PART IV

EMERGENCY PROCEDURES

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PART IV-EMERGENCY PROCEDURES

Chapter 1—ENGINE EMERGENCY PROCEDURES

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1. Engine failure on take-off

- (a) The safety speed with full wing tip tanks is 140 knots.
- (b) At weights below about 33,000 lb., if corrective action is taken quickly, control may be maintained at speeds as low as 125 knots and the aircraft will accelerate and climb away comfortably from this speed. It may be necessary to throttle back the live engine sufficiently to maintain directional control.
- (c) At all weights, if safety speed has not been attained when an engine fails, and if circumstances permit, jettison the wing tip tanks immediately, thereby greatly improving the chances of recovery.
- (d) Raise the undercarriage, trim as necessary and build up speed to 150 knots.
- (e) Carry out the appropriate drill at para. 2 below.
- **◄**(f) For details of arrester barrier engagement after an abandoned take off see Pt. III, Ch. 2, para. 6(g)) ▶

2. Engine failure in flight

If an engine fails in flight and depending on the type of failure, carry out one of the following drills without delay.

(a) Flame-out

A relight may be attempted immediately as described in

Pt. III, Ch. 5, para. 3. If this is not possible or if the attempt fails:—

Throttle Closed HP cock Closed Generator OFF No. 5 inverter and radar ... OFF LP pumps OFF

Leave the generator and No. 5 inverter off until the engine is relit in accordance with Pt. III, Ch. 5, para. 3.

(b) Mechanical failure

Throttle and HP cock ... Closed

LP cock and pumps for affected engine OFF

Engine air switch OFF

Generator OFF, field circuit breaker tripped

No. 5 inverter and radar ... OFF

Electrics Reduce load

Radar may subsequently be operated from 4 inverter. Do not relight, watch for indication of fire.

3. Engine fire

Carry out the following drill:-HP cock, LP cocks and pumps OFF Recuperator switch (if fitted) OFF Fire extingunisher push-Press button OFF Engine air switch ... OFF, field circuit breaker Generator ... tripped OFF No. 5 inverter Reduce load Electrics ... Carry out drill if necessary Toxic fumes (see Pt. IV, Ch. 2, para. 10)

The warning light should go out when the fire is extinguished; do not relight. Radar may subsequently be operated from No. 4 inverter. If fire persists abandon aircraft.

4. Double flame-out

(a) If a double flame-out occurs, a relight on one engine may be attempted immediately, while the RPM are decreasing, by pressing the relight button for 5 seconds and then releasing it, leaving the throttle at its set position. A successful relight will be indicated by the RPM stabilising and then commencing to rise. Ensure by throttling back if necessary, that the maximum allowable JPT is not exceeded.

NOTE: If double flame-out occurs below the maximum height for relighting, first select the LP cocks and pumps of another tank before attempting an immediate relight.

(b) If an attempt to relight an engine as above is unsuccessful, carry out on each engine in turn the flame-out drill at para. 2(a) and reduce electrical consumption to an absolute minimum. Descend as rapidly as possible, commensurate with the need to avoid trimming, to the relight height, and carry out on one engine only the relighting drill at Part III, Chap. 5, para. 3. When that engine has relit, switch its generator on and relight the other engine.

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PART IV-EMERGENCY PROCEDURES

Chapter 2—AIRCRAFT SYSTEMS— EMERGENCY PROCEDURES

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Action in the event of cabin fire

If fire occurs in the cabin, the following drill is recommended:—

mended:-	-		
Oxygen		***	 EMERGENCY and 100% OXYGEN on regulator, mask toggle tight
Electrics Hand fire	exting	uisher	 All non-essential OFF Use if source of fire can be located and is persistent
Pressurisa	tion		 Maintain Maintain

Carry out the "Toxic fumes" drill if necessary (see Para. 10 following).

Land as soon as possible.

If the fumes become dangerous, jettison the navigator's hatch and if necessary, the canopy. If the fire spreads, abandon aircraft.

NOTE: If a fire develops which cannot be quickly controlled, there is a risk that damage may occur to the ejection seat, parachute and jettison circuits, rendering subsequent escape impossible.

