffer from exposure and food shortage. With a safe margin of body fat, one may go without food and require less water for a considerably longer period.

i. The chewing gum which is provided encourages the flow of saliva in the mouth keeps it moist and prevents the mouth from becoming sore. Do not use until the fourth day and then ration to give equal amounts for six days.

j. RUM OR OTHER ALCOHOLIC DRINKS: The use of alcohol by those who are exposed to severe cold and wet conditions, increases the dangers of such exposure. It should not be carried for use in dinghies. The taking of alcohol also interferes with the benefits obtained from the energy tablets.

5. MEDICAL ASPECTS: a. SEA-SICKNESS: A large proportion of men become sea-sick in a dinghy. It generally improves spontaneously within 24 to 48 hours. Do not eat or drink anything until sea-sickness stops.

b. IMMERSION FOOT: This is a condition commonly occurring in dinghies. It is characterized by a swelling of the feet and purplish discoloration, followed later by whiteness and numbness of the skin of the feet. It can be prevented by exercising the muscles of the legs and feet, elevating the feet and supporting them at hip level for 30 minute periods as often as is practicable or possible, and by gentle massage, rubbing the skin from the toes toward the feet and then toward the thigh. These procedures aid circulation and help prevent immersion foot.

*(WARNING: After rescue, heat should not be applied to the legs or feet in cases of immersion foot. It will intensify the condition and delay recovery.)*

c. Sea water is a strong solution of salt; it irritates the stomach, causes vomiting and therefore, should never be drunk. However, when the temperature is warm or moderate, bathing of the exposed portions of the body in sea water is generally refreshing. To minimize effects of exposure, all clothing, especially footwear, should be kept as dry as possible.

d. WOUNDS: A firm bandage holding a clean dressing in position is all that is required. This will generally be sufficient to stop any bleeding that will occur. Sea water is not harmful to wounds.

6. EXERCISES: a. Exercises will afford relief from strain, and improve circulation when the body would otherwise be suffering from fatigue and cold through remaining for long periods in cramped positions.

b. Specified breathing exercises are not recommended because they may cause undue strain and increase hunger and thirst.

c. Working hands and feet simultaneously will produce greater warmth in a shorter time. The joints at the extremities of the body should be exercised first and then the larger joints such as the shoulders and hips.

d. The Captain should insure that the exercises begin before intense cold or stiffness have set in. Short, mild exercises repeated frequently are better than a single prolonged bout. The main object is to have movement occur at frequent intervals. They should be performed slowly - the rate and intensity should never be enough to induce perspiration.

e. The following exercises will tend to promote warmth with a minimum expenditure of muscular effort. They are primarily designed for the sitting position, but the other positions may be used as indicated if more convenient:

ALTERNATIVE STARTING POSITIONS	EXERCISES
(1) Sitting with arms easy Lying " " " "	Fingers clenched-slack Fingers stretch -slack
(2) Sitting feet at right angles Lying " " " "	Toes under - slack Toes stretch lengthways-slack.
(3) Sitting elbows supported Lying elbows supported	Wrists backward bend-slack Wrists forward bend-slack
(4) Sitting foot at right angles Lying	Feet pressed down-slack Heels raise - slack
(5) Sitting	Alternate knees stretch-slack Alternate knees bend-slack

Exercises (1) and (2) should be performed concurrently.

(6) Sitting or Lying	Slightly raise in your seat-slack (by contracting your seat and muscles)
(7) Sitting or Lying	Alternate arms bend-slack " " " " (Keep hands clenched throughout contractions)
(8) Sitting or Lying	Shoulders up to ears Raise-slack
(9) Sitting or Lying	Shoulder circling forward- upward -backward -downward



To chew it out, put a piece of fish in your mouth. Chew it small. Suck out the juice and swallow it, then spit out what is left. Keep it up so long as you are thirsty and have fish.

b. THIRTEEN GENERAL RULES: (1) Never make your line fast to your finger, hand, or foot, or to your boat. A big fish might cut you, or break your line and carry off your tackle.

