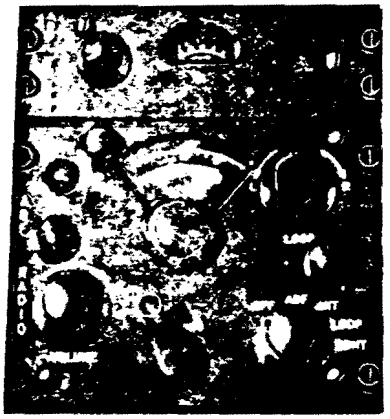
transmission are upper side band (USB), lower side band (LSB) and AM. The remote control panel, located on the radio control pedestal, provides the operator remote selection of any one of the 28,000 frequencies. 28-volt dc and 115-volt ac single-phase from the secondary busses operate the liaison set. To put the liaison radio transceiver into operation:

a. Place the rotary selector switch on the liaison radio control panel at the desired mode of operation.
b. Allow approximately one minute for warmup.
c. Select the desired channel frequency.
d. Trigger the microphone to tune the transmitter.
e. To receive, place the interphone mixer switch in the ON (UP) position.
f. To transmit, place the interphone transmission switch in the appropriate position.

To turn the liaison set off:

g. Turn the function selector switch to OFF.

RADIO COMPASS AN/ARN-6.



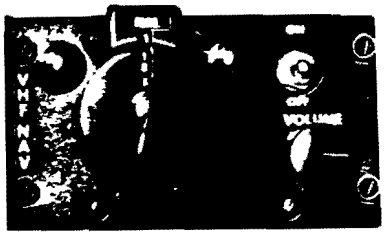
The radio compass is a navigational radio receiver, designed to operate in the 100-1750 kilocycle range of frequencies. Power for the operation of the receiver is supplied by the 28-volt dc primary bus.

Dual Radio Compass Installation (Some Aircraft).

On some aircraft, two radio compasses are installed with an independent control panel for each on the pedestal in the crew compartment. On aircraft which incorporate a common tuning meter, a two-position toggle switch is provided to select either No. 1 or No. 2 ADF for tuning purposes. (See figure 4-12.)

a. Position the tuning meter selector switch (if applicable).
b. Turn function switch to ANT.
c. Turn VOICE/CW switch to VOICE.
d. Select the frequency band.
e. Tune to desired frequency for best audible signal.
f. Identify the station.
g. Turn the function switch to COMP position.
h. Retune for maximum needle deflection on the tuning meter.

VOR/ILS RECEIVER AN/ARN-14.



The VOR set is a VHF navigational receiver designed to operate in the 108.0 to 135.9 megacycle range of frequencies. Remote operation of the receiver is provided for the pilot or copilot by the VOR control panel (figure 4-12) on the pedestal. On aircraft with a single radio compass installed, the magnetic bearing of the VOR station from the aircraft may be read directly from the No. 2 bearing pointer of the pilot's or copilot's radio magnetic indicators (figures 1-58 and 1-59). On some aircraft with a dual radio compass installation, the bearing of the VOR station is indicated by the No. 2 bearing pointer of the pilot's radio magnetic indicator. In addition, the pilot's course indicator (figure 1-58) may be used to read magnetic bearing either TO or FROM the station by turning the SET knob, in the lower left corner of the instrument, until the course deviation indicator is centered. The power supply for the VOR equipment is 28-volt dc supplied by the secondary bus.

a. To start the equipment, turn the power switch ON.
b. Place rotary selector switch on NAV MODE SEL panel to VOR/ILS position.
c. Turn the frequency selector knobs to the desired frequency.
d. Identify the station.
e. To stop the equipment, turn the power switch OFF.

INSTRUMENT SELECT SWITCH.

On aircraft equipped with a TACAN set, an instrument select switch (figure 4-12) is installed on the radio control panel. In the TACAN position, TACAN course information is displayed on the course indicator

and magnetic bearing to the TACAN station is indicated by the No. 2 bearing pointers of the pilot's and copilot's RMIs or No. 2 bearing pointer of the pilot's RMI (dual radio compass installation). In the VOR/ILS position, VOR or localizer course information is displayed on the course indicator and magnetic bearing to the VOR station is indicated by the No. 2 bearing pointers of the pilot's and copilot's RMIs (single radio compass installation) or the No. 2 bearing pointer of the pilot's RMI (dual radio compass installation). When a localizer frequency is selected, the bearing pointer that normally indicates VOR bearing will be inoperative. The instrument select switch receives operating power through the 5-amp circuit breaker placarded, OMNI-RANGE and IFF TEST DC, located on the overhead panel.

TALAR AN/ARN-97

TALAR Radio Receiving Set AN/ARN-97 consists of two major pieces of electrical equipment, a receiver and an electronic control amplifier (ECA). The TALAR receiving set is an airborne landing approach aid, which provides an accurate means of guiding aircraft on an instrument approach under all weather conditions. The receiver accepts unidirectional steering signals from a ground based transmitter and the ECA processes these signals and converts them into steering information capable of being displayed on the pilot's course indicator. The TALAR radio receiving set consists of the receiver and the ECA. Power is provided by the TALAR circuit breaker of the dc secondary bus. However, it is operated by the navigation mode selector panel, which also actuates other navigational equipment. In addition, it makes use of the pilot's course indicator. This indicator, while not part of the TALAR radio receiving set, is required for information display. The TALAR circuit breaker is located on the pilot's overhead panel (figure 1-22). This circuit breaker supplies the TALAR system with the required 28 vdc operating voltage.

TALAR Radio Receiver.

The TALAR radio receiver (hereinafter referred to as the receiver) is located in the nose of the aircraft, between fuselage stations 10 and 20. It is installed so as to present a forward-looking antenna aperature whose boresight is aligned with the longitudinal axis of the aircraft. The receiver contains the antenna, associated waveguide, amplification, detection, and automatic gain control (AGC) circuitry that receive the coded steering signals from the ground-based transmitter, and convert them to signals that can drive the electronic control amplifier (ECA). The antenna is mounted on top of the receiver. It is a waveguide horn type with a beamwidth of 36 degrees vertical x 130 degrees horizontal (3 db). The unidirectional steering signals accepted by the receiver consist of four timed-shared microwave beams transmitted at a carrier frequency of 15.5 GHz. Each beam is identified by the pulse repetition frequency of the carrier. One pair of beams provides glide slope (up-down) information. Its (up-down) beams are modulated at 191.2 KHz and 192.8 KHz, respectively. The other pair of beams provides localizer (left-right) information. Its left-right beams are modulated at 206.2 and 207.8 KHz, respectively.

Electronic Control Amplifier.

The electronic control amplifier (ECA) is secured to the amplifier mounting plate of the radio compartment. The ECA contains the electronic circuits that process the outputs from the receiver and converts them into appropriate signals to drive the indicator needles and their warning flags (of the course indicator). These warning flags serve as confidence check on the needle information, indicating whether sufficient signal levels are available to drive the indicator needles properly.

Normal TALAR System Operation.

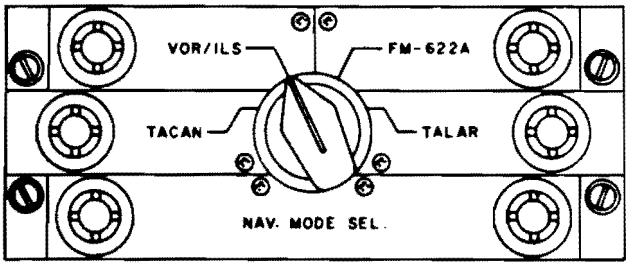
The TALAR system operation is controlled by either the pilot or copilot by means of the NAV. MODE SEL. switch on the navigation mode selector panel (of the radio control panel. Placing this switch to the TALAR position (with the TALAR circuit breaker energized) activates the TALAR System (see NAV MODE SEL PANEL under TACAN paragraph).

When the aircraft is beyond the effective TALAR operating range (10 nautical miles in 10 mm rainfall per hour to 28 nautical miles in clear weather), set the NAV. MODE SEL. switch (on the navigation mode selector panel) to the TALAR position. The glide slope warning flag and course (localizer) warning flag of the course indicator should both be visible, indicating that the TALAR receiver is not receiving a signal of sufficient strength to give a reliable indication on the course indicator. When the aircraft is on the approach path to the landing site and the TALAR receiver detects the TALAR transmitter beam, the bank steering bar and pitch steering bar of the course indicator displays the aircraft's relative position in azimuth and glide slope, with respect to the beam boresight. The bank steering bar indicates the azimuth beam (referred to as the localizer), and the pitch steering bar indicates the glide slope beam. If the aircraft is to the right or left of the transmitter localizer beam boresight, the bank steering bar will deflect to the corresponding side. If the aircraft is then banked in the direction of the steering bar, the steering bar will move toward center. If the aircraft is up or down from the transmitter glide slope beam boresight, the pitch steering bar will deflect to the corresponding side. If the aircraft is then flown in the direction of the pitch steering bar, the pitch steering bar will move toward center. By flying the aircraft, so as to maintain a centered pitch steering bar and a bank steering bar, the aircraft will be flown directly on the transmitter beam boresight.

TACAN—VOR/ILS Selector Circuit Failure (Aircraft not modified according to T.O. 1C-123-566C).

When both the AN/ARN-14 (VOR) and the AN/ARN-21 (TACAN) equipment are turned on, with the selector switch on VOR/ILS, a serious flight hazard may result if power to the TACAN-VOR/ILS selector circuit fails. The selector circuit of the aircraft with both VOR and TACAN receives operating power through the 5-ampere circuit breaker placarded OMNI-RANGE AND IFF TEST DC, located on the overhead panel. If power to the TACAN-VOR/ILS selector switch fails, TACAN will be automatically selected. The course indicator and the radio magnetic indicator which previously indicated course to a selected VOR station, will then indicate course of selected TACAN station. This condition will be indicated by both TACAN and VOR/ILS indicator lights on the pedestal going out. However, there will be no course warning flag on the course indicator to indicate VOR failure.

NAV MODE SEL PANEL. (Aircraft modified by T.O. 1C-123-589).



The NAV MODE SEL panel (figure 4-12) installed in the center pedestal controls system selection for the ID-249, course indicator. Provisions are made for selection of TACAN, VOR/ILS, FM-622A and TALAR. Selection is made by merely placing the rotary selector switch to the desired position. The course indicator will then accept signals from the chosen system only. The NAV MODE SEL panel is energized whenever 28-volt dc power is applied to the aircraft. Circuit breakers are located on the overhead circuit breaker panel for individual system failure involving the NAV MODE SEL panel.

COURSE INDICATOR.

The course indicator (ID-249) located on the pilot's instrument panel (figure 1-58) is a combination instrument requiring several inputs for operation. The course setting, presented in a window at the top of the instrument, is manually controlled by a course SET knob. The selected equipment, VOR/ILS localizer, TACAN and FM-622A Homing or TALAR (if applicable), operates the course deviation indicator (CDI) and TO-FROM indication of the course indicator. During TALAR system operation, the course indicator provides a cross-pointer reading. The vertical bar of the cross pointer is positioned by localizer signals, and indicates any right or left deviation from the course set by the ground-based transmitter. The horizontal bar of the cross pointer is positioned by the glide-path course. A flag arm (labeled OFF) appears across either or both the horizontal and vertical bars, whenever the transmitted signal level drops to a point at which the indication of the associated bar is deemed unreliable. For detailed description and operation of the course indicator, refer to AFM 51-37, INSTRUMENT FLYING.

GLIDE SLOPE EQUIPMENT AN/ARN-31 (Some Aircraft).

The twenty-channel glide slope receiver R626/ARN-31 provides information as to the aircraft position above or below a ground station glide slope beam for operation of the glide slope indicator of the course indicator. The equipment operates in the frequency range 329.3 to 335.0 megacycles and is controlled simultaneously with the localizer section of the VOR set. The unit, located in the radio compartment, is supplied 115-volt single-phase ac from the secondary bus.

Note

The glide slope indicator is inoperative when TACAN equipment is operating the course deviation indicator of the course indicator.

RADIO ALTIMETER

AN/APN-22

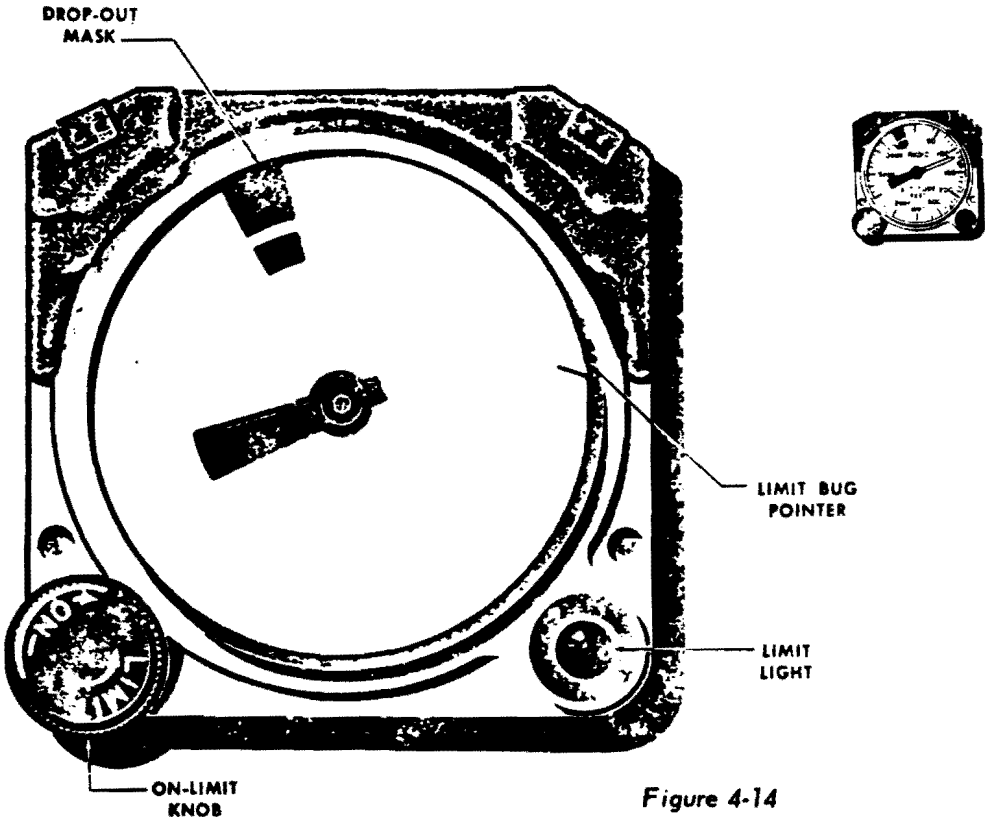


Figure 4-14

17764

RADIO ALTIMETER AN/APN-22.

Radio altimeter AN/APN-22 is provided to measure the terrain clearance of the aircraft. During operation it provides an accurate altitude indication up to 20,000 feet. However, do not rely on the AN/APN-22 indication when flying over areas covered by large depths of snow and ice such as the polar regions. AN/APN-22 indication is unreliable under these conditions. Radio and radar waves can penetrate the surface of snow and ice fields and therefore indicate greater terrain clearance than actually exists. An apparent terrain clearance of 1600 feet greater than actual clearance has been recorded. This penetration phenomena is a function of such variables as frequency, density, moisture content, etc. Lower frequency radio waves (such as produced by the SCR-718) have a higher penetration strength than high frequency radar waves (which are produced by the AN/APN-22). Power for the operation of the equipment is supplied by the secondary 28-volt dc bus and the 115-volt single-phase ac bus. Operating control is provided by a single control knob at the base of the instrument. Refer to figure 4-14.

a. To turn on, the control knob is rotated clockwise as indicated by the arrow.

CAUTION

Allow at least 12 minutes warm-up time after starting the equipment to insure final accuracy. If the temperature is below -40°C, 25 minutes should be allowed.

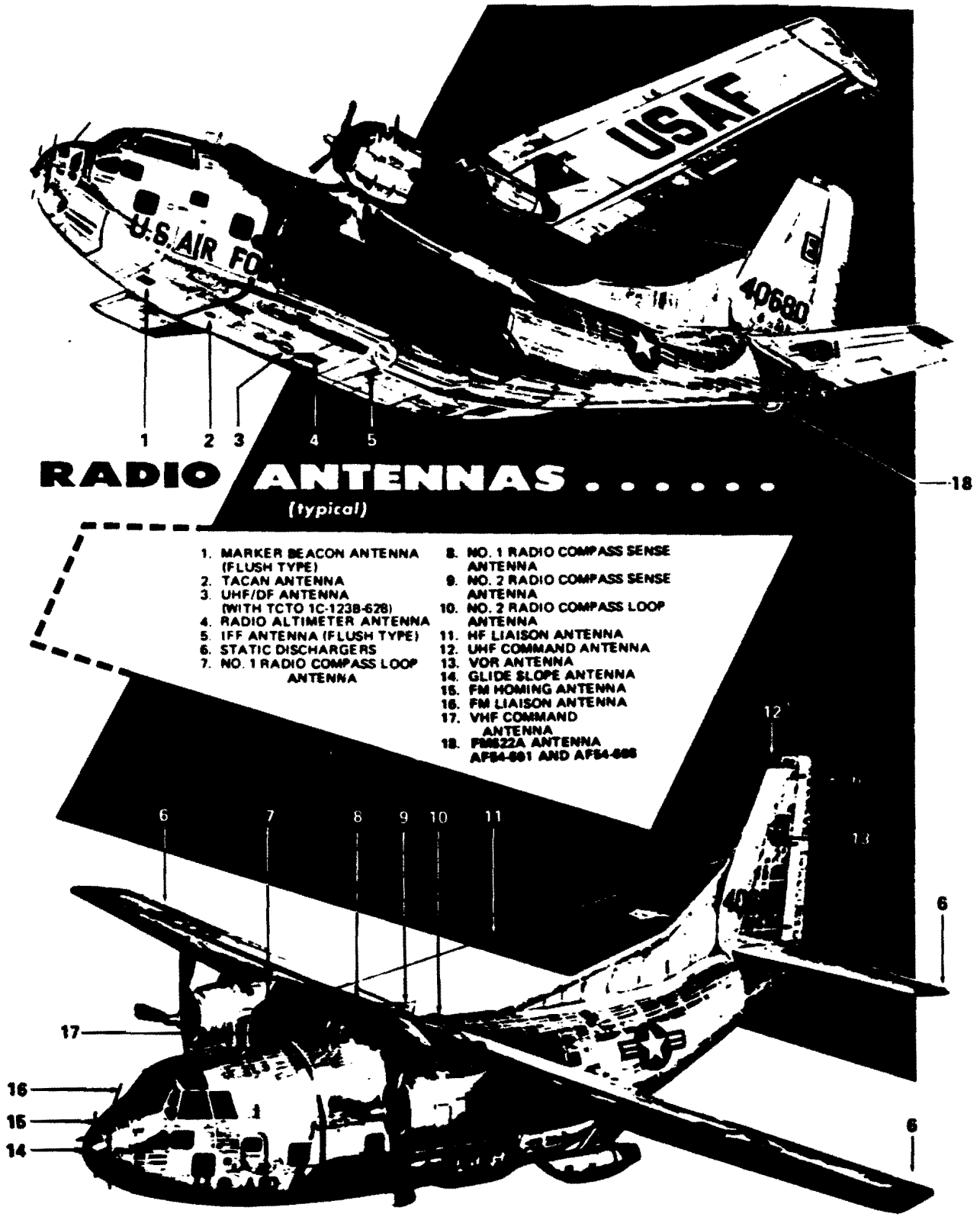

RADIO ANTENNAS . . . . . .
(typical)
1. MARKER BEACON ANTENNA (FLUSH TYPE)
2. TACAN ANTENNA
3. UHF/DF ANTENNA (WITH TCTO 1C-123B-628)
4. RADIO ALTIMETER ANTENNA
5. IFF ANTENNA (FLUSH TYPE)
6. STATIC DISCHARGERS
7. NO. 1 RADIO COMPASS LOOP ANTENNA
8. NO. 1 RADIO COMPASS SENSE ANTENNA
9. NO. 2 RADIO COMPASS SENSE ANTENNA
10. NO. 2 RADIO COMPASS LOOP ANTENNA
11. HF LIAISON ANTENNA
12. UHF COMMAND ANTENNA
13. VOR ANTENNA
14. GLIDE SLOPE ANTENNA
15. FM HOMING ANTENNA
16. FM LIAISON ANTENNA
17. VHF COMMAND ANTENNA
18. FRM22A ANTENNA AF54-691 AND AF54-696
USAF
40680

Figure 4-15

b. Further rotation of the control knob adjusts a small movable bug pointer, located just outside the calibrated dial, to the desired flight altitude.

c. The altitude of the aircraft may then be easily maintained by observing the position of the pointer with respect to the bug pointer without constantly observing the actual scale calibrations. In addition, when flying at or below the selected altitude, warning is provided by a red light which is then energized, illuminating the face of the dial and the pointer. At any time during unreliable operation, the pointer of the instrument will assume an off-scale position between the 20,000-foot and 0 points behind a blacked-out area of the dial. This is done to provide the pilot with a warning of unreliable operation and to prevent him from following an inaccurate altitude indication.

d. To turn equipment off, turn the single control at the base of the instrument counterclockwise.

