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PART 4: SECTION 3

CHAPTER 3

DITCHING

Direction of Approach and Ditching

1. Pilot's Notes for individual aircraft recommend the procedure to be adopted when ditching cannot be avoided. In general, except where circumstances forbid, the aircraft should always be abandoned by parachute, as an unsuccessful ditching invariably has serious consequences. The remainder of this chapter is a guide to the technique to be adopted when ditching is unavoidable.

2. The aircraft should always be ditched into wind if the surface of the water is smooth, or if the water is smooth with a very long swell. It should, however, be borne in mind that in many conditions it is advisable to ditch along the swell and across wind, accepting the higher touch-down speed and the resulting drift. A direction of approach which is a compromise between waves, swell, and wind direction may be the best choice. The danger of nosing into large waves or swells in an into-wind ditching is generally greater than the danger involved in ditching across wind, consequently ditching into a swell or large waves should be avoided whenever possible. The limiting condition is that in which the drift in a cross-wind ditching cannot be counteracted while maintaining control near the stall; if it is known that the aircraft is likely to nose in, the ditching should be made into wind to reduce the violence of impact.

Direction of the Wind

3. Swell is the undulating movement of the surface caused by past or distant winds. The direction of the swell does not necessarily bear any relation to the surface wind.

4. The wind direction may be indicated by wind lanes, *i.e.* the streaked effect made on the surface as the wind ruffles the water. Although doubt may remain as to which of two ways the wind is blowing, the streaked effect is more noticeable when looking downwind.

5. When the surface is unbroken, gusts may sometimes ripple the surface in great sweeps which indicate the direction of the wind.

6. In general, waves move downwind except when very close to a shoreline, or in fast-moving estuaries.

7. Wind strength may be gauged from the appearance of the water, but only if the wind has been blowing with the same force and direction for some time.

State of the Water

8. Water always appears from the air to be calmer than it really is. In particular, swell can only be properly appreciated close to the surface; it may be of far greater consequence in ditching than the more obvious, but smaller, waves which are caused by the immediate action of the wind.

9. If the wind is not moving with the swell, but across it, a "cross-sea" is created with waves running in a different direction from that of the swell.

10. If possible, fly low over the water and study its surface before ditching. Pilots should endeavour to bear in mind the state of the water and wind, rather than leave observation and estimation until an emergency arises.

Personal Equipment

11. Life-saving waistcoats should be worn at all times while flying over water or inland within five miles of the coast (A.M.F.O. 369/4 refers). They should not be inflated until the need for them is near, as they swell at altitude. If large ditching exits are provided, the jackets may be fully inflated before ditching; but if the exits are small, jackets should be partially inflated by mouth before ditching, and fully inflated with the cylinder after leaving the aircraft.

12. Parachute harnesses should be removed when practicable, unless they are attached to a dinghy.

13. Helmets, with leads tucked firmly away, should be retained for protection in the dinghy. Before ditching, when an automatic pressure-demand oxygen system is fitted, the oxygen mask

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should be kept in place, 100 per cent. oxygen selected, and the emergency switch deflected to either side; this allows the crew member to breathe while escape is made from a submerged aircraft. (See Vol. 1, Part 1 Sect. 7, Chap. 4, para. 17.) The oxygen tube should be disconnected before leaving the aircraft, and the helmet retained.

14. Collars and neckties should be loosened or removed.

15. Emergency equipment should not be removed from its stowage before ditching.

Gauging Height

16. Judgment of height over water is difficult, especially when it is very calm or at night.

17. The aneroid altimeter is unreliable for this purpose. On some aircraft the trailing aerial can be used, the wireless operator signalling the captain when the current drops as the aerial weight hits the water.

18. The radio altimeter, when fitted, should be used in preference to other methods, especially at night.

19. During night ditchings the landing light may be helpful in gauging height. It must be borne in mind, however, that the bright light may upset the pilot's night vision and in mist the reflection causes a glare which may obscure the surface of the water.