(2) Let another man hold the end of your line while you are fishing. That gives you two chances to save your tackle and catch your fish.

(3) Do not lean over or rush to the side of the boat when a fish is hooked, or let others do it. If that happens, a boat in a seaway may be upset.

(4) Try to catch small fish rather than large ones. Big fish, such as large sharks, may break lines, carry off bait, cut your hands, and make other trouble, or even upset your boat.

(5) Keep your bait moving to make it look alive. A moving bait is better than a still bait.

(6) Be sure to keep a part of any bird or fish you catch to use as bait. Fresh bait is better than the pork rind in your fishing kit.

(7) After using, clean your hooks and lines of fish and fish slime. Wind them up again as they were in the kit, see that hooks are not sticking into lines, dry them in the sun, return them to the cloth pockets, and keep them dry if you can. While drying, always slide your feather jig up the wire to keep the feathers from rusting against the hook.

(8) Keep your fishing tackle in a safe place or lash it in, when not in use, so that it cannot be lost overboard, even if your boat should turn over.

(9) Be very careful not to get your lines tangled or to let hooked fish tangle them. Two men, at one side, one at stern, can fish at the same time, but they must be very careful. Never leave your line where it can be stepped on, and keep it from wearing itself out by cutting into or rubbing against the gunwhale.

(10) In a rubber boat, see above all that your knife, harpoon, or fishhooks never get a chance to prick, stab, or make a hole in your boat, and so let the air out or the water in. See that your line does not wear or cut into the rubber side. Be very careful where you lay your tackle down, especially after catching a fish.

(11) Be sure every man in your company gets his fair share of whatever you catch.

(12) Keep on fishing and watching for fish. You never know when a fish may bite.

(13) Put one man in charge of the tackle. let him wear the cloth case as an apron when in use. When not in use, keep it all together in the case. Never let it get scattered about.

c. ABOUT FISHING: (1) Do not forget that as a rule fish bite better at a moving bait. If the boat is moving slowly, one man can fish deep and another troll at the same time.

(2) Fish do not bite well at a hook with seaweed on it. Watch your hooks and keep them baited and clear.

(3) If you hook a fish too big to handle, give him as little line as possible. That way you will have more line left after he breaks it.

(4) Watch for schools of fish. You may see them breaking water. Large fish will probably be near schools of small fish. Get up to such schools if you can.

(5) If you have some fish to spare, you can often catch more by chumming. Cut pieces of fish very fine, and scatter them in the water. Chum only if the boat is moving slowly or not at all. Chumming may bring birds also within reach of baited hook, net, or spear.

d. FISHING WITH A LIGHT: Fish often come to a light at night. If you see flying fish, at night hoist your sail or hang up your shirt or any other white cloth. Shine the light of your flashlight on it. Flying fish will often jump at it and fall into the boat. But be careful not to use up your flashlight unless you have several. Often the bright moon shining on the white cloth will draw the fish.

A light thrown on the water at night will sometimes bring flying fish and other small fish. Catch them with your net. They are good to eat.

e. DRIED FISH: To dry fish, cut it in thin narrow strips, and hang it in the sun. If well dried and kept dry, it will often stay good several days. You may like it better when dried.

To dry small fish, a foot long or less, clean, take out the backbone, cut slits across the inside about a quarter inch apart, and hang in the sun.

IMPORTANT. Fish not cleaned may spoil in half a day. Clean your fish and eat it or dry it without delay.

f. SHARKS, SKATES AND RAYS: Do not eat the liver or meat of sharks, skates or rays unless you have plenty of water. They are salty and will make you thirsty. Skates and rays, like the sharks, do not have scales and their skeletons are of cartilage, not bone.

Sharks have killed many men. Stay out of the sea and in the boat when sharks or other large fish are around. Many a man has lost hand or foot by letting it hang overboard.