RADAR ALTIMETER SYSTEM AN/APN-150 (Some Aircraft AF54-691 and 54-698).

The radar altimeter provides a continuous visual indication of the height of the aircraft above ground in hundreds of feet. The system provides altitude readings from 0 to 40 feet with ± 2 feet accuracy. In altitudes from 40 to 5,000 feet the accuracy is ± 5 percent. The system consists of a transmitter, receiver, electronic control amplifier, and height indicator. Power for operation is 115-volt, 400-Hz ac and 28-volt dc supplied through the RADAR ALT 115 VACOA and 28VDC circuit breakers on the flight deck overhead circuit breaker side panel.

Transmitter T-853/APN-150(V).

The transmitter provides the RF energy source radiated by the antenna. In addition to generating RF energy it provides the receiver with a portion of the transmitted energy for use as a local oscillator signal, and provides the electronic control amplifier with a signal for mode centering purposes.

Receiver R-1085/APN-150(V).

The receiver is used to detect the reflected RF energy radiated by the antenna. This signal is mixed with the set modulator oscillator signal, applied directly from the transmitter, to form the intermediate frequency signal. The receiver amplifies the intermediate frequency signal and applies it to the electronic control amplifier.

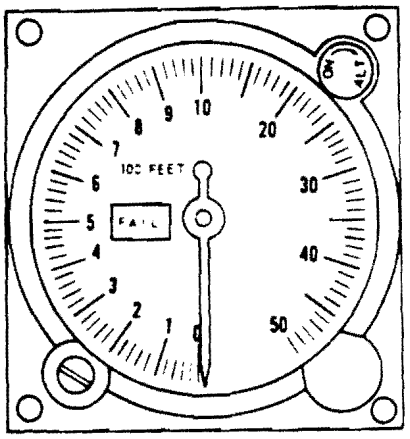
Electronic Control Amplifier AM-3063/APN-150(V).

The electronic control amplifier supplies the operating voltages for the radar altimeter and processes the RF energy into usable data. The altitude data is converted into a form suitable for display on the height indicator.

Height Indicator ID-950/APN-150(V).

The height indicator displays the aircraft altitude in feet. One indicator is located in the pilot's instrument panel. An ON-ALT control is on the upper right corner of the front panel of the indicator. A zero adjustment potentiometer is located on the lower left corner of the front of the indicator. A failure flag indicator FAIL-ON, viewed through a front panel window, presents the system reliability. Interruption of power to the flag indicator circuitry will display the FAIL portion of the flag in the window. Clockwise

rotation of the ON-ALT control energizes the power switching relays in the electronic control amplifier. Further clockwise rotation of the ON-ALT control mechanically positions the low altitude limit cursor on the dial face of the indicator.



TACAN SET AN/ARN-21 (Some Aircraft).

The TACAN set is a tactial air navigational system which provides cockpit displays of range and bearing to the TACAN facility. Transmission and reception are line-of-sight with range information limited to 195 nautical miles by the range indicator (figure 1-58). The control panel (figure 4-12) provides an OFF-REC-T/R switch, two knobs for selecting the desired channel, and a volume control. Turning the control switch to the T/R or REC position turns the equipment on. If the control switch is placed in the REC position, bearing information only will be presented; in the T/R position, both range and bearing information will be presented. A TACAN-VOR/ILS switch (figure 4-12) permits either TACAN or VOR/ILS to energize the CDI of the course indicator. Also, it permits either TACAN or VOR to energize the No. 2 bearing pointer of the pilot's and copilot's radio magnetic indicator (single compass installation) or No. 2 bearing pointer of the pilot's radio magnetic indicator (dual compass installation). Power for operation of the TACAN equipment is supplied from the secondary 28-volt dc bus and 115-volt single-phase ac bus.

To operate the equipment, proceed as follows:

a. Turn the control switch to the REC or T/R position.

CAUTION

Do not select a channel higher than 126. Equipment damage will result.

b. Select the desired channel.

c. Identify the station. TACAN identification is by code only and transmits approximately each 35-seconds.

d. Adjust the volume for continuous monitor of station operation.

e. Turn the control switch to the T/R position. (if desired).

Note

Refer to TACAN-VOR/ILS Selector Circuit Failure.

Occasionally TACAN equipment will "lock-on" to a false bearing which will be 40 degrees or a multiple of 40 degrees in error. These errors can be on either side of the correct bearing. When the TACAN "lock-on" a false bearing, switching to anotner channel and then back to the desired channel, or turning the set off and then back on will recycle the search mode. This will usually result in a correct "lock-on". This deficiency does not affect the range indications provided by TACAN equipment.

a. When using TACAN, cross check for false "lock-on" with ground radar, airborne radar, VOR, dead reckoning or other available means. These cross checks are especially important when switching channels or when turning set on.

b. If a false "lock-on" is suspected, switch to another channel, check it for correct bearing and then switch back to the desired channel.

c. Check for correct "lock-on."

d. If false "lock-on" is still suspected, turn set off and then on.

e. Recheck for correct "lock-on."

f. If false "lock-on" persists, utilize the other equipment or aids available.

TACAN SET AN/ARN-118(V).
(AIRCRAFT MODIFIED BY TO 1C-123K-544)

The TACAN Navigation Set AN/ARN-118(V) is a polar coordinate navigation system that is used to determine the relative bearing and slant-rnage distance to a selected TACAN station. The selected TACAN station can be a ground, shipboard, or airborne station. The ground and shipboard TACAN stations are considered surface beacons. An airborne station only supplies slant-range distance information unless the aircraft is specially equipped with a bearing transmitter and rotating antenna.

TACAN Navigation Set AN/ARN-118(V) is not capable of transmitting bearing information but does supply slant-range distance replies when interrogated. The TACAN Navigation Set has provisions for 126 X channels and 126 Y channels. The Y channels differ from the X channels in pulse spacing. The maximum operating range of the TACAN Navigation Set is 390 NMI when the selected TACAN station is a surface beacon and 200 NMI when the selected TACAN station is an airborne beacon.

NOTE

The Y channels were developed to alleviate congestion of the X channels but have not yet been implemented in AF ground stations. Use of Y channels is encouraged in air-to-air modes.

The AN/ARN-118 TACAN navigation system is capable of providing a continuous indication of the bearing and distance of the aircraft from any selected TACAN surface beacon located within a line-of-sight distance up to 390 nautical miles. Bearing information is determined by the measurement of the phase difference between a reference bearing signal and a variable signal, both transmitted by the surface beacon. TACAN information is presented on the Bearing Indicators Number 2 pointer, Distance Indicators and Course Indicators unless UHF/DF is selected. The TACAN system is powered by 28 volts dc power and 115 volts ac power. Circuit breakers are located on ac circuit breaker panel.

TACAN CONTROLS

Controls for the TACAN systems are located on the radio control panel on pedestal (figure 4-15A). A five-position (OFF, REC, T/R, A/A REC, A/A T/R) function switch selects the mode of operation. With the function switch in the REC position, only bearing information is received; with the switch in T/R position, both bearing and range data are received. The A/A REC and A/A T/R positions of the switch are the same as the REC and T/R positions, except that the TACAN system is transmitting and receiving signals to and from a suitably equipped cooperating aircraft rather than a ground station.

NOTE

The TACAN system can receive both distance and bearing information from other suitably equipped aircraft but can only transmit distance information.

CAUTION

The channel select switch contains a built-in stop to prevent rotation past the nine (9) position on the units (one's) digit setting. Do not attempt to override the stop. Reverse direction when the stop is reached.

The channel selector tunes the equipment to any of 126 frequency channels. The volume control knob varies the volume of the audio signals received from the surface beacon and heard through the intercommunication system when the appropriate monitor button is pulled out. The manual self-test provides a test of the complete TACAN system except for the antennas.

MANUAL SELF-TEST OF TACAN SYSTEM

To initiate self-test, select a course of 180 degrees, place the function switch in the T/R position, and allow 90 seconds for warmup. Depress the test button and observe that the indicator illuminates for about one seond; and that for about seven seconds, the DME flags come into view and the bearing pointers indicate 270 degrees. For the next fifteen seconds, the flags go out of view, the DME's indicate 000.0(±0.5), the bearing pointers indicate 180 (±3) degrees, the course deviation bar centers to within ± 1/2 dot, and the TO-FROM arrow indicates TO. When the self-test is complete, all indicators return to indications displayed prior to initiation of self-test. A failure is recorded on the indicator light if the light stays on during the test; however, the test can be performed again in the REC mode. If the indicator light does not come on in the REC mode, the malfunction is isolated to the transmitter section and the bearing information is valid.

CAUTION

Bearing and/or distance indications may still be present when the TEST lamp is on. Such indications could be either partially usable or grossly inaccurate. They should be cross-checked, using every available means. Be prepared for the possibility of TACAN equipment failure if the TEST lamp illuminates.

AUTOMATIC SELF-TEST OF TACAN SYSTEM

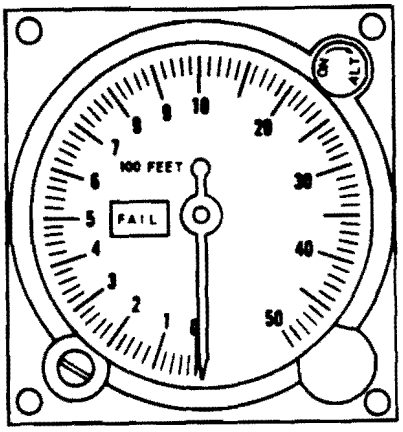
An automatic self-test occurs when the receiver signal becomes unreliable or the signal is lost, to insure that the TACAN system is operating properly. The results of the automatic self-test are the same as for the manual self-test, except that the DME flags and NAV flags remain in view.

AIR-TO-AIR MODES

A/A T/R MODE

In the A/A T/R mode, the AN/ARN-118(V) interrogates a cooperating aircraft and receives slant range distance information. If the cooperating aircraft has bearing transmitting capabilities, bearing information is also received. Up to five aircraft can receive slant range from one cooperating aircraft at one time.

rotation of the ON-ALT control energizes the power switching relays in the electronic control amplifier. Further clockwise rotation of the ON-ALT control mechanically positions the low altitude limit cursor on the dial face of the indicator.



TACAN SET AN/ARN-21 (Some Aircraft).

The TACAN set is a tactial air navigational system which provides cockpit displays of range and bearing to the TACAN facility. Transmission and reception are line-of-sight with range information limited to 195 nautical miles by the range indicator (figure 1-58). The control panel (figure 4-12) provides an OFF-REC-T/R switch, two knobs for selecting the desired channel, and a volume control. Turning the control switch to the T/R or REC position turns the equipment on. If the control switch is placed in the REC position, bearing information only will be presented; in the T/R position, both range and bearing information will be presented. A TACAN-VOR/ILS switch (figure 4-12) permits either TACAN or VOR/ILS to energize the CDI of the course indicator. Also, it permits either TACAN or VOR to energize the No. 2 bearing pointer of the pilot's and copilot's radio magnetic indicator (single compass installation) or No. 2 bearing pointer of the pilot's radio magnetic indicator (dual compass installation). Power for operation of the TACAN equipment is supplied from the secondary 28-volt dc bus and 115-volt single-phase ac bus.

To operate the equipment, proceed as follows:

a. Turn the control switch to the REC or T/R position.

CAUTION

Do not select a channel higher than 126. Equipment damage will result.

b. Select the desired channel.

c. Identify the station. TACAN identification is by code only and transmits approximately each 35-seconds.

d. Adjust the volume for continuous monitor of station operation.

e. Turn the control switch to the T/R position, (if desired).

Note

Refer to TACAN-VOR/ILS Selector Circuit Failure.

Occasionally TACAN equipment will "lock-on" to a false bearing which will be 40 degrees or a multiple of 40 degrees in error. These errors can be on either side of the correct bearing. When the TACAN "lock-on" a false bearing, switching to another channel and then back to the desired channel, or turning the set off and then back on will recycle the search mode. This will usually result in a correct "lock-on". This deficiency does not affect the range indications provided by TACAN equipment.

a. When using TACAN, cross check for false "lock-on" with ground radar, airborne radar, VOR, dead reckoning or other available means. These cross checks are especially important when switching channels or when turning set on.

b. If a false "lock-on" is suspected, switch to another channel, check it for correct bearing and then switch back to the desired channel.

c. Check for correct "lock-on."

d. If false "lock-on" is still suspected, turn set off and then on.

e. Recheck for correct "lock-on."

f. If false "lock-on" persists, utilize the other equipment or aids available.

MARKER BEACON AN/ARN-12 or AN/ARN-32.

The marker beacon set is a navigational and landing aid giving the pilot an aural or visual indication when the aircraft passes a ground marker beacon station. The receiver is tuned to a fixed frequency of 75 megacycles and receives power whenever the 28-volt primary bus is energized. An indicator light on the pilot's course indicator (figure 1-58) and a light on the copilot's side of the instrument panel (figure 1-58 or 1-59) will illuminate to indicate the presence of a marker beacon. A switch on each interphone control panel provides a means for aural reception of marker beacon signal.

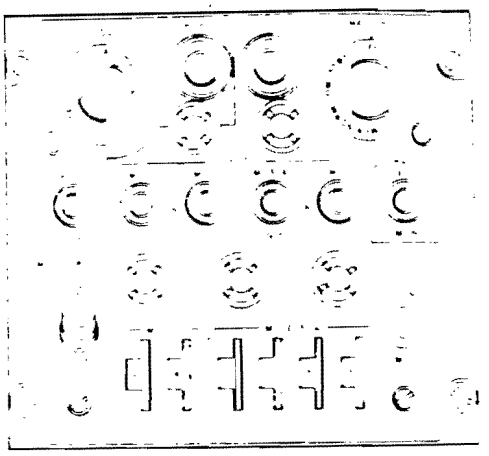
IFF TRANSPONDER SYSTEM (AN/APX-72). Aircraft modified in accordance with TCTO 1C-123-609.

The IFF (identification friend or foe) transponder system provides automatic radar identification and altitude information of the aircraft to all suitably equipped challenging ground facilities, aircraft, and surface ships within line-of-sight. Mode 1, 2, 3/A, C, or 4 interrogation signals on a frequence of 1030 ± 1.5 megahertz are received by the system and decoded. The received signals are checked for valid code and proper mode, and if the proper interrogating signal has been received, a coded reply is transmitted on 1090 ± 3.0 megahertz. In addition to these normal identification and altitude reply signals, specially coded identification of position (I P) and emergency signals may be transmitted in response to interrogating signals. The I P reply signal is used to distinguish between aircraft displaying identical coding, and the emergency reply signals indicate an emergency or distress condition of the aircraft in flight. Normal identification operation, as well as transmission of the I P emergency reply signals, is accomplished in operating modes 1, 2, and 3 A. Mode 1 provides 32 code combinations, any one of which may be selected in flight. Mode 2 provides 4,096 code combinations, only one of which is normally used in flight, since the code selection dials on the receiver-transmitter are preset before flight. Mode 3/A provides code combinations, any one of which may be selected in flight. Altitude interrogations and replies are accomplished in mode C operation. The code for mode C is determined by the altitude of the aircraft and is encoded in 100-foot increments. Mode 4 operation provides a secure (encrypted) IFF capability through the use of a transponder computer with the AN APX-72 transponder. The code for mode 4 must be preset into the computer prior to flight.

The IFF transponder system includes a test set that provides for go/no-go self-testing of the system in modes 1, 2, 3/A and C. System self-testing for mode 4 operation is performed automatically by the transponder computer. The major components of the IFF system are Transponder Control C-6280 (P)/APX, Radio Receiver-Transmitter RT-859/APX-72, Antennas AT-741/A, Antenna Switching Unit SA-1474/A, Altimeter-Encoder AAU-21A, Altimeter AAU-27A, Transponder Set Test Set TS-1843/APX, and IFF antenna switch, and Mount MT-3949( )A/U with connector for Transponder Computer KIT-1A/TSEC.

Primary power to operate the IFF equipment is supplied from the aircraft primary single phase ac bus and the 28-volt dc primary bus and is controlled through three circuit breakers on the overhead radio circuit breaker panel. Ac power (115 volts, 400 Hz, 1 phase) is applied through IFF AC 5-ampere circuit breaker to the altimeter-encoder and the receiver-transmitter. The receiver-transmitter provides switched 115-volt ac power to the antenna switching unit and the transponder computer. The IFF DC 5-ampere circuit breaker provides 28 volts dc to the altimeter-encoder, altimeter vibrators, the receiver-transmitter, the transponder control and the IFF CAUTION light. The TEST SET 5-ampere circuit breaker provides 28 volts dc to the test set.

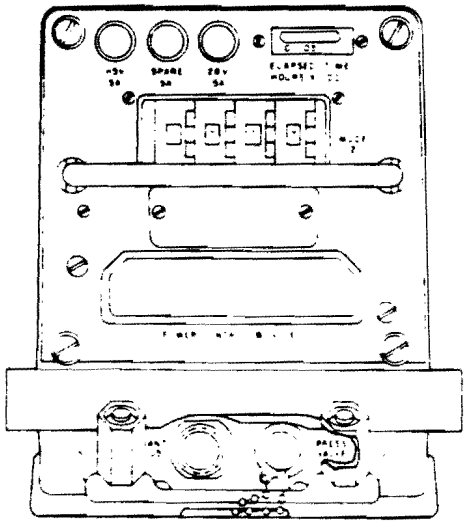
Transponder Control C-6280(P)/APX.



