

## PART 4

# Chapter 2 — AIRFRAME EMERGENCY PROCEDURES

### Contents

	Para
Action in the event of hydraulic failure ... ..	1
Controls restriction ... ..	2
Action in the event of complete electrical failure ... ..	3
Inverter failure ... ..	4
Combined electrical and hydraulic failure ... ..	5
Emergency operation of the tailplane ... ..	6
Aileron trim malfunction in Manual ... ..	7
Canopy jettisoning ... ..	8
Fuel transfer pressure failure ... ..	9
Proportioner failure ... ..	10
Fuel gauge failure ... ..	11
Booster pump failure ... ..	12
Drop tank jettisoning ... ..	13
Asymmetric fuel loads ... ..	14
Cockpit pressure failure ... ..	15
Fumes in the cockpit ... ..	16
Oxygen failure ... ..	17
Landing gear emergency operation ... ..	18
Flaps emergency operation ... ..	19
Wheelbrakes emergency operation ... ..	20

### 1 Action in the event of hydraulic failure

#### (a) *Indications*

Complete failure is indicated by a loss of pressure on the gauge followed by the red light coming on and the audio warning sounding when the pressure falls below 600 PSI.

#### (b) *Immediate actions*

- (i) Reduce speed to below Manual limitations.
- (ii) Release the aileron trim safety lock and check that the trim indicator shows zero.

#### (c) *Subsequent actions*

- (i) If lateral control difficulties are encountered due to turbulence or unequal fuel feeding, jettison external stores including the drop tanks if the fuel state permits.

(ii) The controls may be left in Power, but when Manual reversion occurs, and in any case at a safe height before joining the circuit, switch off elevator and aileron Power. Normally the controls revert to Manual quite quickly.

(iii) Lower landing gear and flaps on the emergency systems.

(iv) Do not exercise the brakes downwind. Use brake parachute on landing, unless the crosswind exceeds the limitations. On landing make one continuous application of the brakes and avoid maxaretting. Close the HP cock at touchdown.

*(d) Considerations*

(i) Subject to satisfactory turbulence and crosswind conditions, full flap may be used for landing in the following configurations:

No external stores.

Any symmetrical drop tank configuration.

One asymmetric empty drop tank on an inboard pylon.

(ii) For any other configuration, a low speed handling check must be carried out (see Part 3, Chapter 4, para 3 (d)).

(iii) When flap is not used on the approach, it should be lowered immediately after touchdown.

(iv) Use the arrester hook if necessary.

## **2 Controls restriction**

*(a) Indication*

Control column movement is restricted.

*(b) Actions*

(i) If sufficient time, height and control are available move the controls in all directions.

(ii) If this is not effective, select Power controls off.

*(c) Considerations*

(i) These actions must not be allowed to prejudice a safe ejection.

(ii) If possible, carry out a low speed handling check before landing.

### 3 Action in the event of complete electrical failure

#### (a) *Indications*

Impending failure is indicated by the generator warning lights both coming on. Subsequent complete failure is indicated by the unserviceability of the booster pumps and all electrically operated instruments.

#### (b) *Immediate actions*

- (i) Switch off all non-essential electrical services to conserve the batteries. If booster pumps are switched off reduce to flight idling RPM and descend as for booster pump failure (see para 12) thereafter restricting RPM to a maximum of 7200.
- (ii) Switch the tailplane interconnection off and trim load-free.

#### (c) *Subsequent actions*

- (i) Land as soon as possible.
- (ii) Provided that the engine is running correctly and hydraulic pressure is normal, leave the flying controls in Power. The magnetic indicators show white when the batteries are discharged although the controls remain in Power.

NOTE: If any doubt as to the serviceability of the hydraulic system exists, select Power off before the batteries are discharged.

- (iii) The decision to remain on main UHF or to switch to the standby set using the emergency battery will depend on the weather conditions, the expected flying time before landing and the facilities available locally on the guard frequency. If the standby set is selected, switch off the main UHF to conserve the batteries.
- (iv) The turn-and-slip supply should be switched to EMERGY.
- (v) Lower the landing gear and flaps on the emergency systems.
- (vi) If battery power is still available in the circuit, trim as required when flap is used and switch on one booster pump for landing.

