

PART 3

MANAGEMENT OF SYSTEMS AND EQUIPMENT



M. 148 Aircraft



Provisional Pilot's Notes

Para.

# PART 3

# MANAGEMENT OF SYSTEMS AND EQUIPMENT

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### MANAGEMENT OF THE FUEL SYSTEM

1. Fuel from all the tanks is automatically fed to the engines, via hydraulically-driven fuel flow proportioners, when the L.P. cocks and the H.P. cocks are on.

### 2. Use of the cross-feed cock

- (i) Normally, tanks No. 2, 4, 5 and 7 supply the port engine and tanks No. 1, 3, 6 and 8 supply the starboard engine. In the event of a proportioner failure with both engines running, the remaining proportioner will maintain an adequate supply to both engines immediately the cross-feed cock is opened. It should be noted that this fuel supply will be drawn only from the tanks which normally supply the serviceable proportioner; to obtain fuel from all tanks, the inter-tank transfer control should be selected ON (para.3).
- (ii) To ensure that a supply of fuel is maintained in the event of proportioner failure during take-off, it is recommended that the cross-feed cock is opened before take-off and closed when a safe height is attained.
- (iii) To cross-feed, select the cross-feed control switch to OPEN and note that the magnetic indicator changes to white.
- Use of the inter-tank transfer cock

In the event of an engine failure, the proportioner feeding that engine will stop due to failure of the hydraulic supply. Fuel from all tanks can, however, be supplied to the remaining engine by closing the L.P. and H.P. cocks of the failed engine and selecting the inter-tank transfer control to ON.

4. Fuel jettisoning

Fuel from all tanks can be proportionately jettisoned through a single electrically-controlled valve. To jettison fuel, pull up the jettison control and turn it to the FUEL JETTISON position. Fuel will be discharged overboard until the control is released or until one of the low level float switches operates.



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### MANAGEMENT OF THE HYDRAULIC SYSTEM

- 5. Starting and taxying
- (i) Before starting the engines, and with an external electrical power supply connected, check the following:-
  - (a) The two power controls warning lamps on the centralized warning panel are illuminated.
  - (b) The two general services system pump failure indicators show white.
  - (c) The general services system indicator shows NORM.
  - (d) The brakes emergency accumulator pressure gauge indicates 3,000 lb. per sq.in. (minimum). Note...
    Accumulator hydraulic pressure is exhausted when the gauge indicates 1,550 lb. per sq.in.
- (ii) As each engine is started, check that:-
  - (a) The corresponding power controls warning lamp is extinguished.
  - (b) The corresponding general services pump failure indicator changes to black.
  - (c) The brakes normal and emergency accumulators pressure increases to 4,000 lb. per sq.in.
- (iii) Before take-off, check the flying controls over their full range of movement. Check the operation of the main plane flaps, tail plane flap and air brakes.
- 6. General services system emergency operation
- (i) Should the general services hydraulic system develop a fluid leakage resulting in the 'bottoming' of the main reservoir piston, the whole of the hydraulic system will be automatically transferred to emergency hydraulic and electrical supply. The general

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services hydraulic system indicator will change to EMGY, and the hydraulic services must be operated, as required, by selection of the standby controls (Part 5, para. 4 to 8).

(ii) In the event of any hydraulic service failing to operate on a normal selection, the service can be selected on the appropriate standby control. With the exception of the bomb door and the air brakes (IN selection only), an emergency selection, once made, must be retained on all services, to ensure that the service is maintained in the selected position. In the case of an air brakes or bomb door standby selection, the remainder of the hydraulic system will revert to normal when the air brakes are fully closed and when the bomb door is fully open or closed.

### MANAGEMENT OF THE AIR CONDITIONING SYSTEM

- 7. Cabin pressurization
- Cabin pressurization is fully automatic in operation upon selecting the CABIN PRESSURE switch to ON.
- (ii) Should the pressure control system fail or damage to the aircraft structure cause a loss of cabin pressure, the warning lamp on the centralized warning panel will illuminate when the cabin altitude reaches 32,000 ft. In this event, the emergency ventilation control should be operated and, if possible, a descent made to a more tolerable altitude.