The transponder control contains all of the controls normally required for operating the IFF transponder system except for mode 2 code selections. The MASTER control turns the IFF system on and off, places it in warmup (STBY), controls the sensitivity of the receiver (low or normal), and initiates the emergency reply operation. The IDENT-OUT-MIC switch selects I P operation. The I/P operation is selected when the switch is held in the momentary IDENT position. With the switch set to the MIC position, I/P operation is initiated by keying the UHF command transceiver. The operating modes are selected by the M-1, M-2, M-3/A, and M-C mode enabling switches. These are 3-position toggle switches providing ON and OUT (off) positions plus a momentary position for test signal selection. The TEST light illuminates when the receiver-transmitter responds properly to a mode 1, 2, 3/A, or C self-test. MODE 1 and MODE 3/A thumbwheel switches select and digitally display code numbers. The RAD TEST-OUT-MON switch in the RAD TEST position permits the receiver-transmitter to be interrogated by selected mode signals from external test equipment. The MON position turns on test set monitoring circuits. In the MON position, the TEST light will illuminate to indicate replies are being transmitted in modes 1, 2, 3/A, or C. The OUT position disables the RAD TEST and MON function. Mode 4 controls and indicator are grouped together along the left side of the control panel. The MODE 4 switch enables or disables mode 4 operation. The CODE switch provides for the selection of either the A or B mode 4 code. When momentarily placed in the HOLD position, it prevents the transponder computer from zeroizing (conceling) the mode 4 codes when power is removed from the system. In the ZERO position, the mode 4 codes are zeroized. The AUDIO-OUT-LIGHT switch in the AUDIO position selects both audio and reply-light monitoring of mode 4 operation. An audio tone in the pilot's headset

indicates valid interrogations are being received, and illumination of the REPLY light indicates replies are being transmitted. To hear the audio tone, the marker beacon (MARKER) mixing switch on the interphone control panel must be on. The LIGHT position selects REPLY light monitoring only. The OUT position turns the monitoring circuits off. The transponder control is mounted on the pedestal.

Radio Receiver-Transmitter RT-859/APX-72.



The receiver-transmitter contains the primary receiving and transmitting circuit of the IFF transponder system. It receives, decodes, and replies to the characteristic interrogations of operational modes 1, 2, 3/A, C, and 4. Absence of the transponder computer and the altimeter-encoder does not affect the operation of the receiver-transmitter except in modes 4 and C respectively. The mode 2 four-digit reply code select switches on the front panel select and indicate the mode 2 reply codes. Other than these switches, the receiver-transmitter is controlled by the positions of the switches and controls on the transponder control. The receiver-transmitter responds only to interrogating signals that correspond to the preset modes and codes. The receiver-transmitter is located in the left radio rack above the left landing gear.

Antenna AT-741/A.

Two antennas are provided with the transponder system. The antennas receive interrogation signals from other stations and radiate the reply signals generated in the receiver-transmitter. The antennas are mounted on the top and bottom of the fuselage. Either or both antennas may be connected to the receiver-transmitter through the antenna switching unit, which is controlled by the IFF antenna switch.

Antenna Switching Unit SA-1474/A.

The antenna switching unit is connected in the radio frequency path between the antennas and the test set, or between the antennas and the receiver-transmitter when the test set is replaced with the bypass cable. The antenna switching unit is controlled by the IFF antenna switch and is mounted in the left radio rack.

IFF Antenna Switch.

The IFF antenna switch panel contains a 3-position toggle switch with switch positions TOP, BOTH, and BOT (bottom). In the TOP position, the antenna switching unit connects the receiver-transmitter to the top antenna and to the bottom antenna in the BOT position. When set to BOTH, the antenna switching unit alternately connects the receiver-transmitter to the top and bottom antennas approximately 38 times per second. The IFF antenna switch panel is located on the pedestal.

NOTE

Set the IFF antenna switch to BOTH for normal operation.

NOTE

When operation of the IFF system is restricted to only the top antenna, sensitivity of the system to interrogators located below the aircraft will be reduced.

Transponder Set Test Set TS-1843/APX.

The test set provides the capability of testing the IFF transponder system on a go/no-go basis in all modes except mode 4. The test set is in the radio frequency path between the receiver-transmitter and the antenna switching unit. When one of the mode 1, 2, 3/A, or C switches is placed in the TEST position, interrogation pulse pairs for the selected mode are generated. These interrogations are applied to the receiver-transmitter to check for proper receiver frequency, sensitivity, and decoding. The test set analyzes the resulting transmitter replies for proper frequency power bracket spacing, and antenna circuit vswr. If all tests are within specified limits the test set causes the TEST light on the transponder control to illuminate, providing a go indication. Failure of a single test prevents the TEST light from illuminating, providing a no-go indication. The test set is located in the left-hand radio rack. A bypass cable may be used in lieu of the test set with subsequent loss of go/no-go testing capability for modes 1, 2, 3/A, and C. The bypass cable is mounted in clips near the test set.

IFF CAUTION Light.

The IFF CAUTION light illuminates when the IFF caution light circuit detects an inoperative mode 4 capability, provided the transponder computer is installed, aircraft power is on, and the IFF MASTER control is not off. Specific discrepancies monitored by the IFF CAUTION light are: mode 4 codes zeroized, transponder failure to reply to a proper mode 4 interrogation, or the automatic

self-test function of the transponder computer reveals a faulty transponder computer. The IFF CAUTION light is located on the pilot's instrument panel.

Operation.

1. Starting Procedure.

a. Turn on electrical power.

b. Set transponder control MODE 1 and 3/A code select switches to the required operational codes.

c. Set receiver-transmitter mode 2 code select switches to the operational code.

d. Set transponder control mode enable switches M-1, M-2, M-3/A, and M-C to ON (unless operational requirements specify that only certain modes are to be used, then set all other mode switches to OUT).

e. Set the transponder control MODE 4 ON-OUT switch to ON and CODE switch to A or B (as required) when equipped with the transponder computer and flying into a known mode 4 interrogating environment.

f. Set transponder control RAD TEST-OUT-MON switch to OUT, AUDIO-OUT-LIGHT switch to LIGHT, and IDENT-OUT-MIC switch to OUT.

g. Set the prevailing atmospheric pressure on the barometric displays of the altimeter-encoder and altimeter. The altimeters should indicate local altitude.

h. Set transponder control MASTER switch to STBY for 1 minute (normal ambient temperature) or 5 minutes (extremely low ambient temperatures) then set to NORM.

2. Self-Test Procedure.

a. Press to test the REPLY and TEST lights. The lights should illuminate.

b. Press to test the IFF CAUTION light. The lamp should illuminate.

NOTE

If the mode 4 codes are zeroized, the IFF CAUTION light will be on before and after this test.

c. Set transponder control mode enable switches M-1, M-2, M-3/A, and M-C in sequence to TEST. The TEST indicator should illuminate when each switch is in the TEST position indicating a system go condition for the particular mode being tested. Reset the mode enable switches to ON or OUT as required.

d. The transponder computer automatically performs a self-test of the mode 4 circuits. Observe that the IFF CAUTION light is off. The IFF CAUTION light will illuminate when a mode 4 no-go condition is detected.

3. Normal Operating Procedures.

a. Mode 4 monitoring. Set the transponder control AUDIO-OUT-LIGHT switch to AUDIO to provide aural and visual (REPLY light) monitoring of valid mode 4 interrogations and replies. To hear the audio tone for mode 4 interrogations, set the marker beacon (MARKER) mixing switch on the interphone panel to the on position. Set the AUDIO-OUT-LIGHT switch to LIGHT to enable REPLY light monitoring only if desired.

b. Monitoring modes 1, 2, 3/A, and C. Set the transponder control RAD TEST-OUT-MON switch to MON for monitoring replies to the selected 1, 2, 3/A, and or C operating modes.

c. Antenna selection. Set the IFF antenna switch to TOP, BOT, or BOTH as required.

d. Identification of position (I/P) operation. The receiver-transmitter will transmit specially coded I/P reply signals to mode 1, 2, or 3/A interrogations when the IDENT-OUT-MIC switch on the transponder control is energized. Transmission of the I/P reply signals requires the appropriate mode enable switches to be in the ON position. Use one of the following methods to control the transmission of the I/P reply signals.

(1) Momentarily hold the IDENT-OUT-MIC switch in the IDENT position (springloaded return to OUT) and then release it. This action will cause the receiver-transmitter to transmit the I/P reply signals for 15 to 30 seconds in response to mode 1, 2, or 3/A interrogations. Repeat as required.

(2) Place the IDENT-OUT-MIC switch in the MIC position. I/P reply signals can now be transmitted by momentarily keying the UHF command transceiver. When the need for transmitting further I/P reply signals ceases, return the IDENT-OUT-MIC switch to the OUT position.

4. Emergency Operating Procedures. During an aircraft emergency or distress condition, the system may be used to transmit specially coded emergency reply signals to mode 1, 2, or 3/A interrogations. These emergency reply signals will be transmitted as long as the MASTER control on the transponder control remains in the EMER position, regardless of the position of the mode enable switches. For emergency operation, set the MASTER control as follows:

a. Lift the MASTER control knob and rotate to EMER position.

b. When the emergency is over, return the MASTER control to the NORM or LOW position.

5. Inoperative Mode 4 Operation. When illuminated, the IFF CAUTION light signifies that the IFF equipment will not respond to mode 4 interrogations, and that operation in a known mode 4 interrogating environment should be avoided. To attempt correction, place the MASTER control to NORM (if in STBY or LOW), check that the mode 4 ON-OUT toggle switch is ON and check that the proper A or B code has been slected for the current code time period. If the IFF CAUTION light remains illuminated, the applicable flight procedures should then be employed that are operationally desired for an inoperative mode 4 condition.

6. Stopping Procedure.

a. Set the transponder control CODE switch to HOLD or ZERO as required.

b. Set the transponder control MASTER switch to OFF. Set the IDENT-OUT-MIC, M-1, M-2, M-3/A, M-C, MODE 4 AUDIO-OUT-LIGHT, and RAD TEST-OUT-MON switches to OUT.

c. Turn off electrical power.

LORAN (LONG RANGE NAVIGATION) AN/APN-157
(AIRCRAFT MODIFIED BY TO 1C-123K-543)

The LORAN AN/APN-157 is a transistorized radio receiver tuned to the 100-kilocycle LORAN C frequency. A basic LORAN C navigation system consists of at least three land-based transmitters and a single receiver. One of the transmitters is designated as a master station and the others as slave stations. The stations can be arranged in triads, stars, or squares to provide the optimum geometric accuracy of position-fixing in the desired area of coverage. The receiver continuously displays and measures the time difference of received pulses from the master and each of two slave stations. These time-difference readings actually represent distance differences, and are used to identify a pair of hyperbolic lines on the LORAN C navigation charts. The point of intersection of the two hyperbolic lines represents the aircraft position. LORAN C ground wave coverage extends to approximately 1200 NM. Usable one-hop-E sky waves may be received during both daylight and darkness up to ranges of 2300 NM.

Each LORAN C system transmits on a particular repetition rate. There are six basic repetition rates available for LORAN operation, each having eight specific rates, or a total of 48 different rates. Since all LORAN C chains operate on 100 KC, a desired chain is selected by adjusting the receiver repetition rate. In order to increase average transmitted power, each station transmits a group of eight pulses spaced at 500- or 1,000-microsecond intervals. The pulse groups are phase-modulated. The phase modulation within the pulse groups reduces the effects of sky wave contamination on pulses subsequent to the first in each group, and provides necessary logical information for signal search, identification, and lock-on.

To provide visual identification of the master station, a ninth pulse is transmitted 500 to 2,000 microseconds after the last pulse of the master group. The LORAN C master and slave station pulses are not transmitted simultaneously. Each slave transmission is delayed a controlled amount so that the master station pulse is always received first. Therefore, time differences increase from a minimum value at the slave station, to a maximum at the master station.

Synchronization of the transmitting stations of a LORAN C chain is essential to the accuracy of the system. The basic time reference pulse is generated at the master station. Pulses from the slave stations are referenced to the master station. The significant difference between master and slave stations is simply that the master provides a signal reference for the other stations. The master station establishes the pulse recurrence rate and the exact radio frequency to be transmitted by the particular LORAN C chain. It also monitors the transmissions from the slave stations to ensure maintenance of system calibration. The master station has a highly stable oscillator whose output is frequency-divided or multiplied to yield the specific pulse recurrence rate and the 100-KC carrier frequency.

In addition to having a specific recurrence rate, LORAN-C signals are also coded in terms of phase relationship between the RF carrier and each signal pulse. Each pulse is either plus or minus according to a predetermined code. There are two codes for the master signal pulse groups and two for the slave pulse groups. The two phase codes appear on alternative cycles. By phase coding the LORAN-C pulses, pulse groups may be more easily identified and sky wave contamination is reduced. The two possible video phase code presentations are shown in figure 2 of this supplement.

LORAN Controls and Indicators.

All LORAN controls and indicators are located on the front panel of the LORAN receiver (figure 1 of this supplement) mounted at the navigator's station. Power is supplied to the LORAN receiver from the 115-volt primary AC bus and the 28-volt primary DC bus through two LORAN circuit breakers on the pilots' overhead circuit breaker panel.

Two models of the APN-157 LORAN receiver are available. The R-1214 APN-157 and R-1214A APN-157 transistorized model are shown in figure 1. The basic difference between the controls and indicators of the two sets is in the readout of time differences. The R-1214A LORAN time differences (M-S_A and M-S_B) are displayed by light emitting diodes (digital display) in lieu of mechanical counters. No operator interpolation is required.

The following is a list of LORAN controls including the function of each control:

GAIN controls (M, S_A, S_B)	-Master and slave station gain controls used only for initial lock-on
SKY WAVE lamp	-Comes on when a ground wave or noise is detected ahead of a sky wave signal being tracked.
Display Oscilloscope	-Displays LORAN station signal patterns
$M\text{-}S_A$/$M\text{-}S_B$ switch	-Selects slave A or slave B pulses for visual display when using "M" or "F" sweep speeds
RF REJECT controls (2)	-Each control rejects one interference frequency between 70 and 130 KC

DISPLAY RF selector switch -Selects four patterns for visual display as follows:

"WIDE"	-Unfiltered LORAN pulses
"NAR"	-Filtered LORAN pulses
"NOTCH"	-Maximized CW interference, tuned by visual display reject control
"VIDEO ENV"	-Envelope of LORAN pulses, for determining if phase code is correct.

DISPLAY SPEED SWEEP switch - Selects sweep speed of visual display as follows:

"S" (slow) position	-Displays master, slave A, and slave B pulses
"M" (medium) position	-Displays master group and one slave group of pulses
"F" (fast) position	-Displays superimposed pulses from master on top trace and one slave group on bottom trace

DISPLAY reject control (Right) - Rejects one interference frequency in visual display from 70 to 130 KC. Maximizes one interference signal when DISPLAY-RF selector switch is in "NOTCH."

DISPLAY GAIN control	- Adjusts amplitude of visual pattern
DISPLAY reject control (Left)	- Rejects one interference frequency in visual display from 70 to 130 KC
SLEW (S_B, S_A) switches	- Slews slave strobes for alignment with slave pulses for initial lock-on
DRIFT (M) switch	- Drifts all pulses, used to align master pulses with master strobes on initial lock-on
Power switch	- Turns LORAN receiver to the "ON," "OFF," or "STBY" positions
STOP COUNTERS pushbutton	- Stops TIME DIFFERENCE counters for 5 seconds

On the R1214 model of the APN-157, the LORAN time difference values are determined using the following counters.

$M\text{-}S_A$ TIME DIFFERENCE dials - display the following:

PHASE	- Indicates phase time difference between master and slave A
ENVELOPE SETTLING	- Indicates the amount envelop reading deviates from phase reading
ENVELOPE	- Indicates envelope time difference between master and slave A

$M\text{-}S_B$ TIME DIFFERENCE dials - indicate the following:

PHASE	- Indicates phase time difference between master and slave B
ENVELOPE SETTLING	- Indicates the amount envelope reading deviates from phase reading
ENVELOPE	- Indicates envelope time difference between master and slave B

On the R-1214A transistorized model of the APN-157, the LORAN time difference values are determined using the following counters and indicators.

$M\text{-}S_A$ TIME DIFFERENCE dials	- Displays the time difference between the master and slave A signals. No interpolation is required by the operator.
ENVELOPE SETTLING lamp	- Indicates when the receiver has settled. Settling light will extinguish in approximately 80 seconds when settling has occurred.
$M\text{-}S_B$ TIME DIFFERENCE dials	- Displays the time difference between the master and slave B signals. No interpolation is required by the operator.

ENVELOPE SETTLING lamp - Indicates when the receiver has settled. Settling light will extinguish in approximately 80 seconds when settling has occurred.

CYCLE SHIFT switch - Matches the phase code of LORAN receiver to the code used by the LORAN chain

RATE switches - Set receiver to basic and specific repetition rate being used by LORAN chain

GUARD switches - Three switches (S_B, S_A, M) enable sky wave circuitry for slave A (S_A), slave B (S_B), or master (M)

LOST SIGNAL lamps - Come on to indicate trouble on slave A (S_A), slave B (S_B), or master (M) station input or incorrect phase code

AUTO MAN switches - Select automatic or manual gain control of master (M) or slave station (S_A, S_B) signals

Normal Operation of LORAN C.

To place the LORAN in operation perform the following steps:

1. Set power switch to "STBY." Wait 15 minutes for receiver warmup.

2. Set switch to "ON."

3. Rotate DRIFT(M), SLEW(S_A) and SLEW(S_B) switches fully clockwise and release.

4. Set RATE switches to basic and specific repetition rate of LORAN chain.

5. Adjust SLEW S_A switch until M-S_A TIME DIFFERENCE counter approximates time difference between master and slave A signals for present aircraft position.

6. Adjust SLEW S_B switch until M-S_B TIME DIFFERENCE counter approximates time difference between master and slave B signals for present aircraft position.

Note

Slew rates of the R-1214A are much faster than the R-1214. This will permit the operator to quickly change to other LORAN stations for additional LORAN LOPS.

Note

When selecting the slaves to be displayed on slave A and slave B, remember that slave B must always represent a greater time difference than slave A and that they must be separated by a minimum of 8,000 microseconds. Slave A should never read less than 10,000 microseconds and slave B should never read less than 18,000 microseconds.

In a good signal area, three or more distinct pulse groups should be displayed on the visual display scope similar to detail B, figure 2. Adjust DISPLAY GAIN control full CW and adjust GAIN controls M, S_A, S_B for a visual display amplitude of two boxes.

Lock on a master station as follows:

1. The master signal on the visual display oscilloscope will show nine pulses. If interference obscures the display, set the DISPLAY-RF selector to "NAR." Adjust RF reject controls to reduce interference.

Note

A blinking ninth pulse in the master group indicates that the station is unreliable and should not be used.

2. Adjust DRIFT M switch until the first eight master pulses are aligned with master strobes as shown in detail B.

3. Set DISPLAY sweep speed switch to "M." Visual display should be similar to detail C. The master pulse group appears on the top trace.

4. Readjust DRIFT M switch for closer master pulse and strobe alignment.

5. SET DISPLAY sweep speed switch to "F." The visual display will now be similar to detail D.

6. Adjust GAIN M control for a visual display amplitude of two boxes.

7. Readjust the DRIFT M switch for proper master pulse alignment.

Note

Proper alignment should be accomplished with the video display set for fast sweep and wide band. Align the pulse so that the notch (strobe) is sitting on approximately the third significant cycle of the RF pulse (detail D). The vertical index line is not used as a reference in this particular situation. The fast sweep, narrow band display is not normally used for final alignment because the strobe is not presented. However, if it is necessary to use this presentation, align the pulse by slewing from right to left until the vertical index line is near the left-hand edge of the pulse. (Detail E.)

8. Set the DISPLAY RF selector to "VIDEO ENV." If phase code is correct and relatively free of interference, pattern "A" shown in detail F should appear. If pattern "B" appears, operate the CYCLE SHIFT switch to the opposite position. When the correct pattern appears, return the DISPLAY-RF selector to the original position. The red LOST SIGNAL M lamp should extinguish. If not, turn the GAIN M control up slightly.

9. Set the AUTO/MAN switch to "AUTO." In weak signal areas, this step may be necessary before the LOST SIGNAL lamp is extinguished.