### 4 Inverter failure

#### *Indication*

Indicator shows STBY (amber)

If No 2 inverter has failed the STANDBY INVERTER magnetic indicator shows white.

NOTE: If either main inverter fails the standby inverter automatically takes over.

## *Action*

Select the NORMAL/STANDBY switch to STANDBY and then return it to NORMAL. If the indicator remains STBY (or magnetic indicator remains white) resetting has not been accomplished and no further action by the pilot is possible.

## **5 Combined electrical and hydraulic failure**

### *(a) Indications*

The most likely cause of the failure is the auxiliary gearbox. The hydraulic pressure gauge shows a fall in pressure followed by the warning light and the audio warning coming on. Both generator lights come on.

### *(b) Immediate actions*

- (i) Reduce speed to below the Manual limitations.
- (ii) Switch the tailplane interconnection off and trim load-free.
- (iii) Switch off all non-essential electrics, including booster pumps, reduce to flight idling RPM and descend as for booster pump failure (see para 12) thereafter restricting RPM to a maximum of 7200.
- (iv) Release the aileron trim safety lock and check that the trim indicator is at zero.
- (v) Select power controls to Manual.

### *(c) Subsequent actions*

- (i) If required select the standby UHF set using the emergency battery and switch off the main UHF.
- (ii) Land as soon as possible.
- (iii) If lateral control difficulties are encountered or are likely to be encountered on landing, jettison external stores, including the drop tanks if fuel state permits.
- (iv) Select the turn and slip supply switch to EMERGENCY.
- (v) Lower landing gear and flaps on the emergency system. Do not exercise the brakes downwind.
- (vi) If battery power is still available in the circuit, trim as required when flap is used and switch on one booster pump for landing.
- (vii) Select brake parachute to STREAM on landing, unless the crosswind exceeds the limitations. Make one continuous application of the brakes without maxaretting. Close the HP cock at touchdown.

(d) *Considerations*

See para 1 (d) of this chapter for considerations applicable to hydraulic failure.

## 6 Emergency operation of the tailplane

(a) If the normal tailplane motor fails or 'runs away' lift the cover of the standby switch *fully* and use that control. Rate of operation is about one third that of the normal control. If this fails to stop the runaway, operate the instructor's cut-out switch. If flying above the flap limiting speed, check that the flaps have not been lowered inadvertently.

(b) If the tailplane runs away to the fully nose-down position, recovery to level flight can be achieved below about 0.86M. Above this speed recovery action may be reduced by elevator jack stalling. If this occurs, after raising the cover of the standby switch, throttle back and extend the airbrake to reduce speed.

(c) If complete electrical failure occurs, control of the tailplane is impossible. It is important, therefore, to trim load-free before the batteries are fully discharged.

(d) *Failure of both normal and standby trim control*

(i) In Power control the aircraft can be controlled throughout its speed range with full nose-down trim and up to approximately 420 knots with full nose-up trim.

(ii) In Manual control full nose-down trim can be held below 350 knots down to 150 knots; there is insufficient elevator control to prevent the nose falling if more than 30° flap is lowered for landing. Full nose-up trim can be controlled below 250 knots and full flap may be lowered for landing.

## 7 Aileron trim malfunction in Manual

(a) When flying in Manual, if the aileron trim actuator malfunctions, resulting in full trim being applied with subsequent inability to rectify, reselect Power immediately and remain in Power for the remainder of the flight.

(b) If it is not possible to reselect Power, the additional aileron force in the circuit is moderate if the speed is kept below 175 knots. Above 250 knots, control may be lost.

(c) It is recommended that rudder trim is used to oppose the roll. Full rudder trim counteracts the aileron load up to 200-220 knots, and may be used for landing.

## **8 Canopy jettisoning**

(a) Jettison the canopy by pulling the handle between the seats firmly and sharply. The speed should be between 130 and 280 knots.

(b) The canopy is also jettisoned when either ejection seat face-screen or seat-pan handle is pulled.

(c) The cockpit altitude exceeds the aircraft altitude by up to 8000 feet when the canopy is jettisoned. The maximum safe operating altitude then is 42000 feet, aircraft altitude. After jettisoning the canopy descend at maximum rate to 35000 feet cockpit altitude and then continue rapid descent to below 25000 feet cockpit altitude.