2. Jettisoning the wing tip tanks

- (a) The wing tip tanks may be jettisoned at any speed full or empty, up to the limitations imposed when carrying wing tip tanks. To jettison the tanks press the FUEL TANK JETTISON pushbutton on the port front panel.
- (b) Always jettison the wing tip tanks if, in the opinion of the captain, their retention will jeopardise the safety of the aircraft.
- (c) The wing tip tanks must always be jettisoned when making a forced landing or a landing with an undercarriage main wheel not locked down.

(d) If an engine fails before the safety speed has been attained on take-off and it is decided to continue with the take-off jettisoning the tip tanks reduces the safety speed, and therefore greatly improves the chances of recovery.

3. Entrance door, canopy and navigator's hatch jettisoning

(a) Entrance door

The entrance door may be jettisoned by turning the cranked ENTRANCE DOOR JETTISON handle above the entrance door in a clockwise direction as far as possible (this releases the hinge pins) and striking the top of the door. Approximately 4½ turns of the handle are required.

◄(b) Canopy

To jettison the canopy proceed as follows:—
Speed Above 150 kts.
Vizor Down
MASTER SAFETY switch Confirm ON
Seat Lower fully

Crouch forward as low as practicable and set CANOPY JETTISON switch ON.

(c) Navigator's hatch

If it is not intended to abandon the aircraft, the Navigator's safety pins should be fitted in the rear sear and the red disc should be detached. To jettison the hatch proceed as follows:—

(i) Speed 180 kts. minimum.

(ii) Check hatch SAFETY switch ON.

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(iii) Vizor down.

(iv) Crouch as low as possible and protect the back of

the neck with one hand.

(v) Set hatch JETTISON switch ON.

4. Jettisoning internal stores

To jettison internal stores in an emergency, switch ON the EMERGENCY BOMB JETTISON switch and, after the internal stores have jettisoned, switch it OFF; this will close the bomb doors provided that the normal selector is set to SHUT.

5. Emergency operation of bomb doors

- (a) If the bomb doors fail to open either when selected normally or when the EMERGENCY BOMB JETTISON switch is set ON, the failure may be hydraulic or electrical. To determine which, check the hydraulic pressure on the main hydraulic gauge (if fitted). If this is less than 2,000 PSI and does not build up the failure is probably hydraulic; otherwise the failure is probably electrical.
- (b) Depending on the type of failure, proceed as follows:—

(i) Hydraulic failure

With either normal selector at OPEN or the EMER-GENCY BOMB JETTISON switch ON, open the bomb doors by means of the hand-pump; they may be closed in the same way with the normal selector at SHUT and the emergency switch OFF.

NOTE: If the handpump is used to operate the bomb doors, lack of hydraulic fluid may make subsequent lowering of the undercarriage impossible.

(ii) Electrical failure

1. Check and, if necessary, change the fuse (No. 24 on RESTRICTED A.L.I. Mar. 64

the electrical control panel) for the bomb door selector valve, before selecting bomb doors OPEN.

2. If the bomb doors still fail to open, operate the bomb doors emergency lever; however, the doors should only be opened in this way if it is vital, as they cannot be closed again until serviced.

⋖6. Emergency operation of the undercarriage

(a) Retraction

- (i) If the undercarriage fails to retract and the indicator shows 3 green lights:—
 - 1. Select DOWN.
 - 2. Check the main hydraulic pressure gauge.

3. Check the undercarriage master switch.

 If the master switch is at SAFE, select LIVE and reselect undercarriage UP.

5. If the master switch is at LIVE do not reselect,

land as soon as practicable.

(ii) If the undercarriage fails to retract and the nose-wheel red light is shown on the indicator:—

1. Check the main hydraulic pressure gauge.

Reduce speed to a practical minimum (approx. 150 kts.).

3. Sharply apply a small amount of negative G.

- If the red light remains, select DOWN and land as soon as practicable.
- (iii) If the undercarriage fails to retract and main wheel red light(s) remain:—

1. Lower undercarriage.

- 2. Land as soon as practicable.
- (iv) To raise the undercarriage in emergency: -

1. Undercarriage master switch LIVE.

Rotate the collar of the UP button clockwise to its stop and select UP.

NOTE: Not to be used unless imperative.