Splashing with an oar or striking at it will usually drive a shark away. The tenderest spot in a shark is the end of his nose. His gills come next.

Do not fish when sharks are around. They may cut your lines. Let sharks alone if you can get other fish. Never harpoon a big shark. The best place to harpoon a small shark is just behind the fin on its back. Harpooned sharks often roll over on the lone and try to bite it. Fight them hard and keep the line taut. A bitten line means a lost harpoon.

g. TURTLES: The whole meat, blood, and juice of a turtle are good to eat. There is good meat against the shell under the backbone. Cut through the ribs to get it. After a turtle's head is cut off, the head may bite and the claws may scratch. Watch out.

If a turtle comes near your boat, try to snag it by throwing your grapple or a fishhook across it where the hook will catch in a leg or

neck, or in the edge of the shell. Better still, use your harpoon and strike the shell hard. Swimmers have caught turtles in the sea by turning them on their backs and towing them to a boat. Hot sun brings a clear oil out of turtle fat. Dip your food in it.

h. BIRDS: All birds are good to eat, cooked or raw. Their blood and livers are edible.

Birds will sometimes light on the boat or on your back or head. Catch every bird you can. Save the feathers. Use them to make fishing jigs. Stuff them inside your shirt to keep you warm. Or skin the whole bird, take the meat and bones out of the wings, and leave the wings attached to the skin. Dry the skin with the feathers on it in the sun and use it to wrap around your neck or cover your back. The meat and entrails of birds, and even the toes make good bait.

Birds follow schools of fish and show you where they are. When feeding on a school, birds sometimes get so excited that it is possible to get very near to them and harpoon them. Watch for fish also.

Sometimes you can catch small birds with your dip net. Larger birds will often take a bait of fish on a hook trolled or dragged on top of the water. If nearby, they will often come after chum or a piece of fish tossed into the air.

i. SEAWEED: Certain kinds of seaweed are good to eat, but not unless you have plenty of water. No seaweed is poisonous. Chew it up fine and swallow it. A bunch of seaweed often holds small fish which you can eat. Lift it out slowly and carefully, and shake it over the boat. Pick out all little jellyfish and crabs that might be

among them. Jellyfish are often poisonous. Crabs are too salty to eat unless you have plenty of water.

j. EELS AND SNAKES: Eels are fish and good to eat. But be careful not to mistake sea snakes for eels. Seasnakes are found only in the Pacific and Indian Oceans. They have scales. Eels do not. Eels swim under water, snakes mostly on top. Sea snakes are poisonous. Let them alone.

k. POISONOUS FISH: When you catch fish near the shore, or when fishing from the land, watch out for three kinds which are poisonous. One is a parrot fish, with large teeth like a parrot's beak. The others, porcupine fish and puffer fish, will swell up like a balloon if you scratch them on the belly. You can use them for bait, but be very sure not to eat them.

l. WHALES: Do not worry about whales. The chances are millions to one they will do you no harm. Metal struck against metal under water will often scare them away.

8. MORALE: a. If the crew is continually exercising and taking rations at regular intervals and at the same time keeping a good watch, morale should take care of itself. After a few days, nerves may begin to fray, and it is then that the good example of each man will aid the behaviour of his fellows. The need for more food and drink will increase and it will require greater effort to restrain the desire.

b. The effect of continually having something to do is most favorable, and it is the Captain's duty to see that this is so. The crew should remember that others have been rescued from the North Sea after fourteen days, and one crew from the Mediterranean after eleven days, while an American crew survived after thirty-four days.

CHAPTER EIGHT

IF YOU LAND ON UNINHABITED ISLANDS



## Chapter Eight

### IF YOU LAND ON UNINHABITED ISLANDS

1. **INTRODUCTION:** This chapter offers general instructions and suggestions for sustaining yourself, in the event you land on an uninhabited island.