#### WARNING ...

If the aircraft is at altitude, rapid opening of the emergency ventilation control will cause sudden decompression of the cabin. In these conditions, therefore, the control must be opened slowly.

# 8. Temperature control

(i) The desired temperature, within the range of +5 deg. C. to +35 deg. C., is selected on the temperature control knob and the temperature control switch set to AUTOMATIC. The selected temperature will be maintained thermostatically, irrespective of any change in aircraft operating conditions.





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(ii) In the event of failure of the thermostatic control, the temperature can be manually regulated by selecting the temperature control switch to MANUAL. In this condition the cabin temperature is governed directly by rotation of the control knob. It should be noted that the resulting cabin temperature will vary with changes in operating conditions or cabin heat load, necessitating adjustment of the control knob in order to maintain a constant cabin temperature.

#### MANAGEMENT OF THE AUTO-PILOT

## 9. Speed limitations

The limitations when the auto-pilot is being used are as follows:-

| (a) | Minimum speed for engaging auto | -pilo | ot . | • | × | ٠ | 0.6  | Mach. |
|-----|---------------------------------|-------|------|---|---|---|------|-------|
| (b) | Maximum speed for continuous cr | uise  | •    |   |   | ÷ | 0,85 | Mach. |
| (c) | Climbing speed                  |       |      | • |   | ÷ | 0.85 | Mach. |
| (d) | Maximum speed permissible       |       |      |   |   |   | 0.95 | Mach. |

### 10. Pre-flight checks

- (i) Preliminary check
  - (a) Ensure that the FLIGHT INST. No. 1 and No. 2 switches are ON and check that the inverter failure indicator shows black.
  - (b) Check the flying controls for freedom and range of movement.
  - (c) Note that the centralized warning system is operating (window marked A.P. illuminated).
  - (d) Press the AUTO-PILOT RESET switch.
  - (e) Check that the auto-pilot warning lamp on the centralized warning panel is extinguished and re-set the system by pressing

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the CANCEL switch.

- (f) Allow at least one minute for the rate gyros to run up.
- (ii) Auto-stabilizer check
  - (a) Select the AUTO-STABILIZER switch ON.
  - (b) Check that the flying controls remain free and return the controls to neutral.
- (iii) Force stick check
  - (a) Centralize the control column and reduce any trim to zero.
  - (b) Select FORCE STICK on the FORCE STICK/LOCK switch.
  - (c) Operate the AUTO-PILOT switch on the control unit.
  - (d) Press the auto-pilot ENGAGE button on the grip unit; check that the doll's eye indicator on the control unit operates.
  - (e) Grip the lower part of the control column below the force stick unit and check that it is locked in pitch and roll.
  - (f) Ensure full authority of force stick in roll.
  - (g) Operate the force stick in pitch and check that the tail plane limit switches operate in both directions (+2 deg. and -4 deg.), causing the centralized warning system to operate.

# Note ...

When the limit switches operate it will be necessary to press the AUTO-PILOT RE-SET switch and to re-engage the autopilot.

- (h) Press the auto-pilot DISENGAGE button on the grip unit and check that the doll's eye indicator on the control unit clears.
- (j) Switch OFF the auto-stabilizer.



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- (iv) Height lock check
  - (a) Select LOCK on the FORCE STICK/LOCK switch and HEIGHT on the HEIGHT/MACH switch.
  - (b) Press the auto-pilot ENGAGE button.
  - (c) Check that the control surfaces remain neutral.
  - (d) Check that the force stick has full authority in roll but is locked in pitch.
  - (e) Disengage the auto-pilot.
- (v) Mach No. lock check
  - (a) Repeat sub-para. (iv), selecting MACH on the HEIGHT/MACH switch.
- (vi) Compass heading check
  - (a) Synchronize the Mk.5 F.T. compass annunciator.
  - (b) Adjust the compass heading selector to the indicated aircraft compass heading.
  - (c) Select LOCK on the FORCE STICK/LOCK switch.

