

EO 05-45B-1A

ROYAL CANADIAN AIR FORCE

**AIRCRAFT
OPERATING INSTRUCTIONS
TELECOMMUNICATIONS AND
NAVIGATION EQUIPMENT**

EXPEDITOR 3TM

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

WQD

22 JUL 64

LIST OF RCAF REVISIONS

DATE

PAGE NO

DATE

PAGE NO

FOREWORD

This Engineering Order contains information on navigation and telecommunication equipment installed - as per development Project WPB6 - on overseas Expeditor aircraft.

For descriptions and operating instructions, other than those listed herein, refer to RCAF EO 05-45B-1.

Expeditor 3TM aircraft bearing the following registration numbers only are affected: 1521, 1527, 1533 and 1566.

TABLE OF CONTENTS

TITLE	PAGE
GENERAL DESCRIPTION	1
RADIO COMPASS (AN/ARN-6)	1
AN/ARC552 TRANSCEIVER	1
BENDIX VHF RECEIVER & TRANSMITTER	1
BENDIX VOR/ILS SYSTEM	2
MARKER BEACON RECEIVER (BENDIX MN-53B)	2
INTERPHONE SYSTEM	2
ISOLATION AMPLIFIER	2
MN72 (RMI) RADIO MAGNETIC INDICATOR	3
MN97 COURSE INDICATOR	3

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Radio Equipment Location Diagram	4
2	Floating Instrument Panel	5
3	Overhead Radio Control Panel	6

GENERAL DESCRIPTION

1. The aircraft has a VHF transceiver, a Bendix VHF receiver and transmitter, a Bendix VOR/ILS system, a marker beacon receiver, a radio compass receiver, an inter-phone system and an isolation amplifier system.

2. All radio controls, with the exception of the VHF and the VOR/ILS, are located on a master control panel, see Figure 3, mounted overhead in the pilot's compartment. The VHF and the VOR/ILS controls, together with the pilot's and co-pilot's microphone selection switches, are mounted on the main instrument panel, see Figure 2.

3. The electronic units are mounted on racks in the aft fuselage compartment, see Figure 1.

4. All antennae are external. Aural reception is heard through head-phones only.

RADIO COMPASS (AN/ARN-6)

5. The radio compass is used for manually controlled or automatic radiodirection finding. Automatic direction finding is accomplished by a null-seeking, closed-servo system. When the function switch is in the COMPASS position, it receives signals on the low frequency broadcast bands, both of which are divided into two sections on the dial. On Expeditor 3TM (Special), the radio compass is operated by the pilots only.

6. Compass Function Switch - The function switch has five positions: OFF, COMP, ANT, LOOP and CONT. A spring return prevents the function switch from remaining in the CONT position.

7. Compass Tuning Meter - With the function switch on COMP station, resonance may be obtained by adjusting the tuning crank until the tuning meter indicates a maximum deflection.

8. Compass CW and VOICE Switch - Either selection may be made, depending on the type of transmitting source. Selection of CW also increases the range of the equipment to receive distant stations and facilitates accurate tuning and aural null position. The light switch controls illumination of the two compass

instruments; the tuning meter and the frequency dial. Receiver volume is adjusted by the volume knob.

9. Loop "L-R" Control - With the function switch in the loop position, the antenna may be rotated by means of the Loop L-R knob to obtain the null position. Direction and speed of loop's rotation are controlled by direction and amount of Loop L-R rotation, respectively.

NOTE

For manual operation refer to flight procedures. A low frequency audio note will be heard when the compass is taking ADF bearings. This audio note does not occur in the Ant or Loop modes of operation.

10. The radio compass relative bearing is registered on the MN72 indicator, narrow needle along with other VOR/magnetic heading information, refer paragraph 27.

AN/ARC552 TRANSCEIVER

11. This equipment is designed to provide two-way AM radio-telephone communication in the frequency range of 225.0 Mc. to 399.9 Mc. Complete control over the operation of the transceiver is maintained by a remote control unit, mounted on the master control panel. This control provides adjustment of the radio set for operation of any one of the 1750 available channels, plus the guard channel within the specified frequency range.

