

Part I

Chapter 8—Air Conditioning System

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Description, Controls and Indicators

1 General

Air for pressurising and conditioning the cabin is tapped from each engine compressor. All components of the system are installed beneath the cabin floor. Two pressure controllers are mounted in the cabin. On top of each is a wire-locked pressure adjusting knob and a ground test lever. The latter must be set fully down for flight conditions.

2 Controls and indicators

The controls and indicators for the system with the exception of a circuit breaker on panel AJ are all on the 2nd pilot's side panel AD as follows:

(a) Four OPEN/CLOSE ENGINE BLEED ISOLATION COCKS switches, one for each engine, control the supply of air for the system and for the anti-icing system.

(b) Two OPEN/CLOSE PORT AND STBD. CABIN AIR ISOLATION cocks, one for each pair of engines control the supply to the pressure ratio control valve and the temperature control valve and thence to the cabin.

(c) The CABIN PRESSURE control switch has three positions, CRUISE/COMBAT/UNPRESS. With it set to CRUISE the pressure controllers, one of which has two different settings, maintain a constant cabin altitude of 8,000 feet at all altitudes above 8,000 feet until a maximum differential pressure of 5 PSI on Mk. 1

or pre-Mod. 2368 Mk. 1A aircraft is reached (23,000 feet approximately). Post-Mod. 2368 the maximum differential pressure is 8 PSI (38,500 ft. approximately). Above that height the pressure differential remains constant and the cabin altitude will increase. With the switch at COMBAT the variable controller is set to maintain 25,000 feet cabin altitude; at altitudes below 25,000 feet ambient conditions are maintained. When set to UNPRESS a discharge valve is opened to dump cabin pressure.

(d) The temperature of the cabin air is controlled by two switches, the CABIN TEMPERATURE MASTER and SETTING switches. The Master switch permits the selection of AUTO, off and MANUAL, COOL or WARM, and the SETTING switch, which is for use with the MASTER switch at AUTO, automatically varies the temperature between COOL, NORMAL and WARM. The MANUAL COOL and WARM positions may be used for manual control of cabin temperature. The switch must be held to either position; when released it reverts to the off position. Above the MASTER switch is an indicator which shows the position of the temperature control valve between WARM and COOL. Above the SETTING switch are two warning lights, an amber one marked MAX. HEAT and a red one marked OVER-HEAT.

(e) A cabin altimeter is provided on the second pilot's instrument panel AB. A warning light on the 1st pilot's side panel comes on if cabin pressure falls by approximately $\frac{1}{2}$ PSI from the selected value when the control switch is set to CRUISE only. Red warning lights are at each crew station except the 2nd pilot's and prone bomb aimer's.

(f) In addition to the warning light a warning horn sounds if cabin pressure exceeds 42,000 feet. The warning can be silenced by operation of the HORN OVERRIDE switch on the 2nd pilot's side panel AD.

◀(g) Mod. 3817 (B.1A and B(K)1A) or Mod. 3929 (B(K)1) provides a cabin differential pressure gauge on panel BF or CAG

respectively to give an indication of prevailing conditions to rear crew members. ▶

3 Flood flow control

(a) The MASTER FLOOD FLOW AUTO/MANUAL switch controls the flood flow system. The switch is held at AUTO by a spring-loaded gate. With the switch at AUTO flood flow is automatically selected should cabin altitude rise above 27,000 feet. When the gate is raised the switch may be set to OFF (central). The MANUAL setting of the switch is either to FLOOD (left) or LESS AIR (right). By judicious use of these two positions the cabin pressure can be maintained to a reasonable degree. The switch must be held to either position, if released it springs to the off position.

(b) A magnetic indicator shows white whenever the flood flow system is in operation.

(c) A guarded RESET switch is provided to reset the flood flow control after use, with the flood flow switch OFF.

4 Ram air ventilation—unpressurised flight

(a) Two ram air intakes are on the port and starboard sides of the nose respectively. The port intake is primarily for supplying air to the heat exchanger unit in the air-conditioning system and the starboard one for cabin ventilation.

(b) On Mk. 1A aircraft ram air for unpressurised flight is introduced by a manually-operated lever, fitted on the structure outboard of the Nav./Radar operator, which controls the starboard ram air valve via a bowden cable.

(c) On Mk. 1 aircraft, ram air may be introduced by setting the RAM AIR VALVE OPEN/CLOSE switch to OPEN. A position indicator is situated above the switch and shows all positions between OPEN and CLOSE. The cabin cannot be pressurised unless the switch is at CLOSE.