(b) Lowering

(i) Hydraulic failure

If main hydraulic pressure is below 2,000 PSI and the undercarriage fails to lower, hydraulic failure is the probable cause. Select undercarriage DOWN and

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- operate the hand pump until the undercarriage locks down.
 - (ii) Indicator or mechanical failure

If the hydraulic system appears serviceable and the undercarriage is felt or heard to lower:—

- 1. Check the changeover lights on the position indicator.
- 2. Use the hand pump.
- 3. Change fuse No. 68.
- 4. Select UP and DOWN several times.
- 5. Apply positive G and yaw under 190 kts within limitations.

NOTE: If the malfunction has occurred because of an out-ofsequence retraction it may be possible to overcome the fault by prolonged use of the hand pump. Considerable force may be necessary.

- (iii) Electrical failure
 - Check and if necessary change the fuse (No. 67 on the ECP) for the undercarriage control circuit before selecting the undercarriage DOWN.
 - 2. If the above actions fail, an electrical failure of the selector valve is the probable cause. Pull the undercarriage emergency toggle handle fully out until it is locked in position by its spring clip. Monitor the main hydraulic pressure gauge, if fitted, and if a drop in hydraulic pressure occurs, check that the toggle handle is fully out and locked. If the undercarriage is lowered by this method it cannot be raised again until serviced.

7. Landing with a defective hydraulic system or wheel brakes

(a) If the handpump has to be used to lower the undercarriage for landing, it may be found that the wheel brake hydraulic pressure is low and shows no signs of building up. Should this occur, or at any other time that the brake pressure remains low, an attempt must be made to raise it by means of the handpump. The brakes must not be applied until after touchdown.

◄(b) The following drills are recommended:—

(i) No arrester barrier

1. Hand pump. Raise pressure if possible.

2. Wheelbrakes. Do not operate before landing.

3. Weight. Reduce by normal fuel drill.

1. HP cocks. Close at touch-down.

Touch-down. Lowest practicable speed, holding nose up as long as possible.

Handpump. Use to maintain pressure whilst holding single application of brake.

NOTE: Use 2,500 yard runway if possible.

(ii) Arrester barrier available

1. Hand pump. Raise pressure if possible.

Wheelbrakes. Do not operate before landing.

3. Weight. Reduce by normal fuel drill.

 Touch-down. Lowest practicable speed, holding the nose up.

 Landing run. By judicious use of rudder and, if necessary, engines, maintain the centre line.

- 6. Lower the nose and close the HP cocks approximately 400 yards short of the barrier then attempt to stop by a single continuous application of the brakes whilst operating the hand pump to build up or maintain pressure.
- (c) If some brake pressure is available, conserve it until the maximum aerodynamic braking has been obtained from the aircraft. To conserve hydraulic fluid, make a single application of brake increasing the pressure as required until the aircraft stops. If possible operate the handpump while the brakes are in use.

8. Electrical system failure

(a) Single generator failure

If a generator failure warning light comes on check the DC voltmeter. If this shows overvolting proceed as at (c) following; if not, proceed as follows:—

(i) Switch off the generator switch.

(ii) Switch off radar and No. 5 inverter.

(iii) Reduce electrical load.

(iv) Reset the appropriate field circuit breaker if necessary.

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- ◄(v) After a pause, switch the generator switch on again.

 if the warning light does not go out, repeat the above procedure, once only. If the generator warning light still remains on, switch, and leave the generator off and trip its field circuit breaker. Use No. 4 inverter to supply Rebecca or the Gee receiver.

 ▶
- (b) Double generator failure

If both generator warning lights come on:-

- (i) Switch off both generator switches.
- (ii) Switch off Nos. 4 and 5 inverters.
- (iii) Reduce electrical load to an absolute minimum.
- (iv) Attempt to regain each generator in turn using the procedure in sub-para. (a) above.
- (v) If neither generator can be regained leave the generator switches OFF and ensure that their field circuit breakers are tripped. Keep electrical load to a minimum.
- (vi) Trip No. 3 inverter circuit breaker, and, if conditions permit, cut off supplies to the artificial horizon, compass and oil pressure indicators by tripping No. 2 inverter circuit breaker. Switch off all electrical services not essential for safety.

(vii) Reduce height to 15,000 ft., or if range precludes this, restrict RPM to 7,200 (max.) and maximum height to 35,000 ft. (AVTUR) or 25,000 ft. (AVTAG).