2. **WATER:** a. Dig a hole at low tide just below the high water mark. The water which runs in may be salty and discolored, but it can be used. Drink moderately the first day, or it may make you sick. If there is a salt marsh or pond behind the beach, dig near the foot of the slope which runs to it. You may find fresh water from three to five feet down. Since fresh water is lighter than salt, go no deeper than where you first find it.

b. On jungle islands, water may be found at the base of the leaves of air plants growing in the trees. Strain out bugs and wigglers. The water is good to drink.

c. Standing fresh water anywhere in the tropics may be dangerous. Boil it, if you can, before drinking. You can boil water in a section of green bamboo before the fire burns out. Or heat stones in the fire, pick them up with branches bent like tongs, and throw them in. Begin with a little water and then add more water and more stones. Where there are no people, running water is usually safe.

3. **TURTLES:** a. Turtles come ashore, mostly at night, to lay their eggs. Turtle eggs are good. Find them by following the trail the turtle makes across the sand to where the eggs are buried. Dig them up. When cooked, turtle eggs do not get hard like hen's eggs. Eat them cooked

or raw. Bite a hole in the shell and squeeze.

b. To turn a sea turtle on land, catch it by the shell near a hind leg, and lift quartering forward. Once turned, it cannot get away.

4. PLANTS: a. Most tropical fruits, but not all, are good to eat. Some are unsafe. At the very top of many palm trees is a large tender bud or cabbage. Cut it out and eat it raw or cooked. The trunks of some palms, if cut into, will drip good water.

b. Rattans, long slender vines with sharp curved thorns, also have cabbages at the top. Good drinking water will often flow from the cut stem of a rattan.

c. The thick stem of a growing bamboo, like rattans and palms, holds drinkable water. Cut off the stem and catch the water as it drips. Bamboo sprouts, up to a foot high, can be eaten raw or boiled. So can young leaf sheaths of bamboo, and the young curled over shoots of ferns.

d. Coconuts contain delicious, cool, nutritious water (*called coconut milk*) and valuable white meat. Strip off the husk and break in.

e. Breadfruit is oval, about 6 inches across, with a warty surface. To roast it, put it in a hole in the ground, cover it with leaves, lay hot stones around it, and cover the whole with dirt.

f. The durian, a large fruit with great spines, smells horribly but tastes like custard. Eat it raw.

5. **FOOD FROM FRESH WATER:** Fresh water fish of any kind, fresh water snails, shells, crabs, shrimps, and crawfish are all unsafe to eat unless thoroughly cooked. Cook fish like breadfruit. The snails and others, drop alive into boiling water. Use your dip net to catch fresh water shrimps. They often hang to branches that dip in the water, and can be lifted out. Or make a dam in a stream, out of mud, sand, or whatever you have, and look for shrimps when the water drains out below it. Eat the shrimp meat but spit out the shells.

6. **FOOD ALONG SHORE:** Fish are found in pools on reefs, in shallow water, or among rocks at high or low tide. Use your harpoon or block the opening of a pool at high tide so the fish cannot get out. Poisonous puffers sometimes go into fresh water. The flesh of other fish in fresh water is never poisonous, when cooked. Fish are sometimes found out of water on rocks or trees. They are good to eat.

b. In parts of New Guinea there are great spiders whose webs may help you. Make a flat net by bending a branch and passing it back and forth through a number of the webs. Then bait it with a bug and set it where small fish can see it. Their teeth will get tangled in the web.

c. By dragging several of the great leaves of coconut palms through shallow water, fastened together, fish may be driven ashore.

7. **SHELL FISH:** a. Shell fish and their juices are good to eat and drink, whether cooked or raw. Many bury themselves in the sand, leaving small holes. Dig for them. You may find shell fish also among the rocks, hanging to the branches of trees that dip in the water, or crawling on

the bottom at low tide. Land crabs, carrying sea shells on their backs, are often very common.