Lock on a slave A station as follows:

1. Set M-S_A/M-S_B switch to "M-S_A."
2. Set DISPLAY sweep speed switch to "S."
3. Adjust GAIN S_A control for a visual amplitude of two boxes.
4. Adjust SLEW S_A control until strobes are aligned with slave A pulses.
5. Set DISPLAY sweep speed switch to "M." Master pulses appear on top trace and slave A pulses appear on bottom trace of visual display.
6. Readjust SLEW S_A switch for closer slave A pulse and strobe alignment.
7. Set DISPLAY sweep speed switch to "F." Visual display now shows eight superimposed master pulses on top trace and eight superimposed slave A pulses on bottom trace.
8. Readjust the SLEW S_A switch for proper slave A pulse alignment.

Note

Proper alignment should be accomplished with the video display set for fast sweep and wide band. Align the pulse so that the notch (strobe) is sitting on approximately the third significant cycle of the RF pulse (detail D). The vertical index line is not used as a reference in this particular situation. The fast sweep, narrow band display is not normally used for final alignment because the strobe is not presented. However, if it is necessary to use this presentation, align the pulse by slewing from right to left until the vertical index line is near the left-hand edge of the pulse. (Detail E.)

9. Readjust GAIN S_A control for a visual display amplitude of two boxes. The red LOST SIGNAL SA lamp should extinguish within one minute.

10. Set slave A AUTO/MAN switch to "AUTO." In weak signal areas, this step may be necessary before the LOST SIGNAL lamp is extinguished.

Note

If lamp remains on, check phase code pattern described in step (8) of master station lock-on procedure.

Lock-on procedure for slave B stations are the same as those used for slave A. Repeat slave A lock-on procedure steps (1) through (10), substituting the S_B switch position in place of S_A switch position in the steps.

When lock-on procedures for master, slave A, and slave B have been completed, proceed with the following steps:

1. Adjust DISPLAY GAIN control for best view of the visual display.
2. Set the three GUARD switches to "ON."
3. Press and release STOP COUNTERS pushbutton. The counters will stop for approximately five seconds.

Note

Use STOP COUNTERS pushbutton only if the speed of the aircraft makes it difficult to read the counters.

4. On the R-1214 receiver obtain time difference readings between master and slave A and master and slave B from TIME DIFFERENCE COUNTERS S_A and S_B. The ENVELOPE counters indicate from 0.0 to 99999 microseconds and the PHASE counters indicate from 0.0 to 9.9 microseconds with graduations in tenths of a microsecond.

Note

To obtain a valid time difference readout on the ENVELOPE counter, add or subtract the ENVELOPE SETTLING readout to or from the ENVELOPE counter to obtain the same value as the PHASE counter. If the ENVELOPE SETTLING dial approaches the number "5," avoid ambiguity by waiting until the value of the ENVELOPE SETTLING dial drops to four or less.

Note

On the R-1214A transistorized receiver, obtain time difference remains between master and slave A and master and slave B from the TIME DIFFERENCE digital displays. When the ENVELOPE SETTLING lamps have extinguished, read the time difference values without interpolation.

To place the LORAN-C in standby operation:

1. Place the power switch to "STBY." Power is removed from the circuits but the crystal oven remains in operation.

To restart operation from standby operation:

1. Place the power switch to "ON."

2. Lock on master, slave A, and slave B stations.

To stop LORAN-C operation:

1. Place the power switch to "OFF."

Sky Wave Operation.

Note

If a ground wave cannot be detected by the LORAN receiver, the sky wave lamp will not illuminate even though the receiver is tracking a sky wave.

If the SKY WAVE lamp illuminates, the receiver is tracking a sky wave on one or more pulse groups. The sky wave alarm circuitry is activated by detection of a ground wave ahead of the locked-on pulse. To determine which pulse group is locked on to a sky wave:

1. Turn all three GUARD switches off until the SKY WAVE lamp extinguishes.

2. Turn on one GUARD switch at a time and leave on approximately one minute each. The pulse group locked on to the sky wave illuminates the SKY WAVE lamp.

Note

The sky wave alarm circuitry is susceptible to activation by RF noise.

After determining which pulse group is locked on a sky wave, attempt to re-align this group on a ground wave.

1. Set up video display for fast sweep, wide band.

2. Slew the previously aligned pulse approximately 50 microseconds to the right.

3. Turn the RF gain up until the ground wave becomes visible and then align as in normal operation.

4. If unable to see a ground wave on the video display, set AUTO/MAN switch to "AUTO." The receiver may be able to lock on even though the pulse is not visible on the display.

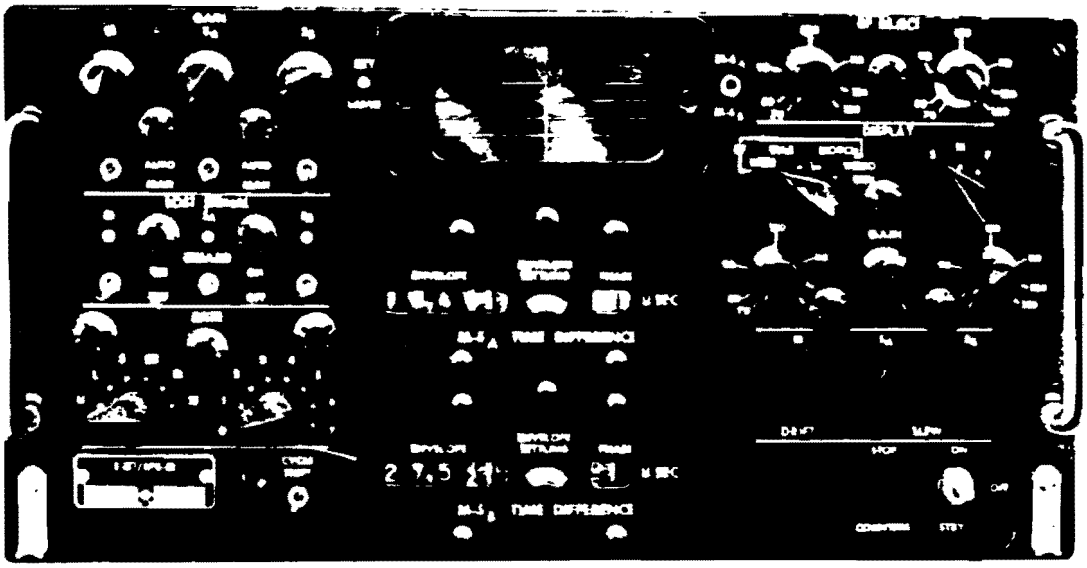
5. If the receiver is unable to lock on to a ground wave, the sky wave can be used by applying corrections printed on the LORAN-C charts.

Emergency Operation of LORAN C.

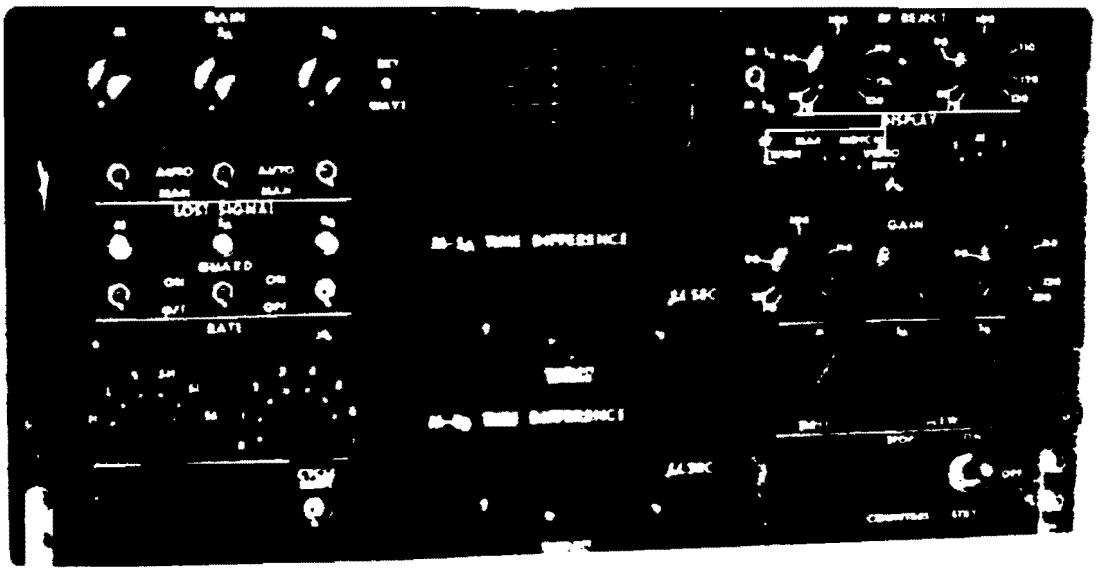
When a LOST SIGNAL lamp illuminates, it indicates that the station has transmission troubles or its signals are not being received. The time difference measurements for that station may not be valid. However, if distinct pulses are visible on the visual display scope and receiver lock-on is evidenced by stable time delay indication, these time delay readings may be valid and may be used with caution. Each LORAN-C chain has two or more slave stations: the unused slaves may be locked on for time difference readings.

Ground stations may periodically change their phase coding. If the receiver was locked on and tracking and all three LOST SIGNAL lamps illuminate simultaneously (signals still present), check the video envelope presentation to ensure that the receiver is still properly phase coded.

LORAN SET



R1214/APN-157



R1214A/APN-157

Figure 4-15B.

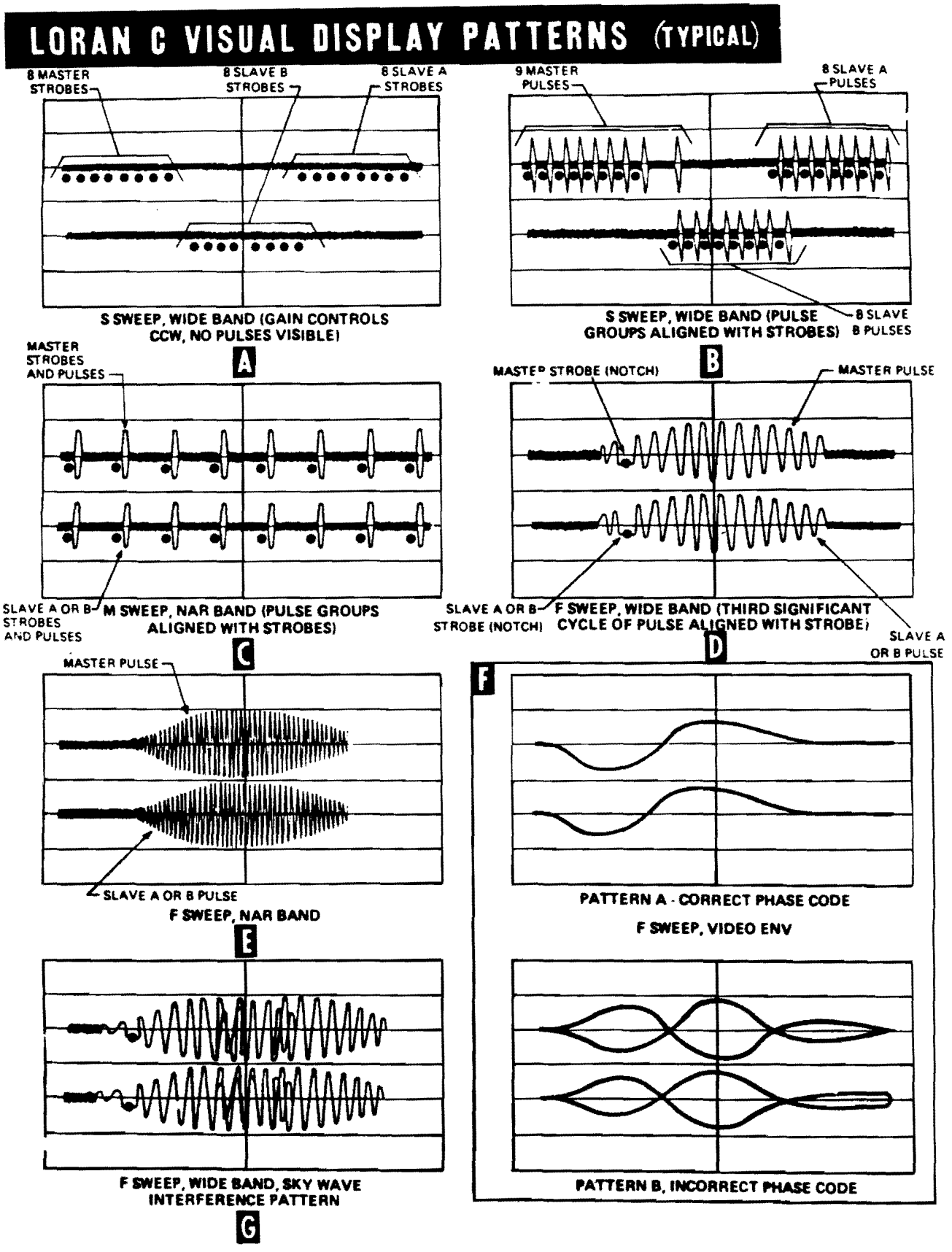

LORAN C VISUAL DISPLAY PATTERNS (TYPICAL)
8 MASTER STROBES
8 SLAVE B STROBES
8 SLAVE A STROBES
S SWEEP, WIDE BAND (GAIN CONTROLS CCW, NO PULSES VISIBLE)
A
9 MASTER PULSES
8 SLAVE A PULSES
8 SLAVE B PULSES
S SWEEP, WIDE BAND (PULSE GROUPS ALIGNED WITH STROBES)
B
MASTER STROBES AND PULSES
SLAVE A OR B STROBES AND PULSES
M SWEEP, NAR BAND (PULSE GROUPS ALIGNED WITH STROBES)
C
MASTER STROBE (NOTCH)
MASTER PULSE
SLAVE A OR B STROBE (NOTCH)
F SWEEP, WIDE BAND (THIRD SIGNIFICANT CYCLE OF PULSE ALIGNED WITH STROBE)
D
SLAVE A OR B PULSE
MASTER PULSE
SLAVE A OR B PULSE
F SWEEP, NAR BAND
E
F SWEEP, WIDE BAND, SKY WAVE INTERFERENCE PATTERN
G
F
PATTERN A - CORRECT PHASE CODE
F SWEEP, VIDEO ENV
PATTERN B, INCORRECT PHASE CODE

Figure 4-15C.

STATIC DISCHARGERS AN/ASA-3.

Twelve static dischargers are installed on the aircraft to dissipate electrical charge accumulated by flying through rain, snow, or ice crystals. Two of these are located on the trailing edge of each aileron, one on each wing tip, two on the trailing edge of each elevator, and two on the trailing edge of the rudder near the top. The dischargers consist of a cotton wick approximately 13 inches long, encased in a slightly shorter plastic sheath. For best results, the wick should protrude about 1-1/2 inches beyond the end of the sheath.

FM LIAISON RADIO SET AN/ARC-44. (Some Aircraft).

This set is an airborne, line-of-sight, short range voice communications set, which is used by the pilot and copilot for two-way air-to-air or air-to-ground communication within the FM liaison set operating frequency range from 24 to 51.9 megacycles. The FM

liaison set consists of the following: radio receiver-transmitter RT-294/ARC-44, control panel SB-327/ARC-44, dynamotor DY-107/AR, antenna AT-454/ARC. The receiver-transmitter, located on a shelf in the radio compartment (right-hand tunnel), is a separately housed unit which converts audio frequency to radio frequency and vice versa. The control panel, located on the copilot's console, is a separately housed unit which provides the control for applying power to the receiver-transmitter. The following controls are provided on the control panel, a power switch marked ON-OFF, a volume control marked VOL, two frequency selector switches marked FREQ, and a selector switch marked REM-LOCAL. The REM-LOCAL selector switch is inoperative and should be left in the LOCAL position. The dynamotor unit, located on a shelf in the radio compartment (right-hand tunnel), supplies high-voltage dc and 400-cycle-per-second ac power for operation of the receiver-transmitter. The antenna is mounted on top of the nose fuselage section and serves as both a receiving and transmitting antenna for the FM liaison set. Power for the operation of the set is supplied by the 26-volt dc primary bus.

To operate the equipment, proceed as follows:

a. With external power source connected, energize primary bus.

b. Turn power switch on FM control panel to ON position. Allow approximately 2 minutes warm-up period before operating frequency selector switches.

c. Select the frequency of a known FM station by turning the frequency selector switches until the required frequency appears in the FREQ window.

d. Ascertain that the REM-LOCAL switch is in the LOCAL position.

e. Select proper interphone control position on the C-824/AIC-10 interphone control panel.

f. Turn the receiver VOL on the FM control panel for maximum volume, and if necessary, reduce the volume with the C-824/AIC-10 VOL control.

g. To eliminate background noise, turn SQUEL switch on SA-474/AR switch assembly to the ON position.

h. Contact FM station or other aircraft on several frequencies to insure that the frequency selector unit cycles properly. A 400-cycle tone should be heard in the headsets while changing frequencies.

FM HOMING GROUP AN/ARA-31 (Some Aircraft).

The AN/ARA-31 FM homing group is installed in conjunction with the AN/ARC-33 FM liaison set. The FM homing group receives homing signals in the frequency range of 24.0 to 51.9 megacycles. Twin antennas, located on the nose section at fuselage station 20, are connected to a keyer, KY-149. The keyer applies the coded signal "D" to the incoming signals received by the left antenna, and the coded signal "U" to the incoming signals received by the right antenna. When these signals are of equal intensity, they blend into a steady tone indicating that the transmitting station is directly ahead or behind the aircraft. A "D" signal indicates that the transmitting station is to the left of the aircraft, and a "U" signal indicates that the station is to the right of the aircraft. The switch assembly SA-474/AR, located on the copilot's console, contains five function switches as follows: one marked HOME, one marked SQUEL, and three marked SPARE. Placing switch number 1 in the HOME position permits the homing group to use the FM liaison set to receive homing signals through the homing antennas. Placing switch number 1 in the down position permits normal use of the FM liaison set for communication, using the communication antenna on top of the nose fuselage section. Switch number 2 is normally in the SQUEL position which cuts down background and static noises, but permits medium and strong signals to be received. Placing switch number 2 in the down position will permit the pick-up of weaker signals, but static and background noise will increase. Switches 3, 4, and 5 are assigned as spares and are inoperative.

. . . FM HOMING AN/ARA-31

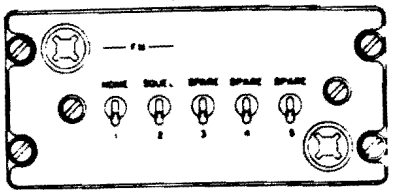


Figure 4-16

To operate the equipment, proceed as follows:

a. Operate the FM liaison set as described above.

b. Place the number 1 switch, located on the switch panel assembly SA-474/AR, in the HOME position and the number 2 switch in the down position (squelch off).

c. Select the frequency of a known FM transmitting station. The coded "D" and "U" signals or a steady 400-cps on-course tone should be heard in the headset.

d. With the FM transmitting station to the left of the aircraft, the code character "D" (dah-dit-dit) should be heard.

e. With the FM transmitting station to the right of the aircraft, the code character "U" (dit-dit-dah) should be heard.

f. With the aircraft headed directly toward the FM transmitting station, a steady 400-cps should be heard in the headset.

g. Station passage is identified by a rapid fade of the 400 cps tone.

h. The transmit and receive function cannot be used in the HOME position.

i. When homing is required to a station having only FM capability, it is desirable to have the ground station transmit a carrier wave for approximately 40 seconds and listen for 20 seconds alternately. The copilot will position switch number 1 in the down position and listen during the 20-second silent period. This procedure permits voice communication to be reestablished rapidly between the aircraft and ground when necessary.