BENDIX UHF RECEIVER & TRANSMITTER

12. The Bendix RA-21A VHF Receiver is a triple-conversion, superheterodyne receiver, operating in the frequency range from 108.0 to 135.95 Mc. with 560 channels spaced 50 Kc. apart.

13. The Bendix TA-21A VHF Transmitter is a lightweight airborne communication transmitter, designed to provide crystal controlled operation on 360 channels, spaced 50 Kc. apart, in the 118.00 to 135.95 Mc. frequency range.

14. Both, the receiver and the transmitter, are remotely controlled by a single control panel located on the main instrument panel.

BENDIX VOR/ILS SYSTEM

15 Bendix Type GSA-8A Receiver is an airborne UHF receiver designed to receive glide slope transmission within the frequency range of 329.3 to 335.0 Mc. and to provide vertical guidance to the pilot during landing operation. This receiver is used in conjunction with the RA-21A and NVA-21A communication-navigation combination to provide lateral guidance and thus complete the navigation system.

16 Bendix Type NVA-21 Navigation Unit is a fully transistorized airborne navigation unit designed to be used with the Bendix type RA-21A receiver to provide complete VOR/LOC information. Course information so derived is supplied to the pilot by means of a MN-72 radio magnetic indicator installed on the main instrument panel. Visual indication includes:

- (a) The Bearing to a selected VOR station.
- (b) The lateral deviation from a selected VOR station radial.
- (c) The lateral deviation from a tone localizer (LOC) path to an airport runway.
- (d) Aircraft magnetic bearing.

17 The RA-21A VHF receiver, when tuned to selected channels in the 108.0 to 117.9 MC. band, furnishes the necessary radio frequency and radio links for the NVA-21 navigation unit, which then provides the following facilities:

- (a) Manual OMNI range.
- (b) Automatic OMNI range.
- (c) 90/150 cycle tone localizer operation.

NOTE

These are displayed to the pilot by means of a MN-97 course indicator mounted on the instrument panel.

Voice identification signals are obtained directly from the companion receiver.

18 Bendix RA-21A VHF Receiver is a light-weight, airborne, VHF receiver designed to

provide reception on 560 crystal controlled communications, VOR, and ILS localizer channels, spaced 50 Kc. apart over the 108.00 to 135.95 Mc. range. This receiver is designed to operate in conjunction with the Bendix NVA-21A navigation unit to comprise a navigation system.

19 The Bendix VOR-ILS System is remotely controlled by a single control panel mounted on the main instrument panel.

**MARKER BEACON RECEIVER
(BENDIX MN-53B)**

20 The function of the marker beacon system is to detect either the cone (Z) beacons on the airways, fan markers or the landing field approach beacons. The system may be controlled by either the pilot or the co-pilot. Reception is possible to the surface ceiling of the aircraft.

21 The marker beacon receiver is preset to receive a 75 Mc. modulated signal. Power to the receiver is controlled by a selector switch in the marker control unit marked OFF, LOW sensitivity and HIGH sensitivity. Selection of HIGH sensitivity in effect increases the area of reception of the beacon. The indicator lights mounted vertically in the centre of the main instrument panel illuminate upon detection of their appropriate beacon (Blue OUTER, White AIRWAY and Amber INNER).

22 The audio portion of the beacon can be selected by either the pilot's or co-pilot's audio switches. The audio level is adjusted by the volume controls provided in the marker control unit and the audio panels.

INTERPHONE SYSTEM

23 An interphone system controlled by the intercom ON/OFF switch and volume control located on the interphone control panel (mounted on the overhead control console) and a pilot, co-pilot mike selector switch (mounted on the instrument panel) facilitates communication between the pilot and co-pilot.

ISOLATION AMPLIFIER

24 The ISO-AMP/ON-OFF switch is located on the interphone control panel. This switch turns on the isolation amplifier which

in conjunction with the individual audio and mike selection switches, permits the pilot and co-pilot to select separately any desired combination of receivers and transmitters. The ON/OFF switch should be selected ON, whenever any of the radio equipment is to be used.

25 As an example, it would be possible for the co-pilot to receive radio compass and marker audio while the pilot is receiving and transmitting on VHF.