Aircraft Handling—General

20. Pilot's Notes state the correct procedure for a given type of aircraft, but the following general considerations apply:—

(a) Jettison all external stores and drop tanks and, if possible, as much fuel as time permits. Pilot's Notes advise on whether or not to jettison the canopy; some aircraft are best ditched with the canopy closed, jettison action being taken after the aircraft has come to rest.

(b) The speed and rate of descent should be as low as possible consistent with safe handling, yet adequate to allow a margin after rounding-out, so that sufficient control is present to control the attitude up to the moment of touch-down, and to attempt to prevent the tail striking a wave crest or swell top which might cause the aircraft to nose in.

(c) The best compromise in relation to waves, swell, and wind, should be chosen.

(d) The wheels should be retracted. If down, or partially down, every effort should be made to retract or at least to unlock the undercarriage.

(e) A tail-down attitude should be adopted when touching down by holding off until excess speed is lost. The speed at the instant of impact should be as low as possible to reduce the subsequent deceleration and the amount of damage to the aircraft.

21. **Use of Flaps.** Unless not recommended in Pilot's Notes the flaps should be lowered to reduce the touch-down speed. It is better, if possible, to use a medium setting and not to lower the flaps fully. Little, if any, further reduction of speed is obtained by using more than take-off flap. The use of full flap may well impair the ditching characteristics of the aircraft, and also give an undesirably high rate of descent.

22. **Use of Power.** The value of power during ditching is so great that when it is certain that the coast cannot be reached, the pilot, having decided to ditch, should always do so before fuel is exhausted. If a ditching must be made for reasons other than fuel shortage, the bulk of the fuel should be jettisoned if possible. Provided control can be maintained, power should be used to ensure the flattest approach and the slowest touch-down. The propellers of failed engines, or of engines not needed during the approach, should be feathered.

23. **Lights.** Before ditching at night, all internal lights should be dimmed to accustom the eyes to the external darkness, but the upper identification lamp may be put on if it does not cause reflections that upset vision. To facilitate the escape of passengers, cabin lights should be left on if practicable. After ditching, all lights should be left on as an aid to search aircraft should the aircraft remain afloat, and to assist when collecting equipment and boarding the dinghy.

Behaviour of the Aircraft on Impact

24. An aircraft ditching in a tail-down attitude will usually encounter a small initial impact as the rear of the aircraft strikes the water. A much more severe second impact and violent deceleration will usually follow and the nose will tend to bury as the aircraft comes to rest. The nose should always be held well up after the first impact. If the ditching has been made too fast the aircraft may bounce; if it does, the control column should be held hard back. The aircraft may also slew to one side after impact.

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25. The crew should not relax or move until the aircraft has come to rest. They should be prepared for a double impact, the first when the tail of the aircraft strikes, then a second and greater shock as the nose hits the water. They should also be prepared for the aircraft to slew to one side.

Dinghy Drill

26. **Built-in Dinghies.** When dinghies are carried in built-in stowages, one of the crew should be detailed to operate the manual release when the aircraft finally comes to rest. It should be borne in mind that a dinghy can be lost by premature operation of the release. A crew member should be detailed to assist the dinghy from its stowage and into the water, and then to prevent the cordage becoming entangled or the dinghy being swept under the wing or fuselage, or punctured by jagged objects.

27. **Valise Dinghies.** Valise dinghies stowed in the aircraft should be launched by a crew member through one of the escape hatches. It is essential to check that the cord operating the CO₂ bottle which inflates the dinghy is attached securely to the aircraft so that, when the valise is thrown into the water, the cord is pulled taut, thus actuating the cutter and releasing the CO₂. Whenever possible the dinghy should be launched in the water on the downwind side to facilitate getting it clear of the wreckage and to reduce the risk of entanglement with the sinking aircraft.

28. **Boarding the Dinghy.** The following recommendations are important :—

(a) As soon as the aircraft comes to rest, emergency equipment should be removed from stowages, the aircraft vacated as soon as possible through the escape hatches, and the dinghy or dinghies boarded. The importance of trying to keep dry cannot be over-emphasized. On some aircraft, ropes are provided at the escape hatches to assist personnel to leave the aircraft and board the dinghy.