(d) If it is desired to remove the canopy on the ground without using the explosive jettison system, remove the pip-pin from the operating rod connected to the canopy jettison firing unit and then pull the red handle on the canopy release unit. The canopy can then be pushed off manually.

## **9 Fuel transfer pressure failure**

### *(a) Indications*

Transfer indicator(s) show white. Subsequently fuel gauge(s) should show front tank contents only.

### *(b) Immediate actions*

- (i) Accept that fuel remaining in the centre, wing and drop tanks is unavailable; rely only on the fuel in the front tanks (800 lb maximum per tank).
- (ii) If one side only has failed, switch the booster pump off on this side until the front tanks contents are equal; the pump should then be switched on.
- (iii) Avoid steep dives due to the possibility of collapsing the tanks.

## **10 Proportioner failure**

### *(a) Indication*

Fuel out of balance.

*(b) Immediate action*

Land as soon as possible.

*(c) Subsequent action*

Attempt to correct any out-of-balance condition by selective switching of booster pumps.

**11 Fuel gauge failure***(a) Indications*

Either or both gauges may fluctuate between empty and full, or indicate empty.

*(b) Immediate actions*

- (i) Check for booster pump or transfer failure.
- (ii) Leave both pumps on and return to base.

**12 Booster pump failure***(a) Indications*

- (i) The booster pump amber warning light comes on.
- (ii) The associated contents gauge commences to read high by comparison with the other gauge if drop tanks are empty.
- (iii) The LP warning light illuminates if the fuel pressure drops below 3-3½ PSI. Depending upon altitude and power setting the LP warning light may come on in the event of one booster pump failure.

*(b) Immediate actions*

- (i) Check booster pump circuit breaker(s).
- (ii) If one or both pumps have failed, reduce to flight idling RPM and switch off the failed pump(s).
- (iii) Descend to a maximum height of:
 

25000 feet	...	...	Clean aircraft or with empty drop tanks.
20000 feet	...	...	2 or 4 drop tanks containing fuel.

NOTE: If maximum range is vital, the above heights may be increased by 10000 feet but this may incur damage to the HP fuel system.

- (iv) If a single booster pump failure has occurred, switch off the serviceable booster pump and, as in the case of a double pump failure, accept the fuel flow provided by gravity and tank pressurisation.

(c) *Subsequent actions*

- (i) Keep throttle movements to a minimum and restrict RPM to a maximum of 7200 (but not less than 6000 with less than 600 lb fuel per side).
- (ii) Avoid negative G manoeuvres.
- (iii) Land as soon as practicable. If a single failure has occurred, the serviceable pump may be switched on before landing, if the fuel state on that side of the system permits.

(d) *Considerations*

If double pump failure has occurred, it is vital to land whilst both sides of the system contain fuel. The fuel flow proportioner maintains any out-of-balance level in the tanks at the time of failure and the engine will not run with one side empty unless the booster pump on the side containing fuel is serviceable and switched on. With both pumps off the LP warning light may illuminate, depending on altitude and power setting.

### **13 Drop tank jettisoning**

Drop tank jettisoning must be carried out with flaps and landing gear up without yaw or side slip, in the speed range 200 to 450 knots in straight and level flight or 300 to 450 knots in dives up to 10°.

NOTE: A better separation is achieved at speeds above 250 knots.

### **14 Asymmetric fuel loads**

In the event of a fuel transfer failure when carrying drop tanks:

- (a) Investigate the low-speed handling characteristics at a safe height. If these are not satisfactory or landing conditions are not favourable, jettison the tanks.
- (b) In Manual control, the aircraft must not be landed with any asymmetric load other than an empty inboard drop tank or practice bombs, unless a low speed handling check has been made. (See Part 3, Chapter 4, para 3 (d).)

### **15 Cockpit pressure failure**

(a) *Indications*

Pressurisation failure is indicated by the cockpit pressure failure light illuminating and the cockpit pressure altimeter reading higher than normal (see Part 1, Chapter 7, para 3).

(b) *Immediate actions*

- (i) Depress the oxygen mask toggle downwards.
- (ii) Descend at maximum rate to 35000 feet cockpit altitude then continue rapid descent to below 25000 feet cockpit altitude. Return to base at the lowest altitude that the fuel state will safely permit.

NOTE: Flood flow will automatically be supplied at a cockpit altitude greater than 38000 feet.