(viii) Land at the nearest suitable airfield.

NOTE: There is a risk of double flame out, when the battery is exhausted, if the LP cocks of an empty tank are left open. Consideration should therefore be given, on aircraft with controllable LP cocks, to conserving sufficient battery power to switch off the LP cocks of tanks which are at low fuel states.

(c) Overvolting

(i) After starting

28-30 volts. Keep engines running and have the fault checked.

Over 30 volts. Shut-down and report the defect.

(ii) In flight

29-30 volts. Return to base and land as soon as practicable.

◆Over 30 volts. 1. Switch off No. 4/5 inverters and radar.▶

- Switch off each generator in turn and check voltage. If one generator gives less than 30 volts isolate the other and return to base using minimum electrics.
- If, after 2 above, voltage is still 30-34 volts, leave both generators on, switch off the battery and land at the nearest suitable airfield; but switch ON the battery before landing to ensure electrical supplies until the runway is reached.
- 4. If the independent check of the generators fails to fault either generator and the voltage is still over 34, switch off both generators, trip their field circuit breakers, switch on the battery and land at the nearest suitable airfield. Keep electrical consumption to a minimum.

(d) Inverter failure

- (i) If No. 2 inverter fails, No. 3 will automatically take over supply to the compass, artificial horizon and oil pressure gauges; the emergency instrument supply indicator will show white.
- (ii) If No. 2 inverter fails attempt to regain the supply by re-setting its field circuit breaker, if necessary, and
 ✓ switching the starboard master start switch off for approximately one second; if the attempt fails do not repeat it.
 - (iii) If No. 3 inverter fails (Phase failure needle indicating zero):—
 - Check No. 5 inverter and associated equipment OFF.
 - 2. Reset No. 3 inverter circuit breaker, if necessary.
 - (iv) If the phase failure indicator needle moves to the red sector maintain a watch on the radar screens for overheating symptoms and, if necessary, shut down No. 5 inverter to allow its electronic regulator to cool.
 - (v) If No. 5 inverter fails use No. 4 inverter to supply Rebecca or the Gee receiver.
- (e) Use of the emergency batteries
 - (i) Emergency lights

In the event of a general power failure the cockpit emer-

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gency lights are supplied from the emergency battery when the EMERGY. LIGHTS switch on the forward coaming is put on.

(ii) Turn-and-slip indicator

To obtain emergency power for the turn-and-slip indicator put the NORMAL/EMERGENCY switch to EMERGENCY.

9. Cabin pressurisation failure at altitude

- (a) If cabin pressurisation failure occurs at altitude carry out the following emergency drill:—
 - Warn crew "Immediate Descent" and order crew to operate toggle on oxygen mask. Crew acknowledge.

2. Throttle right back.

Select airbrakes OUT.
 Open the bomb doors, if practicable.

5. Descend 0.79m above 40,000 ft., 0.75m below.

- Below 40,000 feet switch off the engine air switches. Reduce altitude to lowest practicable and in any case below 30,000 ft. to avoid the effects of decompression sickness.
- (b) If the pressurisation failure was caused by damage to the canopy or cabin, depending on the degree of damage and fuel state, fly the aircraft back to base or land at the nearest airfield. Except for the initial descent, do not exceed a speed of 0.70m or 300 knots.

10. Emergency use of oxygen

(a) Toxic fumes in cockpit

If the cockpit becomes contaminated with toxic fumes: -

1. Check or select 100% OXYGEN.

Deflect the regulator EMERGENCY switch to either side to prevent inward leaks on the mask.

 Pull down the toggle on the oxygen mask to tighten fit.

- **◄**(b) Blinker failure
 - (i) If the blinker remains black:--
 - Check contents and confirm that 100% OXYGEN is selected on the regulator.