26 If audio malfunctions are experienced, it may be necessary to turn OFF the isolation amplifier so that the radio equipment may be operated individually.

MN-72 (RMI) RADIO MAGNETIC INDICATOR

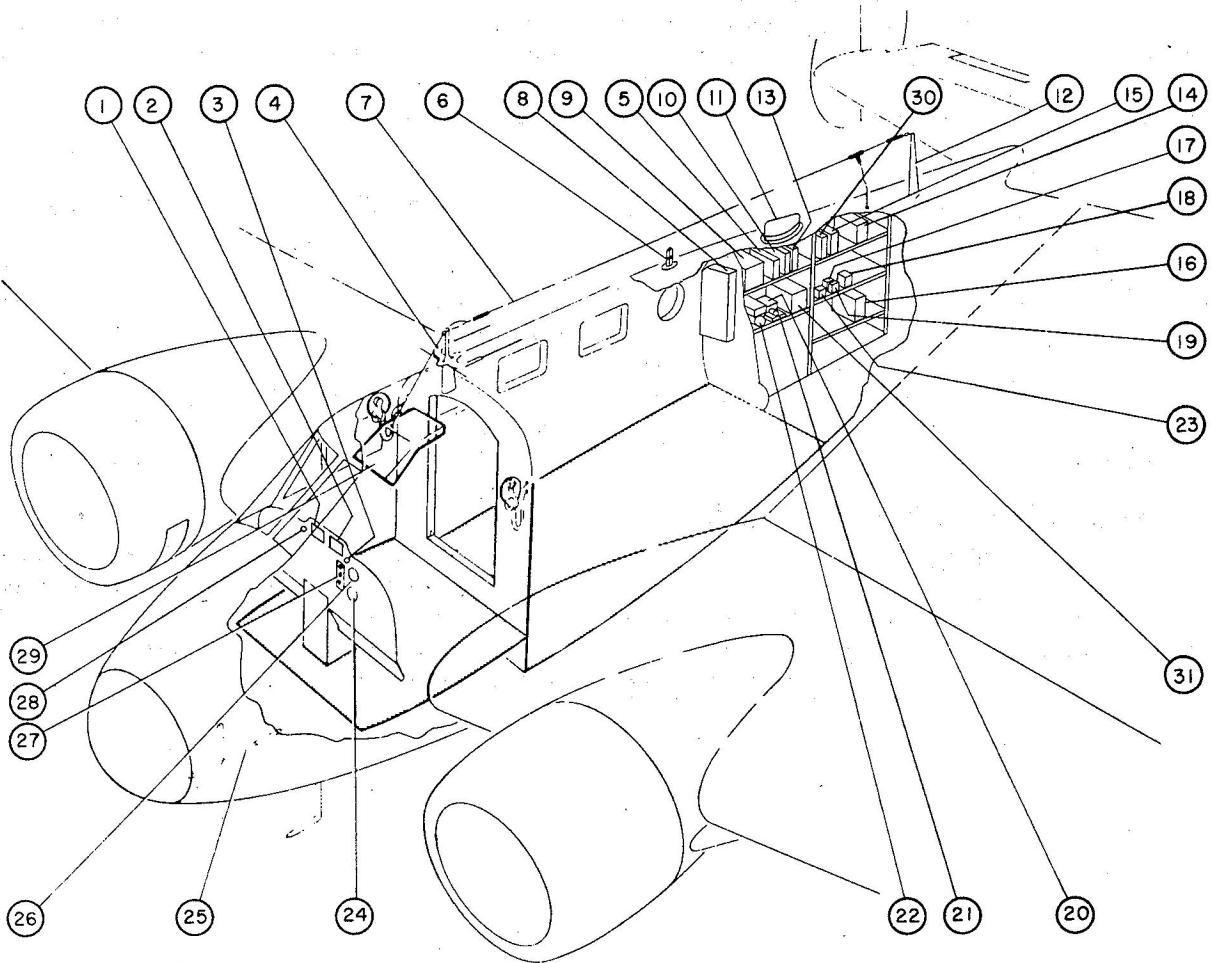
27 This provides two independent needles driven by standard synchro receivers which are used to present ADF and VOR operations

to the pilot. The needles are read against a rotating card which is servoed to the aircraft C2 gyrosyn compass so that the aircraft's magnetic heading is always indicated at the top of the dial opposite the upper fiducial marker, see Figures 1 and 2.