**16 Fumes in the cockpit**

(a) *Immediate actions*

Set the air inlet NORMAL/100% OXYGEN switch to 100% OXYGEN.

(b) Deflect the EMERGENCY three-position switch on the regulator to prevent inward leaks to the mask. If a leak is suspected depress the oxygen mask toggle downwards.

(c) Descend to 35000 feet ASL and depressurise; continue rapid descent to below 25000 feet cockpit altitude.

**17 Oxygen failure**

(a) *Magnetic indicator remains black*

(i) *Immediate actions*

Check connections, contents and pressure.

Set air inlet switch to 100% OXYGEN.

Deflect the regulator EMERGENCY switch.

(ii) *Subsequent actions*

(1) If breathing is restricted after carrying out the above actions, operate the emergency oxygen bottle, disconnect the main supply and descend below 10000 feet cockpit altitude.

(2) If breathing is unrestricted after carrying out the actions in (a) (i), the magnetic indicator is unserviceable and the flight may be continued on 100% OXYGEN.

(b) *Magnetic indicator remains white*

*Immediate actions*

Check mask for tight fit and connection for full engagement. If the magnetic indicator remains white and excessive pressure is felt at the mask, operate the emergency oxygen bottle, disconnect the main supply and descend below 10000 feet cockpit altitude.

## 18 Landing gear emergency operation

NOTE 1: Both landing gear and flap emergency systems operate independently of their normal selectors.

NOTE 2: When operating either the landing gear or flaps emergency selector, it must be pulled out to the full extent of the operating wire.

### (a) *Landing gear failure to unlock or lock down (electrical and hydraulic systems normal)*

(i) If the landing gear or any unit of the landing gear fails to unlock after a normal down selection, a mechanical or hydraulic lock is likely to have occurred. If the landing gear fails to lock down, some other type of failure is likely. In any event, the following sequence of actions is recommended

Make repeated selections at 170-190 knots, with flap both up and down, allowing 30 seconds between selections. If unsuccessful, apply prolonged negative G (by inverting the aircraft if height permits) during down selections, and positive G, followed by sideslip, after down selections.

Operate the landing gear emergency lowering control if the above attempts are unsuccessful.

### (ii) *Considerations*

If a main wheel red light remains on after an up selection, and persists after a subsequent down selection, a sequence valve malfunction may be suspected. If this is confirmed by an external visual check showing the main wheel to be retracted outside the fairing door, the emergency lowering control should be used.

### (b) *Landing gear failure to lock up (electrical and hydraulic systems normal)*

(i) Have an external visual check made before re-selection. If clean, select down normally to obtain 3 greens. Wait 30 seconds to ensure nosewheel locked down. Re-select up whilst applying negative G.

(ii) If on the visual check the nosewheel is outside the fairing door, select down normally to obtain 3 greens.

(iii) If the mainwheel is outside the fairing door, select down by using the emergency lowering control.

### (c) *Landing gear raising on the ground*

To raise the landing gear on the ground in an emergency (after a normal down selection) rotate the normal up selector button clockwise and press in.

*(d) Landing gear failure to retract in the air*

If the up button cannot be pressed in normally after take-off the wheels must be left down. The landing gear override must not be used in the air to retract the landing gear as there is a risk of damage to the leg fairings.

*(e) Inadvertent down selection*

If the landing gear is inadvertently selected down above 250 knots it should be left down, if possible, and speed reduced to below 250 knots.

**19 Flaps emergency operation**

Following the failure of a normal down selection, or a hydraulic or electrical failure, the flaps may be lowered, fully down only, by operating the emergency lowering control (press in knob and pull handle). If a partial hydraulic failure has occurred, it may be possible to select intermediate flaps before using the emergency system.