NARROW BAND VHF/FM RADIO SET FM-622A (Aircraft with T.O. 1C-123-589 incorporated).

The FM-622A radio set provides frequency modulated voice communications from aircraft to aircraft and aircraft to ground as well as homing and retransmitting (requires additional radio set) capabilities. On aircraft, serial numbers AF54-691 and AF54-698, the homing capability is not installed; therefore, the control panel mode selector knob is used to energize the transceiver and only the T/R position is connected. The radio set operates over a line-of-sight distance, approximately 35 miles at 1000 feet altitude and no more than 140 miles at 10,000 feet altitude. A total of 920 crystal controlled channels, 50 kilocycles apart are provided over the 30 to 76 megacycle range within the VHF band. The control panel, located on the copilot's side panel, provides remote control operation of the set. An indicator (figure 1-58) located on the pilot's instrument panel, provides left, right and on course homing data display as well as station passage indication. Transmission and reception are accomplished on the same channel and can be selected from the control panel. Power to operate the set is derived from the 28-volt dc emergency communications bus.

a. To operate the set, place the function switch on the control panel in the T/R position for normal voice communications, RETRAN position for retransmission (additional set required) or HOME position for homing.

b. Select the desired frequency with the switches on the control panel.

Note

A tone should be heard in the headset while the radio set is tuning.

c. Set the SQUELCH control on the control panel to DIS for disabling the squelch, CARR for normal squelch operation or TONE for tone squelch (selective calling).

Note

HOME position automatically selects CARR squelch operation.

Allow at least 20 seconds for warm-up.

d. Press push-to-talk switch, note sidetone in headset(s) and adjust VOLUME control for proper volume.

e. To check homing function, place rotary selector switch on NAV MODE SEL panel to FM-622A position.

f. Place function selector switch on FM-622A control panel in HOME mode. The vertical needle should deflect to the right when aircraft is to the left of being on course, to the left when aircraft is to the right of being on course. The horizontal needle will rise when approaching the homing station and should dip after station passage.

Note

Any known FM station within range can be utilized for homing. If signal is not strong enough, flags on indicator will appear.

g. To stop equipment, turn function switch on control panel OFF.

TSEC/KY-8 SPEECH ENCRYPTION EQUIPMENT (Aircraft modified by T.O. 1C-123-584).

The TSEC/KY-8 speech encryption equipment is installed in conjunction with either the RT-850/ARC-133 or RT-872/ARC-136 UHF command receiver-transmitter. The equipment is installed to provide encoding of voice transmissions through the UHF command radio set as well as decoding of the incoming coded UHF signals. A control panel is provided on the copilot's side panel for remote control operation of the equipment. Power to operate the equipment is derived from the 28-volt dc emergency communications bus.

Note

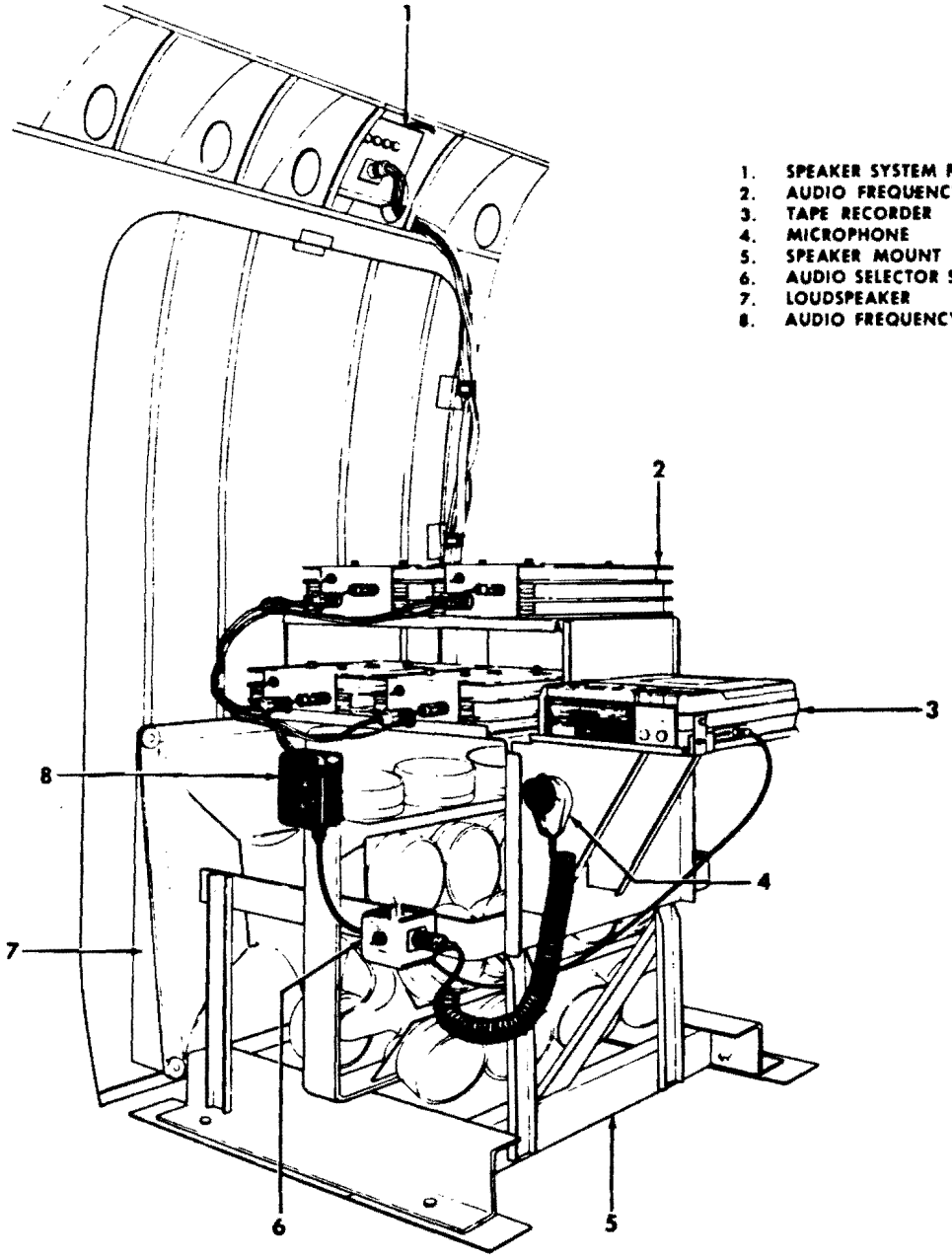
Functions of this equipment are classified.

AIRBORNE LOUDSPEAKER SYSTEM (Aircraft modified in accordance with T.O. 1C-123-587).

The Airborne Loudspeaker System (figure 4-17), installed in the cargo compartment at the left-hand aft troop door location, provides recorder playback and personal microphone audio broadcast modes of transmitting aural information over a wide area. The equipment consists of a transistorized portable tape recorder, Sony Model No. TC-800E; loudspeaker, University Sound Model B24P; four transistorized audio amplifiers, Applied Electro Mechanics Model No. AEM-DE-1492-C; audio frequency transformer, AEM-JB-T-4; audio selector switch assembly, and microphone Model No. AEM-MIC-2. The tape recorder provides recording and playback speeds of 1-7/8 and 3-3/4 inches-per-second. Power for the operation of the tape recorder is supplied by eight self-contained 1.5 volt dc size "D" batteries. Power for the operation of the audio amplifiers is supplied

AIRBORNE LOUDSPEAKER SYSTEM

(AIRCRAFT MODIFIED IN ACCORDANCE WITH T. O. 1C-123-587).



1. SPEAKER SYSTEM POWER JUNCTION BOX
2. AUDIO FREQUENCY AMPLIFIER
3. TAPE RECORDER
4. MICROPHONE
5. SPEAKER MOUNT ASSEMBLY
6. AUDIO SELECTOR SWITCH ASSEMBLY
7. LOUDSPEAKER
8. AUDIO FREQUENCY TRANSFORMER

Figure 4-17

by the 28-volt dc secondary bus through four 15-amp circuit breakers located on the speaker system junction box.

To operate the equipment, proceed as follows:

a. Position volume gain control, located on each of the four audio amplifiers, to the OFF (or center) position.

b. Place the power ON-OFF switch, located on each of the four audio amplifiers, to ON.

Note

An automatic protective circuit is incorporated in each audio amplifier to prevent damage from overload. If the protective circuit trips, power should not be applied again until the volume gain controls have been turned counterclockwise. To reset, the audio amplifier power switch is first placed to OFF and then to ON.

c. Place the audio selector switch to the MICROPHONE position.

d. Depress the push-to-talk switch on the hand-held microphone and commence speaking.

e. Adjust the volume gain control on each of the four audio amplifiers clockwise until the audio power level meter fluctuates.

f. Repeat step (d) to assure that audio amplifier output is clear and intelligible.

g. Release push-to-talk switch on hand-held microphone and place the audio selector switch to the RECORDER position.

Note

Tape recorder should be loaded with a pre-recorded tape.

h. Repeat step (a) to allow for the operation of the tape recorder.

i. Adjust TAPE SPEED selector to match the speed of the recorded tape.

j. Adjust the tape recorder PLAYBACK VOL and PLAYBACK TONE control knobs approximately halfway of full travel.

k. Depress tape recorder FORWARD pushbutton to apply power and start tape.

l. Repeat step (e) to assure that audio amplifier output is clear and intelligible.

m. Depress tape recorder STOP pushbutton to stop tape and turn off tape recorder power.

n. Place the power ON-OFF switch, located on each of the four audio amplifiers, to OFF.

EXTERIOR LIGHTING.

Exterior lighting consists of position lights, fuselage navigation lights, formation lights, landing lights, and 2 anti-collision lights. The position lights include a red light on the left wing tip, a green light on the right wing tip and a white and yellow light on the tail, just below the rudder. The fuselage lights consist of two pairs of white lights; one pair mounted on top of the fuselage, the other pair mounted underneath the fuselage. Each pair has one dim and one bright light. Either dim or bright may be selected. Thirteen lunar white formation lights are installed on top of the wing and fuselage in such a manner as to form a "T", Fixed landing lights are installed in the leading edge of each wing outer panel. The rotating anti-collision lights are mounted on top of the vertical fin, and the bottom of the fuselage at station 145. If the aircraft is at an altitude, placing it within ± 5 degrees of the horizontal plane of another aircraft, the anti-collision light flashes 90 times per minute. If the aircraft is in excess of ± 5 degrees, but within ± 30 degrees of the horizontal plane, the anti-collision light flashes 45 times per minute. A portable inter-aircraft signal light is provided in the crew compartment. Power for the exterior lighting system is obtained from the primary 28-volt dc bus.

Position Lights Switch.

A three-position, STEADY-OFF-FLASH switch (figure 4-6) on the overhead panel provides selection of either steady or intermittent illumination of the position lights.

Fuselage Navigation Lights Switch.

An ON-OFF switch (figure 4-6) on the overhead panel controls illumination of the fuselage lights.

Position Lights And Fuselage Lights Dimming Switch.

A two-position, DIM-BRIGHT, dimming switch (figure 4-6) located on the overhead panel controls the intensity of the position lights and fuselage lights when these lights are on.

Anti-collision Light Switch.

A two-position ON-OFF switch (figure 4-6) on the overhead panel, controls the rotating anti-collision lights.

Formation Lights Rheostat.

A rheostat (figure 4-6) on the overhead panel controls the illumination and intensity of the formation lights. The knob of the rheostat may be moved from OFF to DIM to illuminate the lights. Rotation of the knob to positions between DIM and BRIGHT establishes the intensity of the illumination.

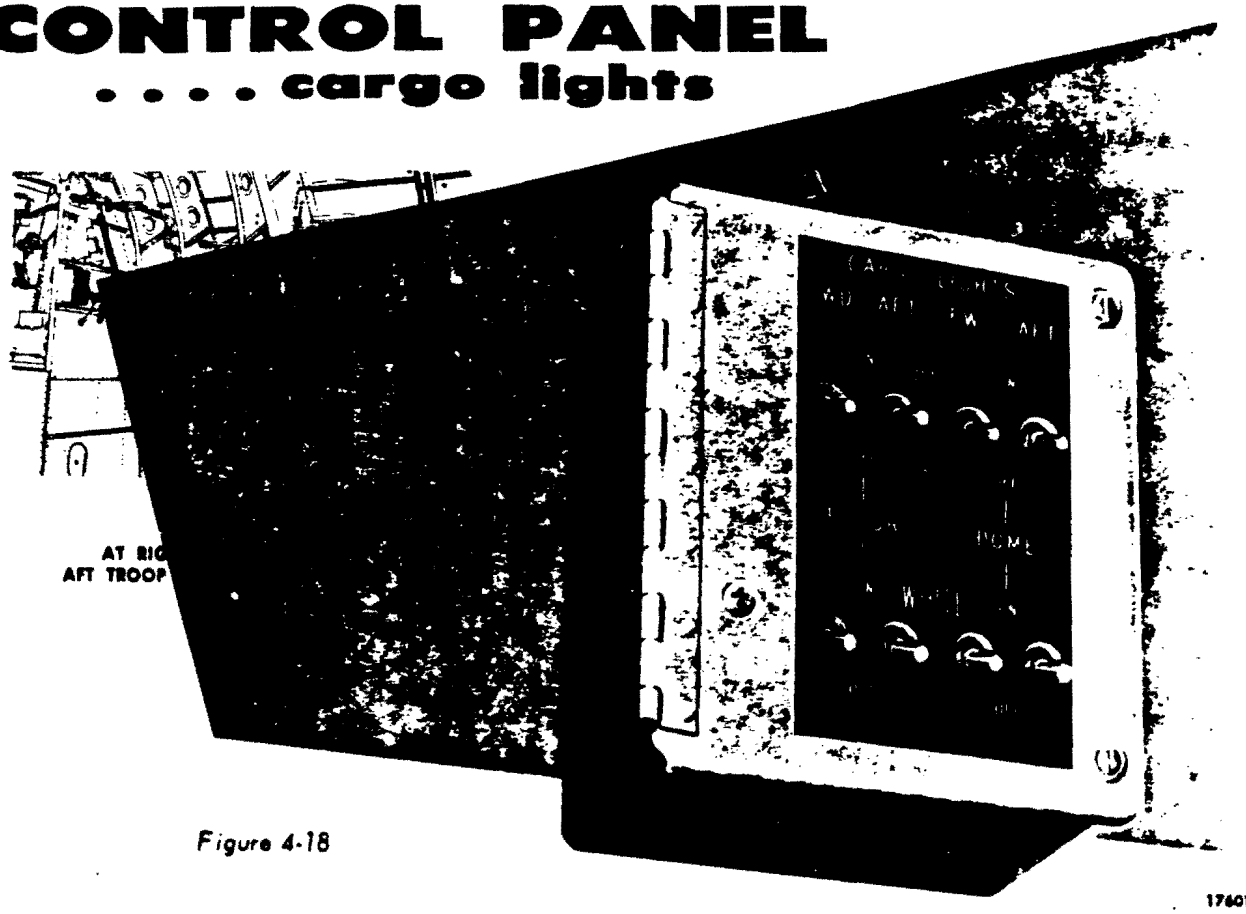


Figure 4-18

Landing Light Switches.

Each fixed landing light installed in the outer panel of each wing is controlled by a two-position landing light switch (figure 1-3) on the control pedestal.

Interaircraft Signal Light (Aldis Lamp).

An interaircraft signal light (figure 1-39) with its respective outlet is located on a snap-spring bracket on the aft face of the pilot's console. A sight integral to the lamp is provided for use during interaircraft signaling. Four filters are provided for use on the signal light; red, amber, green, and dimming. These filters are carried in a case (figure 1-39) located at the base of the pilot's console. The interaircraft signal light may be powered from an outlet (figure 1-40) on the copilot's console.

INTERIOR LIGHTING.

Interior lighting in the cargo compartment consists of the following: ten dome lights and twelve floor lights spaced throughout the compartment, a radio compartment light, and one dome light at the entrance door. Crew compartment lighting includes two dome lights mounted in the crew compartment ceiling, a spotlight mounted on each side of the overhead panel, edge lights for lighting the overhead panel, red floodlights and edge lights for the main instrument panel, a magnetic compass light, two magnetic compass card holder lights, and edge lights for the pilot's and copilot's radio consoles. On aircraft with a navigator's station, lighting includes a fixed light which is the right forward cargo compartment dome light, a work table swivel light, instrument panel lights, and interphone panel lights. All interior lights are powered by the primary 28-volt dc system.

Cockpit Dome Lights Rheostats.

Two rheostats located on the accessory control panel (figure 4-6) control the two dome lights in the crew compartment. When either the white or red light rheostat is turned from OFF to DIM to BRIGHT, intensity of the lights is varied.

Crew Compartment Spotlights.

A spotlight is located on the forward left and right edges of the pilot's overhead panel with a built-in switch rheostat. Red or white illumination can be obtained by replacement or removal of the red filter lens. The spotlights may be removed from their brackets for use as hand flashlights.

Pilots' Instrument Lights Rheostats.

Pilot's instrument panel lighting is controlled by four rheostats on the accessory control panel. Three of these (figure 4-6) controls the instrument panel edge lights, while one (figure 4-6) controls the red instrument flood lights which are mounted under the instrument panel anti-glare hood.

Overhead Panel Lights Rheostats.

The overhead panel lighting is controlled by a rheostat (figure 4-6) on the accessory control panel. This rheostat controls the intensity of the panel edge lights.

Magnetic Compass Light Rheostat.

The compass light, located in the magnetic compass, is controlled by a rheostat (figure 4-6) on the accessory control panel. Power for illumination of the magnetic compass light is obtained from the primary 28-volt dc bus.

Magnetic Compass Card Holder Light.

The compass card holder light, located in the compass card holder in the left and right edges of the pilot's overhead panel, is controlled by the magnetic compass light rheostat.

Radio Console Panel Lights Rheostats.

A rheostat on each radio console panel (figures 1-39 and 1-40) controls illumination of the console panel. Intensity of lights may be varied by the rheostat adjustment.

Radio Panel Lights Rheostat (Pedestal).

The radio control panel rheostat (figure 4-6) on the accessory control panel provides control of the pedestal radio panel edge lights.

Control Panel Lights Rheostat (Pedestal).

A rheostat (figure 4-6) on the accessory control panel provides the usual intensity control of the control pedestal edge lights.

Navigator's Station Light (Some Aircraft).

The fixed light (figure 4-22) at the navigator's station is controlled by the switches for the red and white forward cargo compartment dome lights. To operate this light the cargo compartment lights master switch must be in either the RED & WHITE or RED ONLY position.

Navigator's Swivel Light Rheostat (Some Aircraft).

A rheostat (figure 4-23) on the navigator's switch panel controls the operation and intensity of the swivel light (figure 4-23) on the navigator's worktable.

Navigator's Instrument Lights Rheostat (Some Aircraft).

A rheostat (figure 4-23) on the navigator's switch panel controls the operation and intensity of the illumination of the navigator's instrument panel and interphone panel.

APU Compartment Light Rheostat.

A spotlight (figure 4-28) mounted in the APU compartment is provided for illumination of the APU area and is controlled by a rheostat on the light itself.

Radio Compartment Light.

The radio compartment, located below the crew compartment on the right hand side of the aircraft, is illuminated by a red, white, or red and white dome light in accordance with the position of the two switches (figure 4-34) to the right of the radio compartment entrance. The cargo compartment master lights switch must be in some position other than OFF.