5 Cold air unit bypass (Mk. 1A aircraft)

When Mod. 908 is embodied a cold air unit bypass is fitted and controlled by a CAU BYPASS, IN/OUT switch on panel AD, adjacent to the cabin air isolation cocks switches. When the switch is set to OUT, the CAU is bypassed.

6 Cabin decompression

In an emergency, and if the aircraft is to be abandoned, cabin pressure can be released by any one of the following controls:

- (a) The EMERGENCY DECOMPRESSION switch on the 1st pilot's panel AC when moved upwards.
- (b) The cabin pressure control switch when set to UNPRESS.
- (c) The crew dump control above the main entrance door when pulled downwards.
- (d) The ABANDON AIRCRAFT warning switch when set ON, if Mod. 891 is embodied.

7 Circuit breakers

Circuit breakers for the cabin ventilation control, cabin temperature control, cabin temperature overheat warning, air-conditioning isolation and ram air valve circuits are positioned on panel AV. On panel AH are two test switches for testing the cabin temperature balance bridges.

8 Windscreen de-icing and de-misting

(a) De-icing

The 1st and 2nd pilots' windscreens and DV panels are electrically heated. Each pilot has an OFF/AUTO switch, a DEMIST/DE-ICE switch and a NORMAL/OVERHEAT/DE-ENERGISED magnetic indicator.

(b) Demisting

A WINDSCREEN DEMISTER OPEN/SHUT control on panel AB can be used to supply de-misting air either to the pilots' windscreen (up) or to the downward observation windows (down) and provides reduced supplies to both in the intermediate position. Additionally Mod. 2023 introduces a control lever beneath 2nd pilot's panel AB which can be used to divert hot air to the pilots' feet or to the windscreen for heating purposes.

(c) Windscreen wipers

A windscreen wiper is on each pilot's front panel. Each wiper is actuated by a hydraulic pump driven by an electric motor, through suitable reduction gears. The speed of each electric motor is controlled by its associated OFF/SLOW/FAST switch, one on each pilot's console, AE, AF, aft.

(d) Alcohol spray

When Mod. 2357 is embodied an alcohol spray unit is provided for the 1st pilot's windscreen panels. Alcohol, sufficient for 30 minutes continuous use, is contained in a 1.5 gallon reservoir. It is forced out by air pressure, controlled by a switch on the 2nd pilot's panel AF.

Management of the System

9 Controls selection

(a) Before flight

(i) Before starting the engines set the pressurisation and air-conditioning controls as follows:

- Cabin pressure master (panel AJ) and all circuit breakers on panel AV . . . Closed
- Cabin pressure selector switch Set to CRUISE or COMBAT as required
- Flood flow switch AUTO. Reset switch OFF. Magnetic indicator black

Ram air valve switch
(Mk. 1) or lever (Mk.
1A) Operate ram air valve and leave
as required
(In hot weather the ram air valve
may be put in the OPEN posi-
tion while taxiing)

Cabin temperature master
switch MANUAL

Cabin temperature setting
switch Mid-position

Cabin air isolation cock
switches CLOSED

CAU bypass (Mk. 1A) . IN

(ii) After the entrance door has been closed, check or set:

Emergency decompression
switch NORMAL, safety lock engaged

Dump valve control . . Up

(iii) After the engines have been started set:

Engine bleed isolation cocks OPEN (these selectors also control
the supply of air to the anti-
icing and bomb-bay heating
systems and should normally be
left on at all times during flight)

◀ *Pre-Mods. 2548 and 2802B & C
these cocks must remain closed
until above 20,000 feet in the
climb, unless a lower rate of
climb is acceptable in which case
air conditioning may be achieved
below 20,000 feet by restricting
one engine to 85% RPM with its
bleed isolation cock open.* ▶

(b) *Before take-off*

DV windows Closed

Ram air valve CLOSE

(c) *After take-off*

Cabin air isolation switches OPEN (one during the two
thousand feet checks, the second
during the ten thousand feet
checks)

Cabin Temp. master switch AUTO at ten thousand feet

Cold air unit bypass switch
(Mk. 1A aircraft only) . OUT (it should only be switched
IN if the cabin temperature
becomes excessively hot)

◀ (d) *Descent*

Pre-Mods. 2548 and 2802B & C no engine is to exceed 85% RPM
when descending below 20,000 feet unless the associated engine
bleed isolation cock has first been closed.