- (d) Centralize the control column and press the auto-pilot ENGAGE button.
- (e) Displace the heading selector of the compass by 4 deg. to port; check that the ailerons indicate a bank to port.
- (f) Restore the heading selector into alignment with the aircraft heading; check that the ailerons return to datum.
- (g) Displace the heading selector by 4 deg. to starboard; check that the ailerons indicate a turn to starboard.
- (h) Repeat operation (f) above.



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- (vii) Cut-out check
  - (a) Operate the cut-out button on the grip unit.
  - (b) Check that the centralized warning system operates and that the flying controls revert to manual with full freedom of movement.
  - (c) Re-set the centralized warning system by depressing the CANCEL switch.
  - (d) Switch OFF the AUTO-PILOT switch.

(e) Press the AUTO-PILOT RE-SET switch. Note...

The AUTO-PILOT and AUTO-STABILIZER switches on the control unit must be selected OFF before take-off; the AUTO-PILOT switch must also be switched OFF before landing.

- 11. Operation in flight
- (i) Engaging the auto-pilot
  - (a) Select the AUTO-PILOT switch ON.
  - (b) Select the required auto-pilot mode, trim into the appropriate flight condition and press the ENGAGE button; check the

operation of the doll's eye indicator on the control unit.

### Note...

To change the mode in which the auto-pilot is engaged, the DIS-ENGAGE button must be depressed, the required mode selected and the ENGAGE button operated. The auto-stabilizer, however, may be switched on and off as required when the aircraft is being flown under manual control or when the Force Stick mode is engaged.

(ii) Height lock

To engage the height lock, select LOCK on the FORCE STICK/ LOCK switch and select HEIGHT on the HEIGHT/MACH switch.





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Trim the aircraft to fly hands and feet off and depress the ENGAGE button. With the height lock engaged the aircraft will maintain the barometric height prevailing at the time the ENGAGE button is depressed.

### (iii) Mach lock

To engage the Mach lock, select LOCK on the FORCE STICK/ LOCK switch and select MACH on the HEIGHT/MACH switch. Trim the aircraft in the desired flight attitude and depress the ENGAGE button. The aircraft will now maintain the Mach No. prevailing at the time the ENGAGE button is operated. In this mode an increase or decrease in power will produce an increased rate of climb or descent respectively.

## Note ...

Selection of the height lock or Mach lock modes automatically engages the auto-stabilizer, irrespective of the position of the AUTO-STABILIZER switch. In both of these modes bank can be applied by the Force Stick.

# (iv) Force stick

The Force Stick mode is engaged by selecting FORCE STICK on the FORCE STICK/LOCK switch and depressing the ENGAGE button.

## (v) Use of the heading selector

The principal function of the heading selector is to maintain a selected course when in height or Mach lock modes. To obtain the required course, the aircraft must be flown either manually, i.e., with the auto-pilot disengaged, or by Force Stick in bank with the auto-pilot engaged. When the turn is completed, adjust the heading selector to the new course.

(vi) Disengaging the auto-pilot

To disengage the auto-pilot, press the DISENGAGE button on the grip unit.

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# 12. Checks before landing

Before landing, check that the AUTO-PILOT switch is selected OFF.

# 13. Operation of limit switches

In the event of any of these switches operating in flight, the autopilot may be re-engaged by operating the AUTO-PILOT RE-SET switch and, after an interval of not less than one minute, pressing the ENGAGE button. Should further automatic disengagement occur, the auto-pilot should not be used for the remainder of the flight.

### 14. Emergencies

In the event of malfunctioning of the auto-pilot, the cut-out button on the grip unit must be operated and, if necessary, immediate recovery action taken. Re-set the centralized warning system. Do not operate the AUTO-PILOT RE-SET switch.