Only two kinds of sea shells are dangerous. Each is in a single piece. One is shaped like a sharp spindle. The other is thicker, rounder, open the length of the shell, and shaped like a short flat cone at one end. They are found in tropical parts of the Pacific and Indian Oceans. The animals inside the shells have poison teeth and are dangerous. Let them alone.

**8. BIRDS AND ANIMALS:** a. All animals are safe to eat - monkeys, bats, lizards, land turtles, frogs, and even snakes, including poisonous snakes, if they have not bitten themselves. Snakes taste like frog legs or the white meat of chicken. Grubs found in the ground or in rotten wood make good food. So do grasshoppers, toasted on a stick. Pick off legs and wings before cooking. But do not eat any caterpillars. Many are poisonous.

**9. PEOPLE:** Nearly all native peoples are friendly. Show them that you are friendly, too. Except along the coast and in the Northern mountains of New Guinea, you can almost always go to them safely for help.

**10. FINALLY:** These instructions do not and cannot cover all cases. The best advice of all is to keep using your head. Many other men before you have saved their lives by doing just that.

CHAPTER NINE

"DO'S AND DON'T'S" TO BE OBSERVED



## Chapter Nine

### "DO'S AND DON'T'S" TO BE OBSERVED

1. DO start an early distress procedure, and cancel it if not used.
2. DO loosen collars, remove neckties, and parachute harnesses.
3. DO stay on interphone. The pilot should warn the rest of the crew as to how things are progressing.
4. DO jettison all excess load and equipment - anything not necessary to the navigation of the aircraft.
5. DO destroy all secret papers.
6. DO check all lower escape hatches, and open upper hatches.
7. DO assume the prescribed ditching position.
8. DO fasten safety harness. Slip a cushion under waist belt to prevent internal injuries, if possible.
9. DO ditch with bombay doors closed.
10. DO ditch with all bombs, mines, or depth charges safe. If time is insufficient to salvo depth charges, they will, if left armed, explode as aircraft sinks.
11. DO inflate Mae West as soon as you are out of hatch, - before if possible.
12. DO check valve on Mae West before attempting inflation.

13. DO assist life raft on inflation.
14. DO right an inverted raft from the wing, if possible.
15. DO stay near floating plane, and leave lights on. They may attract attention.
16. DO try to take all emergency equipment along, individual single man rafts, parachutes, Verey pistol and cartridges, navigation equipment, first aid kit, etc.
17. DO lash rafts together after boarding from plane.
18. DO have everything securely fastened to the raft.
19. DO stop leaks and rig cover immediately, if necessary.
20. DO be very careful with the homing pigeons. Keep them dry.
21. DO institute careful rationing of food and water.
22. DO take exercises to avoid getting stiff.
23. DO keep in the shade and avoid perspiring.
24. DO suck on a button if your mouth becomes dry.
25. DO practice with the signal mirrors, so that they may be easily and quickly used when needed.
26. DO carefully inspect all of your equipment.

27. DO set a course and stick to it.

28. DO show wounded companions every consideration possible.

29. DO REMAIN CALM.

30. DON'T release life raft too soon, it may break free and drift out of reach.

31. DON'T place extra or unprescribed equipment, or cordage, in the life raft compartment. It may cause the dinghy to break free during flight or to become entangled on inflation.

32. DON'T allow the rafts to be punctured or torn on damaged flaps or fuselage.

33. DON'T allow the raft to become trapped under the plane as it rolls in heavy seas, or drifts in the wind.

34. DON'T allow the raft to become entangled in the antenna.

35. DON'T jump into the raft.

36. DON'T be careless in killing a turtle or fish. You may puncture the raft if knife is improperly used.

37. DON'T eat or smoke if you have no water.

38. DON'T drink salt water. Your body moisture will be wasted, trying to dilute the salt. The same is true of sea-water enemas.

39. DON'T drink urine. It contains waste materials the body can't use. Don't try to force it through your system again.