OXYGEN DURATION
man-hours

	GAGE PRESSURE—PSI	CABIN ALTITUDE—FEET				
		10,000	15,000	20,000	25,000	30,000
FOUR-BOTTLE SYSTEM	400	7.2	5.4	4.5	3.9	4.2
	350	6.3	4.7	3.9	3.5	3.7
	300	5.4	4.0	3.3	3.0	3.1
	250	4.5	3.4	2.8	2.5	2.6
	200	3.6	2.7	2.3	2.0	2.1
	150	2.7	2.0	1.7	1.5	1.6
WHITE FIGURES: Diluter lever in 100% OXYGEN	100	1.8	1.4	1.1	1.0	1.1
BLACK FIGURES: Diluter lever in NORMAL						
SIX-BOTTLE SYSTEM	400	10.8	8.1	6.7	5.8	6.3
	350	9.4	7.0	5.8	5.2	5.5
	300	8.1	6.0	4.9	4.5	4.6
	250	6.7	5.1	4.2	3.7	3.9
	200	5.4	4.0	3.4	3.0	3.1
	150	4.0	3.0	2.5	2.2	2.4
	100	2.7	2.1	1.6	1.5	1.6

Figure 4-19

BELOW 100 PSI

EMERGENCY! Descend to altitude not requiring oxygen.

THE ABOVE FIGURES REPRESENT THE ESTIMATED MAN-HOURS ALWAYS AVAILABLE TO THE PILOT. THESE FIGURES ARE ALSO VALID FOR THE COPILOT IF THE NAVIGATOR IS NOT CARRIED. HOWEVER, WHEN THE NAVIGATOR IS USING OXYGEN, DIVIDE THE ABOVE FIGURES BY 2 TO OBTAIN THE DURATION IN MAN-HOURS FOR BOTH THE COPILOT AND THE NAVIGATOR.

Warning Lights Dimming Switch (Some Aircraft).

A warning light dimming switch (figure 4-6) on the accessory control panel is provided to enable the pilots to dim all crew compartment warning lights for night flights. This is a two-position toggle switch, spring-loaded to an unmarked center position. When the switch is placed momentarily in DIM, additional resistance is added to the warning light circuits by the action of four dimming relays, and the lights are dimmed accordingly. It is not necessary to hold the switch in the DIM position since the dimming relays, once closed, are held closed by 28-volt dc power from the primary bus. When the switch is placed in BRIGHT, the dimming relays are deenergized, and the intensity of the lights increases.

Note

Should a power failure occur on the primary bus, all warning lights on the flight emergency bus will be automatically reset to bright, and those lights on the primary bus will go out. Upon restoring power to the primary bus, all warning lights will be bright, but may be dimmed by placing the warning lights dimming switch momentarily in DIM.

Cargo Compartment Lights Master Switch.

The three-position RED & WHITE-OFF-RED ONLY cargo compartment lights master switch (figure 4-6), located on the accessory control panel, affords the pilot master control of cargo compartment lighting. When this switch is placed in RED & WHITE, it makes possible red or white light selection by the individual light switches located on the cargo compartment lights switch box (figure 4-18). With the master switch in the RED ONLY position, the cargo compartment red lights are operative, and when in OFF position, all switches on the cargo compartment lights switch box are inoperative. On AF 55-4555 and subsequent aircraft, the RED ONLY position will dim the three sets of troop jump signal lights in the cargo compartment and tail section. Dimming will improve the vision of troops during night drops and reduce the possibility of enemy detection. On these aircraft, if it is desired to have the jump lights dimmed and the cargo compartment blacked out, the red lights must be turned off at the cargo compartment lights switch box.

Cargo Compartment Floor And Dome Lights Switches.

Eight cargo compartment floor and dome lights control switches, located on the cargo compartment lights switch box, directly control illumination of the cargo compartment floor and dome lights and the troop door light. Four of the switches afford either red or white selection of the floor lights and four switches afford similar selection of the dome lights. Light selection as accomplished by these switches, is only possible in accordance with the position of the pilot's cargo compartment master lights switch. Although all cargo lights are powered by the primary 28-volt dc bus, failure of the secondary dc bus will render the cargo lights inoperative. On some aircraft, the forward dome light on the right side of the cargo compartment is at the navigator's station.

To Turn Cargo Compartment Lights On.

Because control of the cargo compartment floor and dome lights is dependent upon the energization of the secondary dc bus, the following procedure for turning on these lights should be employed when either engine-driven generator or both generators are not operating:

a. Battery - ON.
b. Cargo compartment lights master switch RED ONLY or RED & WHITE as desired.
c. Secondary bus - MONITOR.
d. Cargo compartment floor and dome light switches - As desired.

When both engine-driven generators are operating the lights are turned on by employing the following procedure:

a. Cargo compartment lights master switch - RED ONLY or RED & WHITE as desired.
b. Cargo compartment floor and dome light switches - As desired.

OXYGEN SYSTEM.

Two separate gaseous, demand-type oxygen systems are installed. One system supplies the pilot; the other, the copilot. On some aircraft, the navigator receives oxygen from the copilot's oxygen system.

SYSTEM COMPONENTS.

Each system consists of two (three on some aircraft) F-1 shatter-proof cyclinders filled to a pressure of 425 psi, a mask regulator unit, a demand regulator unit, a portable unit recharger outlet, a flow indicator, a pressure gage, and the related metal or rubber tubing and connections. Both systems are simultaneously filled through the filler valve forward of the front entrance door. Check valves prevent flow back into the filler lines. No crossfeed provisions between the pilot's and copilot's systems are incorporated. Two A-1 low-pressure portable oxygen units, consisting of an oxygen cylinder and regulator, are provided for use by the crew when it is necessary for them to move about in the aircraft at altitudes requiring the use of oxygen. Refer to Servicing, Figure 1-62 for oxygen specification.

Note

As an aircraft ascends to high altitudes, where the temperature is normally quite low, the oxygen cylinders become chilled. As the cylinders grow colder, the oxygen gage pressure is reduced, sometimes rather rapidly. With a 100°F decrease in temperature in the cylinders, the gage pressure can be expected to drop 20%. This rapid fall in pressure is occasionally a cause for unnecessary alarm. All the oxygen is still there, and as the aircraft descends to warmer altitudes, the pressure will tend to rise again, so that the rate of oxygen usage may appear to be slower than normal. A rapid fall in oxygen pressure while the aircraft is in level flight, or while it is descending, is not ordinarily due to falling temperature, of course. When this happens, leakage or loss of oxygen must be suspected.

Diluter Demand Oxygen Regulator.

A diluter demand oxygen regulator (figures 1-39 or 1-40) is installed on the pilot's and copilot's consoles. On some aircraft, the navigator's oxygen regulator (figure 4-22) is installed to the right of the crew compartment entrance on the cargo compartment forward bulkhead. Each regulator incorporates a diluter lever with two positions, NORMAL OXYGEN, and 100% OXYGEN. In the NORMAL OXYGEN position the regulator automatically mixes the proper quantities of air and oxygen, the ratio depending upon altitude. The quantity of the mixture delivered depends upon the breathing of the user. A red emergency knob is provided which may be used in event the demand oxygen regulator becomes inoperative. This emergency knob is always safety-wired closed and should be opened only in case of regulator failure. When the emergency valve is turned counterclockwise, it permits a continuous flow of oxygen to the user, bypassing the regulator assembly.

Oxygen Filler Valve.

The pilot's and copilot's oxygen systems are refilled at the oxygen filler valve. This valve is located on the lower left side of the fuselage nose section, beneath an access panel.

Portable Oxygen Bottle Rechargers.

The portable oxygen bottles provided for the pilot and copilot may be recharged at the portable bottle recharger points at each pilot's station. A portable oxygen bottle (figures 1-39 or 1-40) is mounted aft of each pilot's seat. Plugging a portable bottle into the recharger unit will recharge the bottle up to system pressure. On some aircraft, an additional portable oxygen bottle recharger point is provided on the cargo compartment forward bulkhead to the right of the oxygen compartment entrance.

Oxygen Indicators.

An oxygen pressure gage (figures 1-58 and 4-23) is located on the pilot's, copilot's, and navigator's instrument panels. These pressure gages show the oxygen pressure available for use. Since the pilot's and the copilot's oxygen systems are independent of each other, each gage will indicate in psi the pressure in its related system. The navigator's pressure gage indicates the pressure existing in the copilot's oxygen system. For satisfactory operation of the system, the gage should read from 100 pounds minimum to 425 pounds maximu. One blinker-type oxygen flow indicator (figures 1-58 and 4-23) is mounted on each pilot's instrument panel and on the navigator's instrument panel. This unit indicates by blinking action that oxygen is flowing to its respective oxygen mask.

NORMAL OPERATION OF OXYGEN SYSTEM.

Note

Only a demand oxygen mask should be used.

a. The diluter lever on the diluter demand regulator should always be set at the NORMAL OXYGEN position except under emergency conditions.

Note

Each crew member should check his oxygen regulator with the diluter valve first at the NORMAL OXYGEN position and then at the 100% OXYGEN position as follows: Remove mask and blow gently into end of the oxygen regulator hose as during normal exhalation. If there is a resistance to blowing, the system is satisfactory. Little or no resistance to blowing indicates a faulty demand diaphragm or diluter air valve.

EMERGENCY OPERATION OF OXYGEN SYSTEM.

a. With symptoms of the onset of anoxia, or if smoke or fuel fumes should enter the cabin, set diluter lever of the regulator to 100% OXYGEN.

b. If the demand regulator should become inoperative, open the emergency valve of the regulator by breaking safety wire and turning the red emergency knob counterclockwise.

WARNING

When use of 100% OXYGEN or the emergency valve becomes necessary, the pilot should be informed of this action. Use of 100% OXYGEN or opening of the emergency valve will reduce oxygen duration. After the emergency is over, set diluter lever to NORMAL OXYGEN.

NAVIGATION EQUIPMENT.

SLAVED GYRO MAGNETIC COMPASS SYSTEM.

The slaved gyro magnetic compass (J-2 compass system) combines the functions of both a directional gyro and a magnetic compass. The system consists of a remote compass transmitter installed in the left wing, a gyro unit, an amplifier unit, and an indicator. In the slaved position the compass is synchronized at all times with the earth's magnetic meridian by means of a remote compass transmitter. The remote compass transmitter is a pendulously mounted instrument which, by normally maintaining a horizontal position, accurately obtains its directional reading from the horizontal component of the earth's magnetic field. Information from the remote compass transmitter is sent to the flux valve synchro in the directional gyro control where it is compared with the position of the gyro. Any error between the two is transmitted to an amplifier where it is amplified and sent back to an electric motor in the directional gyro control. The motor drives the gyro until it is properly aligned with the remote compass transmitter and no error signal exists. At the same time, the pilot's heading indicator pointer and, on some aircraft, the navigator's indicator pointer follow the movements of the gyro and indicate the magnetic heading of the aircraft. The gyroscope furnishes an inertia force which maintains a stable, accurate reference for the indicator during course changes or maneuvers of the aircraft. Due to bearing friction, unbalance, and the earth's rotation, the gyroscope, and consequently the pointer, will tend to drift slowly. In the slaved condition, the pointer is automatically reset by the magnetic component of the system. However, in the unslaved condition when the instrument is used as a directional gyro, it cannot be reset and precession errors must be taken into consideration. The gyro magnetic compass system is also used to control the cards of the radio magnetic indicators. Power for operation of the slaved gyro magnetic compass system normally is obtained from the single-phase inverter, the pilot's or spare three-phase inverter and the 28-volt dc flight emergency bus.

COMPASS SIGNAL POWER AMPLIFIER.

A compass signal power amplifier is provided to permit the operation of several indicators by amplifying the magnetic compass signal from the remote compass transmitter and furnishing the necessary ac voltages for operation of the repeater indicators. The inputs to the compass signal power amplifier are the gyro magnetic compass signal and 115-volt ac 400-cycle, single-phase inverter. The outputs of the compass signal power amplifier are an amplified gyro magnetic compass signal capable of driving additional indicators and ac voltages (400-cycle, single-phase) of 26.5, 36, and 75 volts. These inputs are used to supply the necessary information and excitation for operating the navigational flight instruments. Refer to figure 4-20.

WARNING

With partial or complete loss of the ME-1A Compass Amplifier, it is possible to have erroneous indications on pilot's heading indicator, the ID-249 and the ID-250. There will be no "OFF" flags or warning lights displayed.

Distribution Of Amplifier Outputs.

The amplified gyro magnetic compass signal is applied to:

a. The stator of the heading (wind drift) autosyn of the course indicator (ID-249).

b. The stators of the card autosyns of the radio magnetic indicators (ID-250).

c. The stator of the differential synchro generator of the bearing converter (ID-251).

d. The stator of the differential synchro transmitter of the azimuth indicator (ID-307), on aircraft equipped with TACAN.

e. The stators of the pointer autosyn in the pilot's directional indicator and the navigator's heading indicator (on aircraft equipped with a navigator's station).

The 26.5 volts ac output is applied to:

a. The rotor of the heading (wind drift) pointer autosyn of the course indicator (ID-249).

b. The rotors of the card autosyn of all radio magnetic indicators (ID-250).

c. The rotors of the No. 2 pointer autosyn of both radio magnetic indicators (ID-250) on aircraft with single radio compass installation.

d. The rotor of the No. 2 pointer autosyn of the pilot's radio magnetic indicator (ID-250) on aircraft with dual radio compass installation.

e. The fixed phase of the two-phase motor of the bearing converter.

f. The VOR receiver, where this voltage is used to power the circuit which drives the variable phase of the reversible motor in the bearing converter.

g. The stator of the fundamental synchro resolver of the azimuth indicator on aircraft equipped with TACAN.

On aircraft modified in accordance with TCTO 1C-123B-628, the 26.5 volts ac output is applied to:

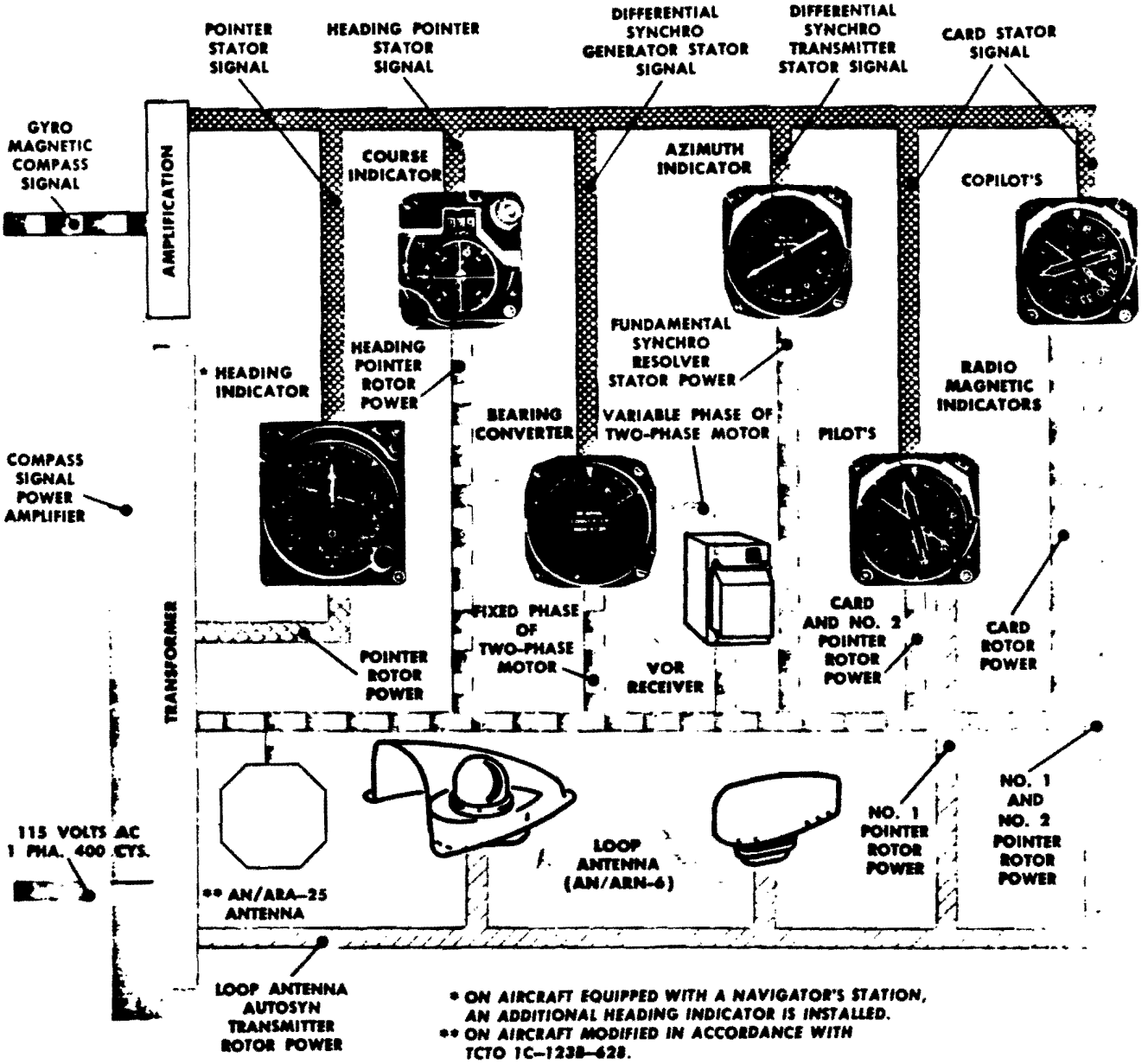
a. The rotor of the heading (wind drift) pointer autosyn of the course indicator (ID-249).

compass signal power AMPLIFIER FUNCTIONS

(POWER AND SIGNAL DISTRIBUTION)

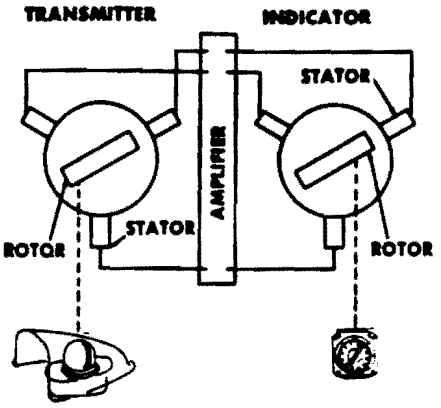
NOTE:

The configuration illustrated below represents the arrangement of instruments with dual radio compass and TACAN installed. On aircraft without TACAN, the arrangement is identical except that no azimuth indicator is supplied. On aircraft with only one radio compass, the inputs to the copilot's radio magnetic indicator are the same as the inputs to the pilot's rather than as shown below and only one loop antenna is supplied. On aircraft modified in accordance with TO 1C-123B-628, the inputs to the copilot's radio magnetic indicator are the same as the inputs to the pilot's whenever UHF direction finding is selected.



** ON AIRCRAFT EQUIPPED WITH A NAVIGATOR'S STATION, AN ADDITIONAL HEADING INDICATOR IS INSTALLED.*

*** ON AIRCRAFT MODIFIED IN ACCORDANCE WITH TCTO 1C-123B-628.*



The autosyn instruments require, on the rotor of both the transmitter and indicator, a constant operating power which is obtained from a transformer in the compass signal power amplifier. The signal from the transmitter of the gyro magnetic compass system is fed into the compass signal power amplifier where it is amplified and applied to the appropriate stators of the heading indicators (pilot's and navigator's), course indicator, radio magnetic indicators, azimuth indicator and the bearing converter. The signal applied to the stators of the indicators creates a magnetic field identical to that of the transmitter and causes the rotors of the indicators to assume the same position as the rotor of the transmitter. The rotors of the indicators are mechanically connected to the pointer or card on the instrument. A compound instrument with a movable card and one or more pointers, will contain several autosyn indicators, each of which must receive its proper power or signal. Failure of either the power or signal may, therefore, render such an instrument either partially or completely inoperative, depending upon the components of the instrument affected by the power failure.