- 2. Check pressure 200-400 psi (needle oscillating).
 - Depress the regulator EMERGENCY switch. Increased flow indicates that the regulator is serviceable; flight may be continued on 100% OXYGEN.
 - If no increase in flow is felt, operate the emergency oxygen bottle, disconnect the main supply and descend to 10,000 ft.
 - (ii) If the blinker remains black and breathing is restricted:—
 - 1. Check connections.
 - If all connections are properly made, operate the emergency bottle, disconnect the main supply and descend to 10,000 ft.
 - (iii) If the blinker remains white :-
 - 1. Check mask for tight fit.
 - If the blinker remains white and excessive pressure is felt, operate the emergency bottle, disconnect main supply and descend to 10,000 ft.
 - 3. Turn the regulator OFF.
- (c) Use of emergency bottle
 - Pull up on the operating cable conduit or down on the ball on the operating cable, both on starboard side of the seat pan.
 - Disconnect the mask tube from the main supply point.
 - The emergency oxygen bottle is brought into operation automatically when ejection takes place.

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Chapter 3—HAZARDOUS LANDINGS, ABANDONING, DITCHING

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1. Preparation for hazardous landings and subsequent escape

When carrying out a hazardous landing, the pilot should consider whether the circumstances permit the ejection seats to be rendered safe before landing, or whether the possible need for ejection before landing, precludes this. If it is decided to render the seats safe, the safety pin should be inserted in the rear sear of each seat, if possible, and the navigator and bomb aimer should remove the red disc from their safety pins before jettisoning the hatch. Before and after landing proceed as follows:—

(a) Before landing

Before landing carry out the following drill: -

- (i) Release life jackets from survival packs.
- (ii) Disconnect the emergency oxygen tube from the mask tube.
- (iii) Disconnect the Avs coupling.

- ◀ (iv) Tighten helmet straps and safety harness.
 - (v) Navigator or bomb aimer. See Pt. IV, Ch. 2, para. 3, for hatch jettison procedure if ordered to jettison hatch.
 - (vi) Switch off all non-essential electrics before touch down.

(b) After landing

- (i) Battery master switch OFF.
- (ii) Release oxygen mask from face and disconnect from main supply.
- (iii) Release harnesses and leg restraint.
- (iv) Vacate aircraft through the hatch aperture or entrance door.
- (v) If necessary, return to the aircraft when safe to do so, and render it "safe for parking."

2. Landing with the nosewheel not locked down

Unless circumstances dictate otherwise, land on a runway. The aircraft can be landed successfully as follows:—

- Use as much fuel as practicable following the normal fuel drill.
- 2. Jettison internal stores.
- 3. Crew preparation as at 1 (a) above.
- 44. The navigator's hatch may be retained at the pilot's discretion.
 - 5. Make a normal approach and landing and maintain a moderate nose-up attitude after touchdown, using rudder only to keep straight.
 - 6. Close the throttles and shut the HP cocks.
 - 7. Use the tail trimmer to assist in holding the nose off as long as possible and, while elevator control is still available, lower the nose smoothly and positively on to the runway; use the brakes gently to keep straight.
- 8. When aircraft comes to rest proceed as at 1 (b).

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3. Landing with one main-wheel not locked down

The aircraft can be successfully landed as follows:-

- Reduce weight as much as practicable following the normal fuel drill.
- 2. Jettison internal stores and wing tip tanks.
- 3. Crew preparation as at para. 1 (a).
- Jettison the navigator's hatch when below 5,000 ft. (Speed 180 kts. min.).
- Make a normal landing biased to the side of the runway centre line of the locked down main wheel, e.g. port wheel locked down, land port side of runway.
- Close the throttles and shut the HP cocks at touchdown.
- 7. Hold the wings level for as long as possible. At approximately 55 knots the wing can be expected to drop accompanied by a swing in the dropped wing direction. Application of brake, if available, will maintain directional control down to a lower speed. However, eventually the aircraft will swing sharply in the direction of the dragging wing tip and may swing through 360° or more.
- 8. When the aircraft comes to rest proceed as at para 1 (b).

NOTE: Experience has shown that the usual swing causes the aircraft to finish up approximately 50 yards to the side of the touch down centre line. Therefore, it is recommended that the landing strip should have a cleared area of at least 100 yards in width at the side of the landing path in the direction of the expected swing.

4. Landing with all wheels up

- Reduce weight as much as practicable following the normal fuel drill.
- 2. Jettison the wing tip tanks and internal stores.

- 3. Crew preparation as at para 1 (a).
- Jettison the navigator's hatch when below 5,000 ft. (Speed 180 kts. min.).
- Make a normal approach and close the throttles and HP cocks at touch-down.
- When the aircraft comes to rest proceed as at para. 1 (b).