(e) *Low flying*

Pre-Mods. 2548 and 2802B & C, to provide cabin air conditioning
for low level flying it is recommended that one engine is restricted
to 85% RPM and its bleed isolation cock is opened. The other three
engines can be used normally, but if the fourth engine has to be
accelerated above 85% RPM the bleed cock must first be closed. ▶

(f) *Before landing (Mk. 1A aircraft only)*

Cold air unit bypass switch IN

NOTE: When the temperature control valve indicator needle has stabilised,
the temperature setting switch may be used to adjust the cabin temperature.
Movement of the control before the needle has stabilised will not assist in
establishing the desired condition.

10 Control of cabin temperature

(a) Normally the temperature control switch should be at AUTO
and the temperature adjusted by means of the setting control. If
the red OVERHEAT warning light comes on, the temperature
control valve will automatically revert to fully cool. The indication
of the light is a failure of the automatic system. All subsequent
control must then be by manual selection.

(b) Manual control is achieved by judicious use of the control switch between the COOL and WARM positions. If the amber MAX. HEAT warning light comes on, the temperature may be reduced by inching the control switch to COOL until the amber light goes out. If, when the amber light is on, further overheating occurs, the red light will come on and the system will automatically go to fully cold and remain there.

(c) Only sufficient hot air to prevent misting should be directed onto the windscreen panels. Excessive heating may cause panel de-lamination. Surplus air should be directed away from the panels by selecting the WINDSCREEN DEMISTING control lever towards BOMB AIMER OPEN, and the PILOTS' WINDSCREEN HEATING control lever towards PILOTS' FEET HEATING. It may be necessary to adjust the control settings whenever engine power settings are altered, and particularly after a prolonged descent. Particular care must be taken to avoid excessive heating of the panels whenever the anti-flash screens are fitted.

(d) During a descent the heating should be controlled to avoid transparency misting and not switched to full heat when misting occurs as this may crack the transparencies. Until Mod. 779 is embodied do not descend through cloud with fully cold selected as this may cause failure of the cold air unit. During a descent the DV panel heating should be switched on.

(e) Before descending to low level, in conditions of high humidity and temperature, the cabin should be refrigerated for about 20 minutes using the CAU.

11 Control of cabin pressure

The control switch should normally be set to either CRUISE or COMBAT. UNPRESS. should be selected if air-conditioning only is required. When the switch is set from COMBAT to CRUISE or vice versa the times taken to stabilise the new conditions are as follows:

CRUISE to COMBAT	36 seconds
COMBAT to CRUISE	5½ to 6¼ minutes

Malfunctioning of the System

12 Loss of cabin pressure

(a) (i) When operating in CRUISE conditions, a red light at the crew stations (see 2(e)) gives indication if the cabin altitude increases by more than 2,000 feet.

(ii) When operating in COMBAT conditions the red lights do not illuminate but the flood flow system is automatically brought into use, controlling cabin altitude between 26,400 and 27,000 feet.

(iii) If the flood flow system is unsuccessful in preventing cabin pressure loss, the cabin altitude will continue to increase. When it reaches an equivalent to 42,000 feet the warning horn sounds. This warning may be silenced by operation of the cut-out switch on panel AD. A descent should then be made to a cabin altitude of 30,000 feet at which height the flight may be continued.

(b) Control of the flood flow system

(i) Normally the master flood flow switch should be set at AUTO, the FLOOD and LESS AIR settings providing a MANUAL means of operating the flood flow system. When the system is in operation a magnetic indicator adjacent to the switch shows white.

(ii) To reset the system after use, or if it has operated inadvertently, set the master switch to OFF and hold up the RESET switch until the indicator shows black. Then reset the master switch to AUTO.

13 Automatic cabin depressurisation (post-Mod. 891)

When the ABANDON AIRCRAFT warning light switch on the 1st pilot's side is operated the dump valve solenoids are energised and the cabin depressurises, at the same time the flood flow circuit is rendered inoperative.

14 Emergency de-pressurisation

(a) In an emergency the cabin can be de-pressurised by any of the following selections:

1st Pilot's ABANDON AIRCRAFT switch (Post Mod. 891)	ON
1st Pilot's EMERGENCY DECOMPRES- SION switch	EMERGENCY DE- COMPRESSION
CABIN PRESSURE selector	UNPRESS

Rear crew Dump Valve operating handle . Break wire and pull
down

(b) The time taken to depressurise the cabin will vary according to the aircraft's altitude and the pressure differential selected. Above 40,000 feet and with CRUISE selected (post-Mod. 2368), at least 6 seconds should elapse between selecting depressurisation and opening the cabin door. All crew members should remain strapped in their seats until the door is open.



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