MN97 COURSE INDICATOR

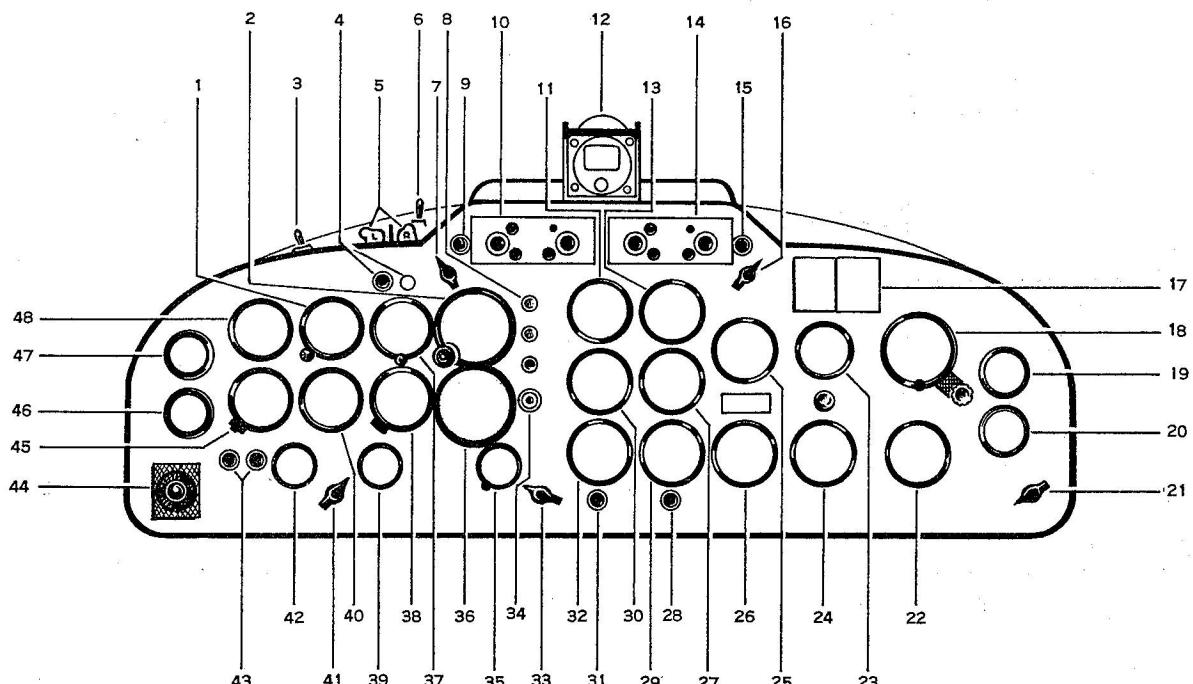
28 This instrument contains an OMNI-bearing selector, a cross-pointer indicator, warning flags, an ambiguity (TO-FROM) indicator and a relative heading pointer which assists in determining the proper drift correction required to remain on course. The indicator marker light is inoperative, see Figures 1 and 2.

29 For practical applications, interpretations and proper operational procedures involving the MN72 (ID-250/ARN) and MN97 (ID-249/ARN) indicators, refer to EO 35AA-10ARN14-1.