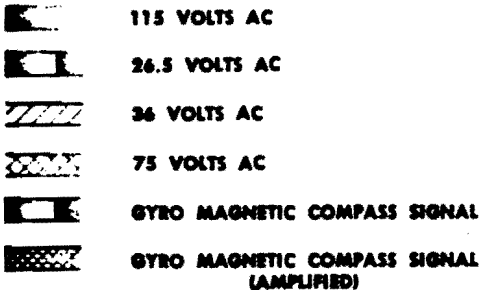


Figure 4-20 17648

b. The rotors of the card autosyns of all radio magnetic indicators (ID-250).

c. The rotors of the No. 2 pointer autosyns of both radio magnetic indicators (ID-250) on aircraft with single radio compass installation.

d. The rotor of the No. 2 pointer autosyn of the pilot's radio magnetic indicator (ID-250) on aircraft with dual radio compass installation.

e. The rotor of the No. 2 pointer autosyn of the copilot's radio magnetic indicator (ID-250). on aircraft with dual radio compass installation, whenever UHF direction finding is selected.

f. The rotor of the synchro generator of the UHF directional antenna.

g. The fixed phase of the two-phase motor of the bearing converter.

h. The VOR receiver, where this voltage is used to power the circuit which drives the variable phase of the reversible motor in the bearing converter.

i. The stator of the fundamental synchro resolver of the azimuth indicator on aircraft equipped with TACAN.

The 36-volt ac output is applied to:

a. The rotors of the autosyns in the loop antenna position transmitters.

b. The rotors of the No. 1 pointer autosyns of the radio magnetic indicators (ID-250).

c. The rotor of the No. 2 pointer autosyn of the copilot's radio magnetic indicator (ID-250) on aircraft with dual radio compass installation, except when UHF direction finding is selected on aircraft modified in accordance with TCTO 1C-123B-628.

The 75-volt ac power output of the compass signal power amplifier is applied to the rotor of the pointer autosyn in the pilot's heading indicator and the navigator's heading indicator (on aircraft equipped with navigator's station).

Emergency Operation.

Emergency operation of the compass system will depend on the cause of the failure. A failure of one of the three components (remote compass transmitter, compass amplifier, or indicators) or of power sources (single-phase or three-phase) will cause the compass system to fail. Proper operation of power sources can be determined by observing engine pressure instruments (single-phase power) and switching to an alternate source of three-phase power. If single-phase power has been lost, the pilot's heading indicator should continue to function using an unamplified signal from the remote compass transmitter and one phase of the three-phase inverter powering the pilot's instruments. If the change-over relay has failed to effect this mode of operation, the change may be made manually by positioning the remote compass switch (on the left wheel well) to THREE-PHASE EMERGENCY.

Positioning the remote compass switch to THREE-PHASE EMERGENCY will also bypass portions of the compass amplifier. If the amplifier has failed, the

pilot's indicator may return to normal operation; however, all other heading instruments will be inoperative (RMI card etc.).

As a last resort, the compass may be unslaved causing the pilot's instrument to become a gyro heading indicator that will precede like any other gyro. This will restore partial operation in the event of failure in the remote compass transmitter.

If changing to alternate power sources and onslaving the instrument has no effect, the failure probably cannot be corrected and further operations will have to be conducted with reference to the stand-by magnetic compass.

Remote Compass Switch.

A two-position remote compass switch (figure 4-21) is mounted on the ac circuit breaker and relay panel at the left wheel well. Switch positions are SINGLE-

PHASE NORMAL and THREE-PHASE EMERGENCY. In the SINGLE-PHASE NORMAL position, the slaved gyro compass system receives single-phase power from the single-phase inverter. If the single-phase inverter should fail, an automatic changeover is accomplished, permitting single-phase power from one winding of the three-phase inverter (pilot's or spare, whichever is operating) to supply single-phase power to the slaved gyro compass system. However, if the changeover does not occur because of relay failure, placing the remote compass switch to the THREE-PHASE EMERGENCY position will manually accomplish the changeover which is normally accomplished automatically. These emergency provisions restore only the pilot's heading indicator. The navigator's heading indicator, radio magnetic indicators and heading pointer of the course indicator become inoperative should single-phase inverter failure occur or the remote compass switch be placed in the THREE-PHASE EMERGENCY position.

Pilot's Heading Indicator.

The pilot's heading indicator is an autosyn instrument in which the pointer moves with respect to the card. The card is calibrated at intervals of two degrees, with the compass directions N, E, S, and W marked. The card and pointer may be manually rotated simultaneously, but not separately, by a knob to bring any desired calibration of the card to any position on the dial. Eight equally-spaced stationary bezel marks on the dial serve as indices for the card; conventionally, the top bezel mark is considered to represent the heading of the aircraft and serves as a lubber line. The stator of the pointer autosyn is attached to and moves with the card. The stator is energized by the gyro magnetic compass signal which it receives normally from the compass signal power amplifier. The rotor of the pointer autosyn normally uses 75-volt ac power from the compass signal power amplifier. In the event of failure of the single-phase inverter, the pilot's heading indicator is automatically supplied power from alternate sources: the stator receives the gyro magnetic compass signal directly from the directional gyro control and the rotor is supplied 115-volt single-phase ac power from one-phase of the pilot's or spare three-phase inverter depending upon which three-phase inverter is operating to supply the pilot's instruments. In the event of failure of the compass signal power amplifier without failure of the single-phase inverter, the pilot's heading indicator will be inoperative unless the remote compass switch is positioned to THREE-PHASE EMERGENCY, by which action the alternate power sources are permitted to supply the instrument. The slaved gyro magnetic compass system and the pilot's or spare (as alternate for pilot's) three-phase inverter operate from the flight emergency bus; therefore, unless this equipment fails, the pilot's heading indicator is operable as long as any source of electrical power is available on the aircraft. In the event the remote compass transmitter of the slaved gyro magnetic compass system fails, the pilot's heading indicator may still be used as a directional gyro by placing the slaving cutouts switch to OUT. When using the pilot's heading indicator as a directional gyro only, it is necessary to keep in mind that gyro precessional errors will be introduced over an extended time, and the pointer of the instrument cannot be manually reset to show magnetic heading readable from the card. The pointer may, however, be reset with respect to the bezel marks on the dial by rotating the card and pointer together.

Magnetic Slaved Operation.

a. Compass slaving cutout switch - IN.
b. Energize the compass system and allow a three-minute warm-up period.
c. Rotate the SET COURSE knob to set the dial index to the desired heading.

A constant heading can be flown by controlling the aircraft to keep the pointer aligned with the bezel index. Turns of 45, 90 or 180 degrees can be made by setting the dial index, with the overlapping pointer against the zero bezel index and flying the aircraft to align the pointer with the 45 and 90 degrees bezel indices on both sides of the zero index or with the index at 180 degrees. The final heading may be set against the zero bezel index by means of the SET COURSE knob.

Note

Errors of up to five degrees in heading will be introduced due to normal dive, climb, or bank.

Compass Slaving Cutout Switch.

A two-position slaving cutout switch (figure 1-58) is mounted on the pilot's instrument panel. Switch positions are IN and OUT. When this switch is positioned to IN, the pilot's heading indicator and, on some aircraft, the navigator's heading indicator are slaved to the flux gate transmitter; hence, the indicators show the aircraft's magnetic heading. In the OUT position, the indicators function merely as gyro directional indicators.

Note

If the aircraft electrical system is energized when the cutout switch is moved from OUT to IN, fast slaving of the indicator will not occur and it may require up to 20 minutes for the indicators to show an accurate heading. By toggling the pilot's three-phase inverter switch OFF and then ON, the fast slaving feature of the system is restored and the indicators should be properly aligned within approximately three minutes.

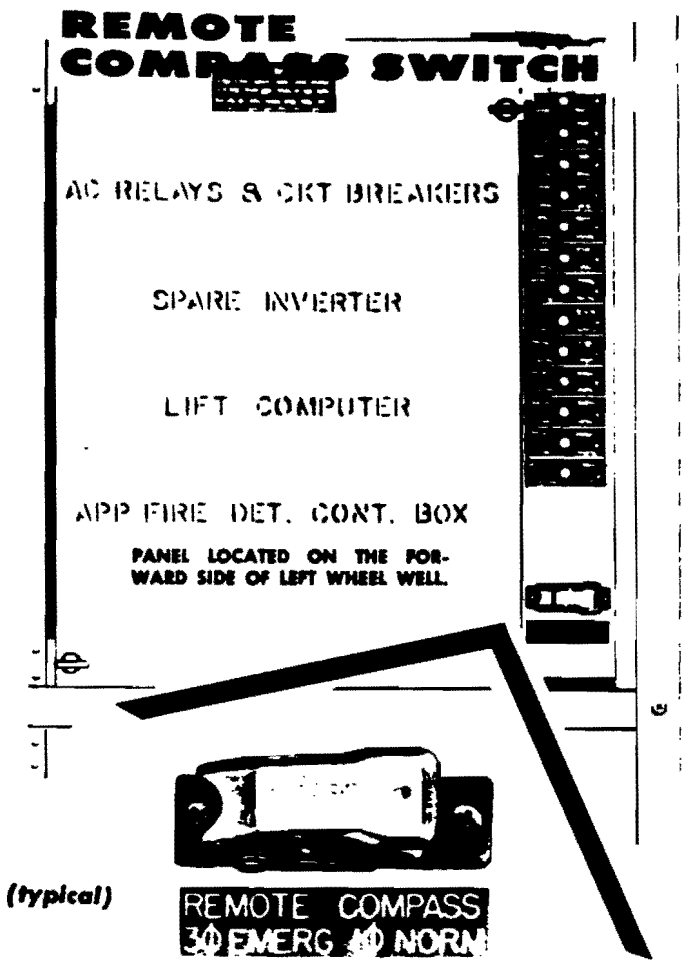


Figure 4-21 17762

Copilot's Heading Indicator.

The copilot's heading indicator is a directional gyro only and gives no magnetic heading information except that the card or pointer may be manually set by reference to the magnetic compass. The card is calibrated at intervals of five degrees and, by means of a knob, may be rotated simultaneously with the pointer to bring any desired calibration of the card to any position on the dial. A second knob permits positioning of the pointer with respect to the card. Since the copilot's heading indicator is not magnetically self-correcting, gyro precessional errors will be introduced over an extended period of time.

Navigator's Heading Indicator (Some Aircraft).

A type V-3 heading indicator, providing a continuous indication of the aircraft's magnetic heading, is mounted on the navigator's instrument panel. The dial is calibrated at two-degree intervals by dull black paint and at five-degree intervals by luminescent paint. Bezel index marks are provided at 0°, 45°, 180° and 315°. A knob on the indicator permits manual rotation of the dial and pointer simultaneously to any desired position. The heading indicator requires operation of the slaved gyro magnetic compass system and the compass signal power amplifier which employs 28-volt dc power, 115-volt single-phase ac power, and 115-volt three-phase ac power. The navigator's and pilot's heading indicators are connected in parallel as long as single-phase inverter power is available. Should single-phase ac power be lost, or the remote switch positioned to THREE-PHASE EMERGENCY, the navigator's indicator will become inoperative even though the pilot's indicator continues to function. Positioning the slaving cutout switch to OUT will simultaneously convert both the pilot's and navigator's heading indicators to directional gyros rather than magnetic bearing indicators.

Bearing Converter.

The bearing converter (ID-251) is not strictly a flight instrument and is installed in the radio compartment. This instrument combines the information furnished by the slaved gyro magnetic compass with that of the VOR equipment; its outputs are from these sources and the compass signal power amplifier. Loss of any of this equipment will cause the bearing converter to become inoperative; consequently, the VOR function of the VOR bearing pointers will become inoperative. The bearing converter indicates the magnetic bearing of the VOR station from the aircraft without regard to the aircraft's heading. On aircraft with a single radio compass installation the indication of the bearing converter and the VOR bearing pointer of both the pilot's and copilot's radio magnetic indicators will be the same. On aircraft with dual radio compass installation, the indication of the bearing converter and the VOR bearing pointer of the pilot's radio magnetic indicator will be the same.

Azimuth Indicator (Some Aircraft).

The azimuth indicator (ID-307), calibrated at two-degree intervals, is installed below the TACAN receiver-transmitter on the cargo compartment bulkhead or on the navigator's instrument panel. This instrument responds to TACAN equipment and provides a visual indication of the magnetic bearing of the beacon from the aircraft without regard to aircraft heading. On single-compass aircraft, the information is transmitted to the No. 2 pointers of the radio magnetic indicators (pilot's only on dual-compass aircraft), and through a phase-detecting network to the course deviation indicator and TO-FROM indicator of the course indicator whenever TACAN is selected. Failure of the TACAN equipment will render the azimuth indicator and, consequently, the instruments to which it supplies information, inoperative.

To avoid error, whenever TACAN equipment is operating but the desired beacon is not being received, the pointer of the indicator "searches" by rotating at a speed which prevents reading. When the beacon signal is received, the pointer will "track" or indicate the bearing of the beacon from the aircraft. Loss of either ac or dc secondary bus power as well as a malfunction of the TACAN equipment will render the azimuth indicator inoperative.

NAVIGATOR EQUIPMENT. (Some Aircraft).

A navigator's station (figure 4-22) comprising a seat, a worktable, an instrument panel, an electronic equipment rack, stowage compartment, assist straps, and facilities for interphone, oxygen, ventilation, and lighting is provided in the forward cargo compartment above floor level on the right hand side of the aircraft. A periscopic sextant mount is incorporated in the forward ditching hatch assembly and provisions for a driftmeter are installed in the oxygen compartment. A section of the worktable is hinged to permit stowing when not in use.

INDICATORS (Some Aircraft).

The navigator's instrument panel contains a true airspeed indicator, a heading indicator, a TACAN azimuth indicator (installed or provided for), indicators for oxygen flow and oxygen cylinder pressure. The airspeed indicator is operated by the pitot-static system; the oxygen indicators, by the oxygen system. These instruments require no electrical power. The TACAN azimuth indicator (ID-307) and navigator's course indicator require operation of the appropriate electronic equipment.

DRIFTMETER (Some Aircraft).

Provisions are included for the installation of a type B-3 or B-6 driftmeter (figure 4-24) in the oxygen compartment, accessible for use from the oxygen compartment entrance. An ON-OFF switch (figure 4-23) on the navigator's switch panel supplies 115-volt, three-phase ac power from the copilot's or spare three-phase inverter to operate the driftmeter.

Note

Should the copilot's three-phase inverter fail, the spare inverter will automatically assume the load, unless failure of the pilot's three-phase inverter requires the output of the spare inverter to supply the pilot's instrument power requirements.

An amber light (figure 1-58) on the copilot's instrument panel indicates by glowing that the driftmeter is in the extended position. A handrail is provided for the support of the navigator while using the equipment.

Driftmeter Preparation.

To extend the driftmeter, the lever protruding from the forward portion of the mount should be positioned and held outboard with one hand while the other hand supports and rotates the driftmeter counterclockwise. When the key on the telescoping tube engages its keyway, the driftmeter may be lowered until it bottoms. Care should be exercised to lower the driftmeter gently. To retract the driftmeter, draw it vertically upward to the limit of travel and rotate the instrument clockwise. To check that the driftmeter has automatically locked in the retracted position, attempt the extension procedure without using the lever; the instrument should not rotate nor extend when locked.

CAUTION

To prevent damage to the driftmeter and/or nose gear door, the driftmeter should not be extended at any time the landing gear is down.

Driftmeter operation (B-3):

a. Turn driftmeter switch ON.
b. Turn gyro switch ON and allow three to five minutes before caging.
c. Pull out caging knob to uncage gyro.

CAUTION

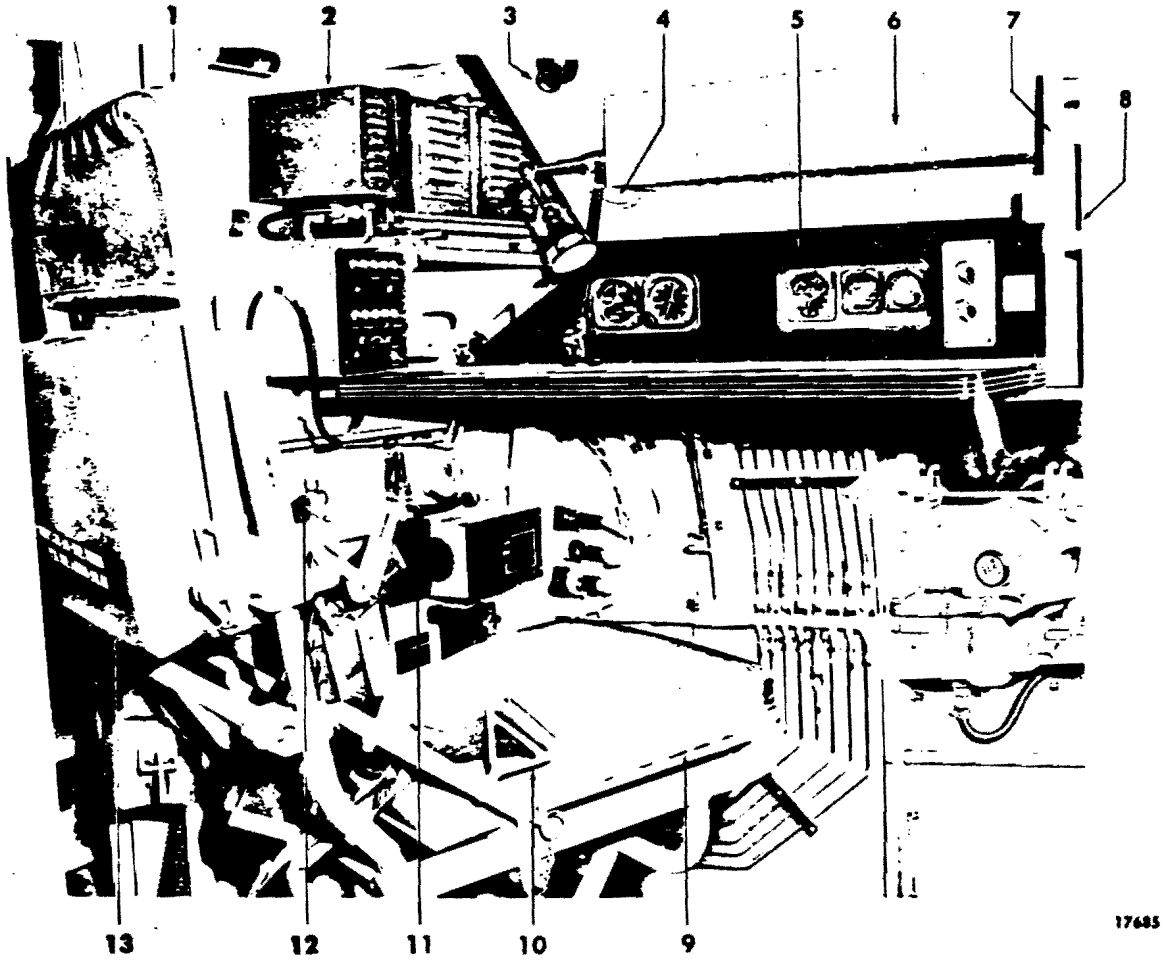
Do not engage gyro during taxiing, take-off, landing or turns.

Cage gyro before driftmeter is tipped more than 15 degrees from the vertical.

d. Always cage gyro before switching off power to the instrument and keep caged when not in use.
e. Adjust reticle lights rheostat for desired illumination.
f. Adjust eyepiece adjusting ring.
g. Cage gyro upon completion of driftmeter observations.
h. Turn gyro switch OFF.