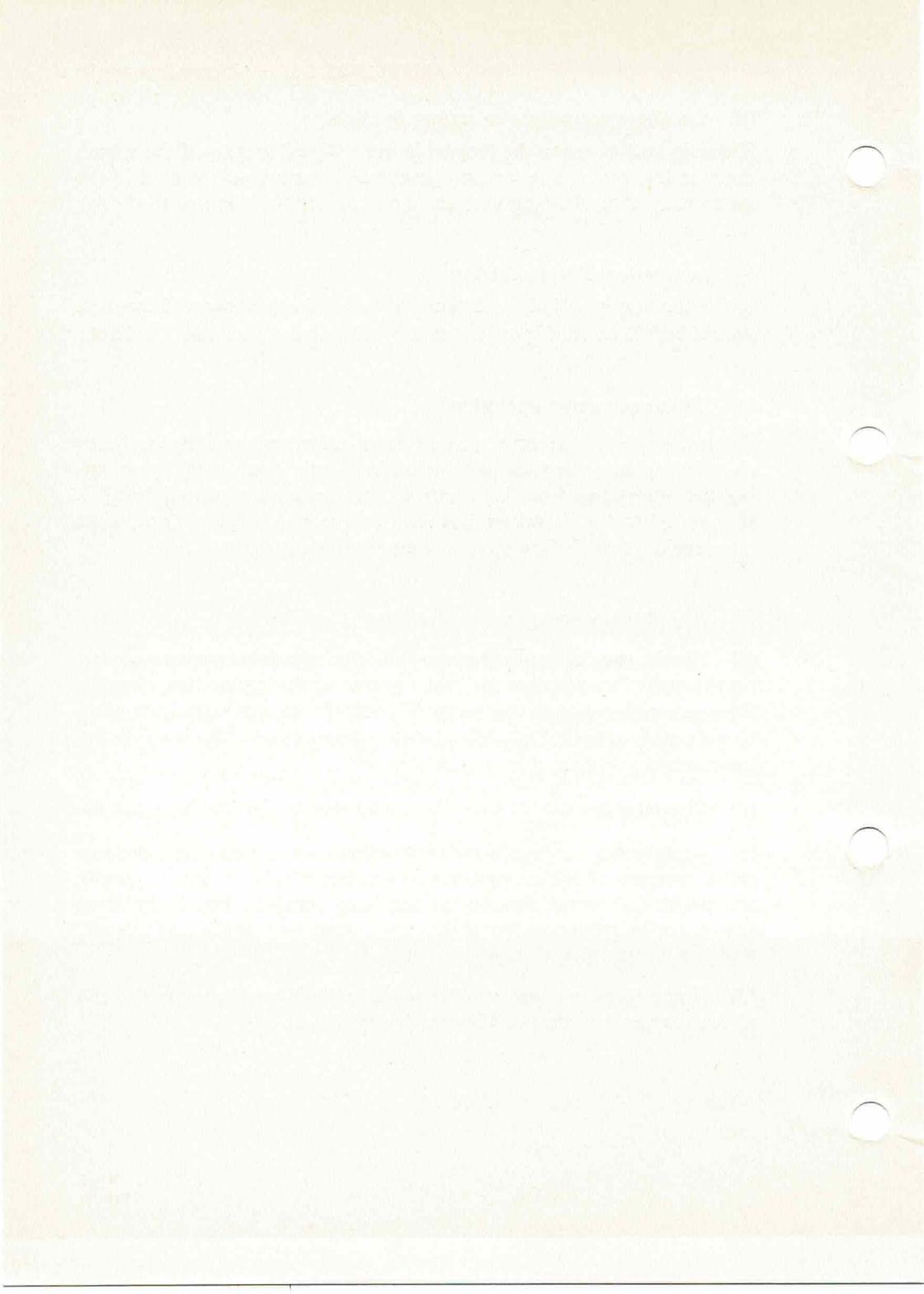
**20 Wheelbrakes emergency operation**

*(a)* Should the hydraulic system fail, the wheelbrake accumulators provide sufficient pressure for brake operation during landing, down to a gauge reading of approximately 750 PSI. To conserve pressure when landing without main hydraulic pressure do not operate the lever during the downwind checks. Call for barrier.

*(b)* Close the HP cock at touchdown and stream the brake parachute.

*(c)* Apply brake pressure in such a way that maxaretting does not occur (little pressure at high speed but increasing with decrease in speed), and avoid differential braking as much as possible. The brake lever should not be released after brakes have once been applied as this will result in a large loss of pressure.

*(d)* If necessary, use the arrester hook to avoid over-running the end of the runway (see Part 4, Chapter 3, para 8).



This file was downloaded  
from the RTFM Library.  
Link: [www.scottbouch.com/rtfm](http://www.scottbouch.com/rtfm)

Please see site for usage terms,  
and more aircraft documents.