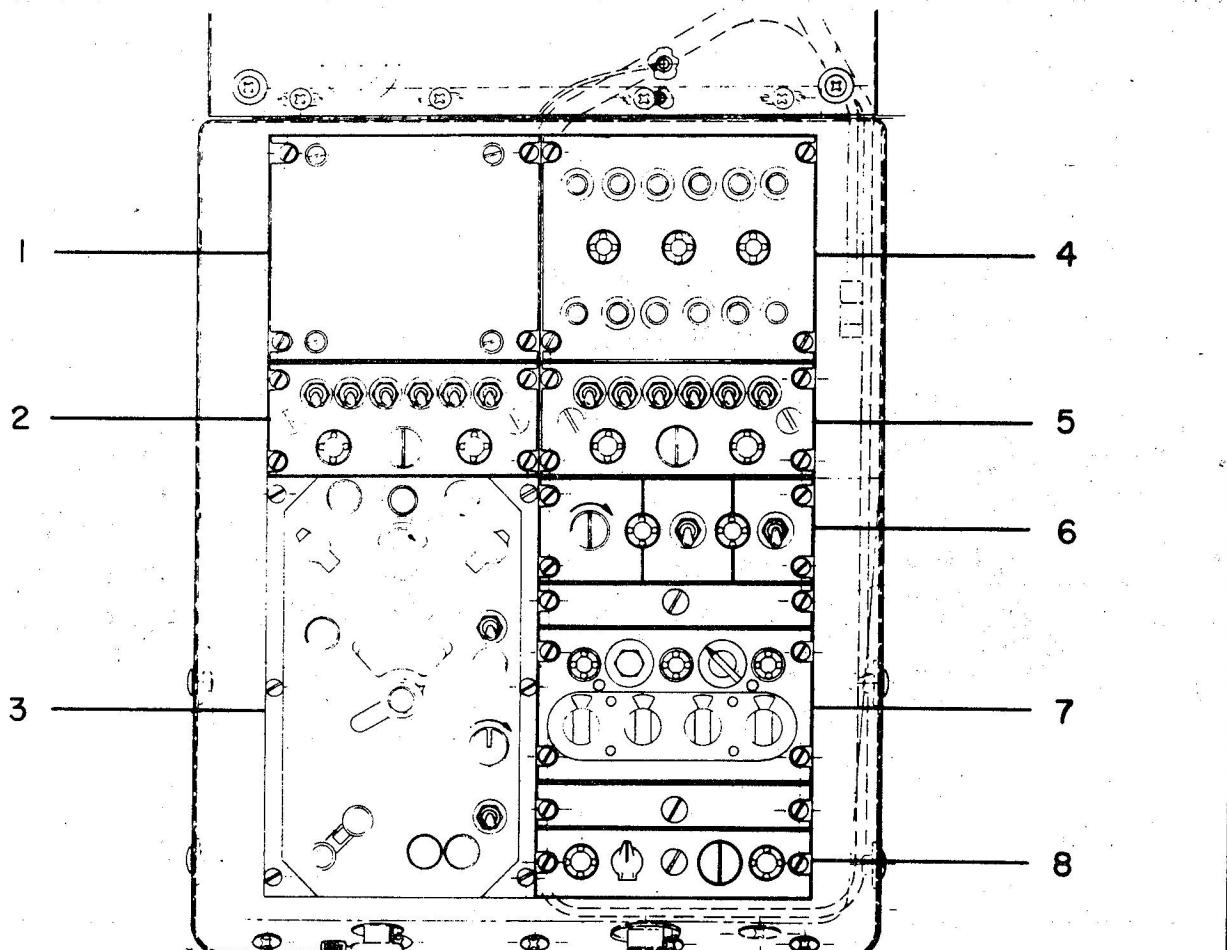
- | | |
|--------------------------------------|--|
| 1 VOR / ILS CONTROL PANEL | 16 MN53B MARKER BEACON RECEIVER |
| 2 BENDIX VHF CONTROL PANEL | 17 VOR/ILS POWER RELAY |
| 3 PILOT'S MIC SWITCH | 18 UHF TRANSFORMER |
| 4 VOR/ILS DI-POLE ANTENNA | 19 VHF POWER RELAY |
| 5 GSA-8A GLIDE SLOPE RECEIVER | 20 INTERPHONE AMPLIFIER BC-347 |
| 6 AT-256/ARC ANTENNA MAST | 21 DYNAMOTOR PE-86 |
| 7 RADIO COMPASS SENSE ANTENNA | 22 F-20-4 INVERTER |
| 8 RADIO JUNCTION BOX | 23 VOR/ILS TRANSFORMER |
| 9 RIOIA/ARN-6 RADIO COMPASS RECEIVER | 24 MN-72 VOR/ILS INDICATOR |
| 10 RA-21A VOR/ILS RECEIVER | 25 MARKER ANTENNA |
| 11 AS313/ARN-6 RADIO COMPASS LOOP | 26 MN-97 VOR/ILS INDICATOR |
| 12 BENDIX VHF ANTENNA MAST | 27 MARKER INDICATOR LIGHTS |
| 13 NVA-21A NAVIGATION UNIT | 28 CO-PILOT'S MIC. SWITCH |
| 14 ISOLATION AMPLIFIER OA-5002/ARR | 29 PILOTS OVERHEAD RADIO CONTROL PANEL |
| 15 TA-21A VHF TRANSMITTER | 30 RA-21A VHF RECEIVER |
| | 31 RT-50II/ARC-552 TRANSCEIVER |