5. Forced landing

NOTE: It may be advantageous when making a forced landing to have the undercarriage down and pilots should carefully consider the probable advantages, in most cases, of reducing impact load by this means.

If a forced landing has to be made, and time permits, carry out the preparatory actions given in para. 1 (a) and in any case jettison the navigator's hatch. Proceed thereafter as follows:—

- (a) With engine power available
 - Reduce weight as much as is practicable following the normal fuel drill.
 - 2. Jettison the wing tip tanks, and internal stores.
 - 3. Check harnesses tight and locked.
 - Make a normal approach and landing (see NOTE above).
 - Switch off the battery master switch and close the HP cocks before touch-down.
 - When the aircraft comes to rest proceed as at para. 1 (b).
- (b) With no engine power available
 - 1. Glide at 165 knots.
 - 2. Jettison the wing tip tanks.
 - 3. Jettison internal stores.
 - Close the HP cocks ,and LP pumps (and cocks if possible).

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- 5. Check harnesses tight and locked.
- While positioning for a landing reduce speed to 130 knots and maintain this speed until the final approach is commenced.
- Use flap if possible, and cross the landing area threshold at 100-110 knots.
- Before touch-down switch OFF the battery master switch.
- (c) After the landing run is complete leave the aircraft through the navigator's hatch aperture and move well upwind of the aircraft. When it is apparent that there is no risk of explosion or fire, return, if necessary, to the aircraft to fit its ejection seat safety pins.

6. Abandoning the aircraft in flight

- (a) The minimum height recommended for ejection in straight and level flight is 1.000 feet. If possible, ejection should take place at 200 kts.
- (b) The bomb-aimer should occupy his ejection seat at all times unless engaged at the nose station, as he may find it difficult or even impossible to regain his ejection seat if the aircraft goes out of control.
- (c) The recommended method of escape for the pilot is by ejection through the closed canopy after operating the control column snatch unit. The navigator's hatch must be jettisoned before the navigator and bomb aimer eject, otherwise severe injury may result.
- (d) The following escape drill is recommended:-
 - (i) Reduce speed if possible to 200 kts.
 - (ii) Pilot checks MASTER SAFETY switch ON.
 - (iii) Navigator and bomb-aimer
 - Check hatch SAFETY switch ON and jettison hatch (above 180 kts. if possible).

 Eject, one after another. Whoever ejects last must grasp the blind firing handle and cover his face with his forearms before the first crew member ejects.

(iv) Pilot

Pilot operates the control column snatch unit and ejects through the canopy.

- (v) After the automatic seat-harness-release has operated kick the seat away.
- (vi) The barometric release will stream the parachute at 13,000 feet, or after 2±½ seconds if ejection is below 13,000 feet. If the barometric control fails to operate, or if it is necessary to stream the parachute instantaneously, ensure that the seat is well clear, then pull the manual override knob.

(e) If the automatic harness release fails after ejection: -

- Operate the seat harness manual quick-release (if height permits, the main oxygen tube should be disconnected before releasing the harness).
- (ii) Kick the seat away.
- (iii) The parachute will be streamed automatically at 13,000 feet or when the manual override knob is pulled (see (d) (vi) preceeding).

(f) If the ejection seat fails to fire:

(i) Operate the emergency bottle.

(ii) Disconnect the main oxygen tube.

(iii) Operate the brass key on the static line to disconnect the barometric control.

(iv) Operate the seat harness quick release.

(v) Abandon the aircraft through an escape hatch.

(vi) Pull the manual override knob to stream the parachute.

7. Ditching

(a) The ditching qualities are expected to be poor and it is recommended that the aircraft be abandoned in flight rather than ditched.

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(b) Should ditching be unavoidable, the bomb doors must be closed and the entrance door must not be jettisoned. Jettison the navigator's hatch above 180 knots. Make the final approach with the flaps lowered and touchdown in a nose-up attitude at the lowest practical forward speed and rate of descent. After touch-down lose no time in escaping through the hatch aperture.

NOTE: The demand oxygen system makes a fairly good underwater breathing set if the mask fit is good, the air inlet switch is set to 100% OXYGEN and the emergency switch is set to either side. However, it is imperative that the use of the demand system as under-water breathing equipment is fully understood. This is covered in A.P.129.