(b) Do not jump into the dinghy or it may be damaged.

(c) **Dinghy Inverted.** If the dinghy is inverted and cannot be righted from the aircraft, one man should jump into the sea and right it by either of the following methods :—

(i) Grasp the handling patches on the bottom of the dinghy with both hands, lean

back and haul on them, with the knees on the buoyancy chamber, and be prepared for momentary immersion.

(ii) If there are no handling patches on the bottom of the dinghy, place the feet on the bottom of the ladder and haul on the two nearest stabilizing pockets, leaning back as in the first method.

(d) Do not jump on to an inverted dinghy, as this will expel air trapped underneath and make righting more difficult.

(e) To board from the water, grasp the ratlines with one hand and the bottom rung of the ladder with the other, pushing it down to help insert the foot, then pull up with both hands on the ratlines.

(f) A fully inflated life-jacket helps in boarding from the sea. A coiled rescue line on the dinghy may be used to help other crew members to reach the dinghy.

29. **After Boarding the Dinghy.** When instructed by the captain, cut the painter with the floating knife carried near the point of attachment of the painter and paddle away from the aircraft ; while the aircraft floats, remain in the vicinity to increase the chance of being located. Check the dinghy for leaks, and if necessary use the leak-stoppers provided. Connect the topping-up bellows and inflate the dinghy until it is rigid ; This may assist crew still in the water to board. Bail out any water and rig the dinghy cover. It is important to keep as dry as possible, but do not remove clothing whether wet or dry.

Single-Seat Dinghy, "K" Type

30. Pull in the lead and, if the dinghy has not left the pack, rip off the cover and grasp the bottle. Pull out the locking pin and slowly unscrew the valve ; one turn opens fully. Inflate slowly, assisting the dinghy to unfold ; rapid inflation may cause the air outlet to choke with ice caused by adiabatic freezing.

31. Board by the narrow end aided by the loop handles, but if the other end rises, let go and give the dinghy a little push to fill the water pocket.

32. If the crew member is exhausted or injured, he can board more easily by only partially inflating the dinghy and then turning over on his back and easing the dinghy down and under him. When aboard, inflation should be completed and the dinghy bailed out.

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33. When aboard, the drogue should be thrown out to make the dinghy ride the waves better and ship less water.

34. If the dinghy capsizes, remove the hood and the apron elastic and slide out head first.

35. The "K" type dinghy is easy to paddle if the water pocket is collapsed and the drogue hauled in ; to paddle, lie well back and use the forearms only.

36. In rough weather it is generally safer not to attempt a landing but to lie off shore until sighted. If, however, the sea conditions inshore and the nature of the foreshore appear favourable, an attempt to land is justifiable.

ULTRA RESCUE BEACON (SARAH)

Introduction

37. The ultra rescue beacon is a radar beacon small enough to be carried in a life-saving waistcoat. Some models have facilities for R/T two-way communication.

Method of Use

38. To operate the beacon remove the aerial cover ; when this is done the aerial automatically erects itself and the beacon transmits a continuous signal.

39. The equipment consists of a battery pack in the life-saving waistcoat, and the aerial which is attached to the waistcoat in a convenient position. Improved models incorporate a microphone/telephone and on/off switch control for two-way voice communication.

Range

40. The power output is 16 watts which should give the ranges set out below :—

<i>Search Aircraft at (feet)</i>	<i>Sea Range (miles)</i>	<i>Land Range (miles)</i>
15,000	75	45
10,000	65	35
5,000	45	25
1,000	20	12

When the beacon is used for R/T, satisfactory two-way speech is possible when the searchers are in the immediate vicinity of the survivor. Fixes from an altitude of 500 feet are accurate to within a distance of 200 feet.

Battery Life

41. The battery provides for 15 hours continuous operation on the beacon only, plus one hour of R/T operation.

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