Figure 1 Radio Equipment Location Diagram



- | | |
|---|---|
| 1. GYROSYN COMPASS | 25. AIRSPEED INDICATOR |
| 2. MN-97 VOR/ILS INDICATOR | 26. ALTIMETER |
| 3. SUMMER/WINTER FEATHERING DILUTION SWITCH | 27. ENGINE GAUGE UNIT |
| 4. GYRO HORIZON ERECTION SWITCH AND INDICATOR LIGHT | 28. GENERATOR FAILURE WARNING LIGHT |
| 5. PROPELLER FEATHERING BUTTONS | 29. CARBURETTOR MIXTURE TEMPERATURE GAUGE |
| 6. PROPELLER FEATHERING CIRCUIT BREAKER | 30. ENGINE GAUGE UNIT |
| 7. PILOT'S MIKE SWITCH | 31. GENERATOR FAILURE WARNING LIGHT |
| 8. MARKER BEACON LIGHTS | 32. CYLINDER HEAD TEMPERATURE GAUGE |
| 9. FUEL PRESSURE WARNING LIGHT | 33. INSTRUMENT LIGHT SWITCH |
| 10. BENDIX VHF CONTROL PANEL | 34. HORN SILENCER BUTTON |
| 11. RPM INDICATOR (TACHOMETERS) | 35. CLOCK |
| 12. B-21 COMPASS | 36. MN-72 VOR/ILS INDICATOR |
| 13. MANIFOLD PRESSURE GAUGE | 37. GYRO HORIZON INDICATOR |
| 14. VOR/ILS CONTROL PANEL | 38. RATE OF CLIMB INDICATOR |
| 15. FUEL PRESSURE WARNING LIGHT | 39. FLAP POSITION INDICATOR |
| 16. CO-PILOT'S MIKE SWITCH | 40. TURN AND BANK INDICATOR |
| 17. COMPASS CORRECTION CARD HOLDERS | 41. INSTRUMENT LIGHT SWITCH |
| 18. GYRO HORIZON INDICATOR | 42. ELEVATOR TAB POSITION INDICATOR |
| 19. SUCTION GAUGE | 43. FIRE DETECTION WARNING LIGHTS |
| 20. DE-ICING PRESSURE GAUGE | 44. FUEL GAUGE SELECTOR SWITCH |
| 21. INSTRUMENT LIGHT SWITCH | 45. ALTIMETER |
| 22. RATE OF CLIMB INDICATOR | 46. FUEL QUANTITY GAUGE |
| 23. DIRECTIONAL GYRO INDICATOR | 47. OUTSIDE AIR TEMPERATURE GAUGE |
| 24. TURN AND BANK INDICATOR | 48. AIRSPEED INDICATOR |

Figure 2 Floating Instrument Panel



- 1 MIKE RELAY PANEL
- 2 PILOTS AUDIO SWITCH PANEL
- 3 AN/ARN-6 RADIO COMPASS CONTROL
- 4 CIRCUIT BREAKER PANEL
- 5 CO-PILOTS AUDIO SWITCH PANEL
- 6 INTERCOM.-ISO. AMPL. CONTROL
- 7 AN/ARC-552 UHF CONTROL
- 8 MARKER CONTROL

Figure 3 Overhead Radio Control Panel