Driftmeter Operation (B-6):

a. Turn driftmeter switch ON.
b. Turn rotary switch ON.
c. Adjust reticle lights rheostat as desired (DIM or BRIGHT).
d. After switch has been on for ten minutes, turn the caging knob to the left to uncage gyro.



navigator's STATION

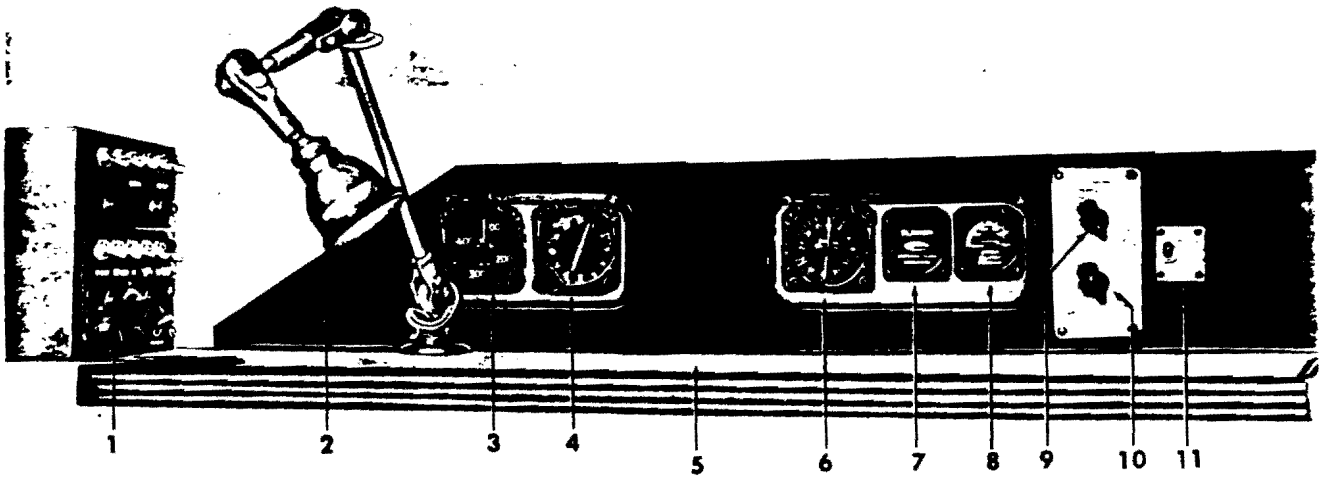
1. SEAT BACK REST
2. TACAN RECEIVER-TRANSMITTER
3. VENTILATOR
4. NAVIGATOR'S STATION LIGHT
5. INSTRUMENT PANEL
6. MAP AND CHART CASE
7. STOWAGE RACK
8. LORAN SET RECEIVER
9. NAVIGATOR'S SEAT
10. SAFETY BELT (NAVIGATOR'S SEAT)
11. SAFETY BELT (SEXTANT SEAT)
12. OXYGEN REGULATOR
13. SEXTANT SEAT (WHEN TIPPED HORIZONTAL)

Figure 4-22

CAUTION

Do not uncage gyro during taxiing, take-off, landing, or when pitch or roll exceeds 36 degrees.

e. Pull out the azimuth drive knob and move shaft through keyway to disengage the gear to obtain the desired line-of-sight.
f. Turn filter selector knob to desired setting.
g. Adjust eyepiece ring to obtain clarity of focus.
h. Push azimuth drive knob in and turn to obtain fine adjustment.



1. INTERPHONE PANEL
2. WORKABLE SWIVEL LIGHT
3. AIRSPEED INDICATOR
4. HEADING INDICATOR
5. WORKTABLE
6. AZIMUTH INDICATOR
7. OXYGEN FLOW INDICATOR
8. OXYGEN PRESSURE GAGE
9. INSTRUMENT AND INTERPHONE PANEL LIGHTS RHEOSTAT
10. WORKABLE SWIVEL LIGHT RHEOSTAT
11. DRIFTMETER SWITCH

17683

NAVIGATOR'S INSTRUMENTS

Figure 4-23

PERISCOPIC SEXTANT.

A perscopic sextant (figure 4-25) is provided in the aircraft for the purpose of celestial navigation. A mount, to accommodate the sextant, is installed in the forward ditching hatch above the navigator's station. The back of the navigator's seat is designed to be tipped into the horizontal position and is adjustable in height to provide a seat for the navigator while using the sextant. On aircraft without a navigator's seat, a platform is provided to attach at the crew compartment entrance for the navigator to stand on while using the sextant. Leather assist straps adjacent to the hatch are installed for the navigator's convenience. An ON-OFF switch (figure 4-25) on the sextant mount assembly controls the 28-volt dc power input from the primary bus necessary to illuminate the equipment.

To insert the sextant, employ the following procedure:

a. With the line-of-sight locking lever on mount unlocked, insert the sextant as far as possible with arrows on tube and mount aligned.

b. Hold the sextant firmly to prevent dropping and rotate the lower ring of mount counterclockwise (looking up, toward mount) until it hits a stop.

c. Pull out knob marked, TO INSERT, REMOVE-PULL.

d. Rotate lower ring on mount further allowing knob to seat itself. Be sure the sextant can not rotate in either direction with the line-of-sight locking lever locked.

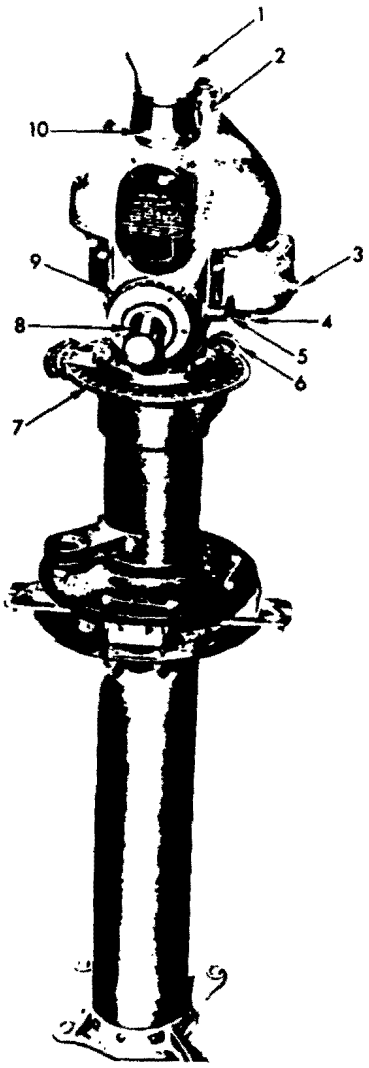
Note

The provision of stops in the retracted position of the sextant is intended only to prevent its being dropped during insertion or removal. It is not advisable to leave the sextant in the retracted position for any extended period, particularly during rough weather. When the sextant is removed from the mount, it should be returned to the carrying case and secured.

e. Open the mount shutter with lever.

f. Insert sextant further until knob, marked TO RETRACT SEXTANT - PULL, snaps into place.

g. Make connections between the mount and the sextant with the electrical cable.

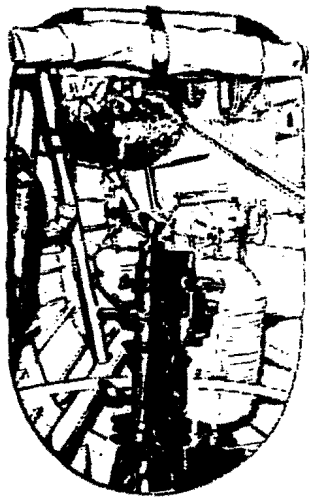


B-3 DRIFTMETER

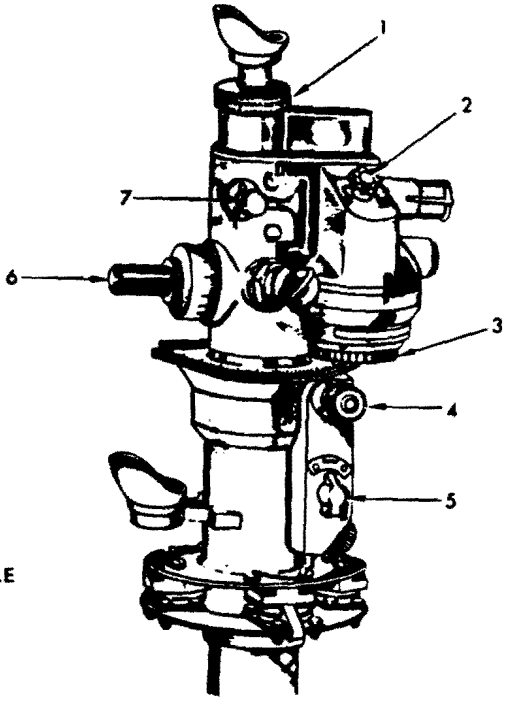
1. EYEPIECE
2. RHEOSTAT KNOB
3. PUSH-BUTTON SWITCH
4. GYRO CAGING KNOB
5. SHADE GLASS LEVER
6. SLOW-MOTION KNOB
7. AZIMUTH SCALE
8. LINE OF SIGHT HANDLE
9. LINE OF SIGHT DIAL
10. EYEPIECE ADJUSTING RING
11. GYRO SWITCH (NOT SHOWN)

NOTE

LOCATED ON RIGHT SIDE ABOVE THE GYRO CAGING KNOB.



OXYGEN COMPARTMENT



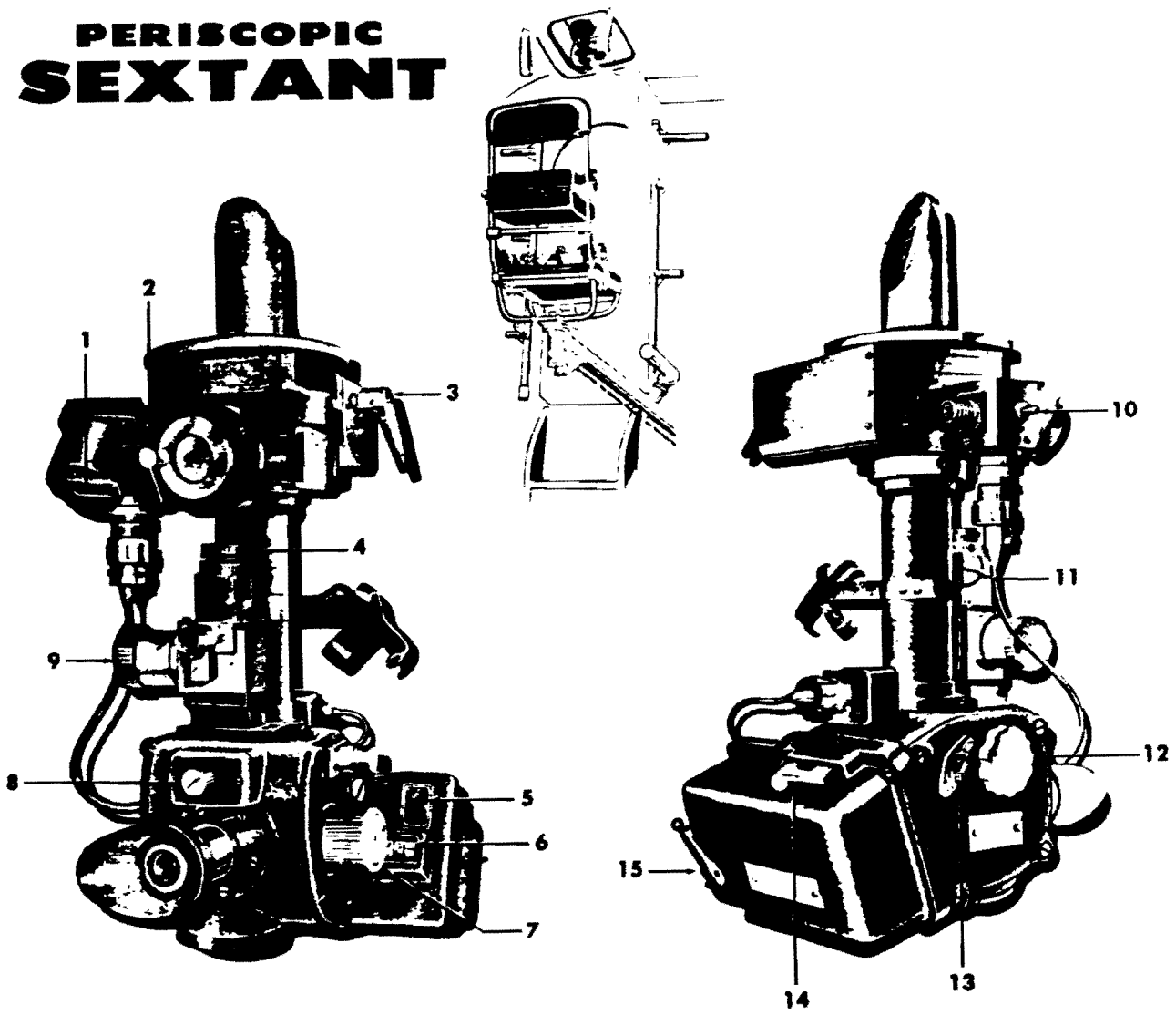
B-6 DRIFTMETER

1. EYEPIECE ADJUSTMENT RING
2. RETICLE LIGHT SWITCH
3. GYRO CAGING KNOB
4. AZIMUTH DRIVE KNOB
5. ROTARY SWITCH
6. LINE OF SIGHT HANDLE
7. FILTER SELECTOR KNOB AND HANDLE

DRIFTMETER INSTALLATION

Figure 4-24

PERISCOPIC SEXTANT



1. AZIMUTH COUNTER
2. AZIMUTH CRANK
3. SHUTTER LEVER
4. PROJECTION LENS
5. HALFTIME DIAL AND AVERAGER
6. ALTITUDE COUNTER
7. ALTITUDE KNOB
8. LAMP RHEOSTAT
9. BUBBLE CONTROL KNOB
10. ILLUMINATION SWITCH
11. DIFFUSER LEVER
12. FILTER ADJUSTMENT SELECTOR
13. DESICCANT
14. AVERAGER ACTUATING LEVER
15. AVERAGER WINDING LEVER

Figure 4-25

To remove the sextant employ the following procedure:

a. Turn switch to the OFF position, and disconnect the electrical cable.

b. Holding the sextant securely with one hand, pull out knob marked, TO RETRACT SEXTANT-PULL and lower the sextant to the retracted position.

c. Close the mount shutter.

d. Holding the sextant securely with one hand, pull out knob marked, TO INSERT, REMOVE-PULL and rotate the lower ring on the mount counterclockwise until arrows on tube and mount are aligned.

e. Sextant will then be free to be lowered until completely removed.

f. Return it to the carrying case and secure as shown.

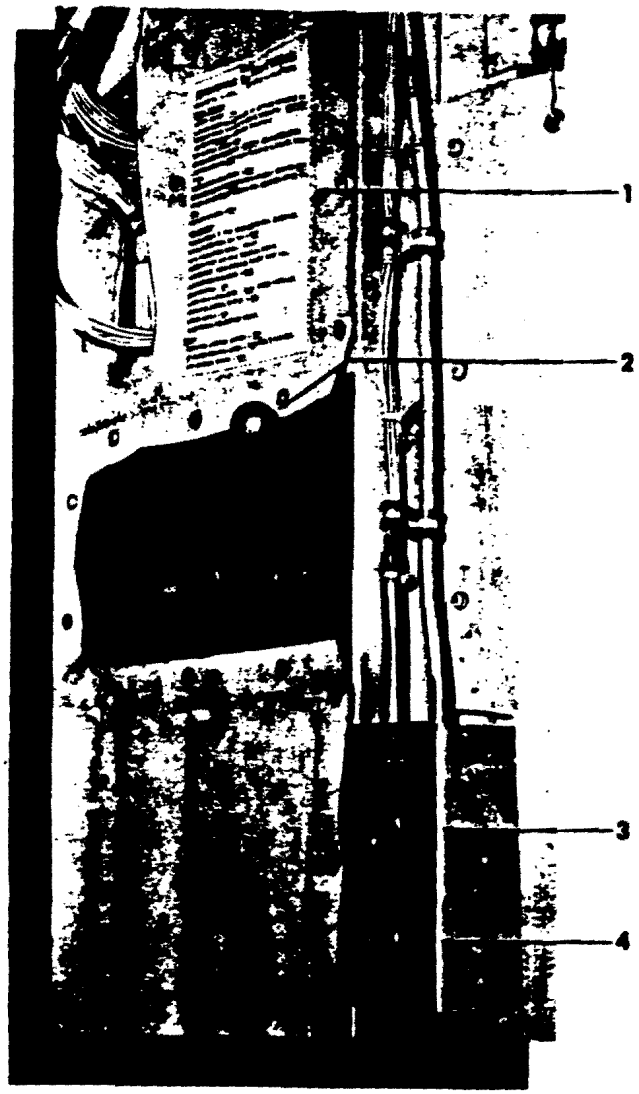
CAUTION

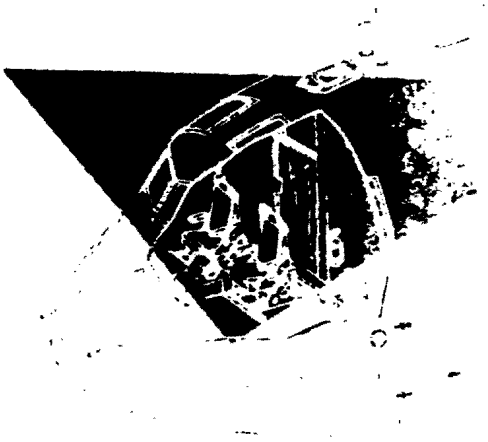
Before replacing sextants in the carrying case always press actuating lever or button, allowing the averager to run down and always rotate bubble knob to maximum increase position.

AUXILIARY POWER UNIT.

A type D-2, auxiliary power unit, (figure 4-28) shock-mounted in an enclosure directly above the right main landing gear wheel well, provides an additional source of dc electrical power.

. . . . APU CONTROLS





TYPICAL

1. OPERATING INSTRUCTIONS
2. APP GOVERNOR LEVER
3. APP IGNITION SWITCH
4. APP STARTER SWITCH

Figure 4-26

17603

APU COMPONENTS.

The unit consists of a two-cylinder, 10-horsepower internal combustion engine which drives a 200-ampere dc generator adjusted to 27 volts output. Although the APU generator is rated at 200 amperes, only 175 amperes are available due to horsepower limitations of the engine. The engine is a four-cycle, V-type, gasoline engine in which are incorporated a shielded ignition system, manual cranking system, air induction system, self-contained oil system and an air cooling system. The APU control panel, on some aircraft, is installed on the APU unit and is accessible through the access door provided on the APU compartment cover. On other aircraft, the APU control panel is located on the crew compartment bulkhead immediately aft of the copilot's seat. Fuel for operation of the APU (figure 4-27) is obtained from the right engine fuel supply line. Refer to Servicing, (figure 1-62) for fuel and oil specification and grade.

APU OPERATION.

The APU may be started either electrically or manually. Whenever the flight emergency bus is energized, the generator may be utilized as a starting motor. In-flight electrical starting of the APU from

battery power after all generator output has been lost should not be employed, in order to conserve the battery for operating essential flight instruments. Starting the APU without electrical power is accomplished by a manual cranking system. Since the APU engine is not supercharged, the power output of the engine is inversely proportional to the altitude at which it is being operated; as the altitude increases, the power output decreases. At an altitude of 10,000 feet under standard day conditions, the power output, for example, decreases to approximately nine horsepower. A similar reduction in the output of the generator results. Starting, likewise, is affected by altitude; above 10,000 feet normal starting operations are prolonged and manual starts become increasingly difficult. The altitude compensator valve on the carburetor, when turned to the setting nearest the altitude at which the aircraft is being operated, will facilitate APU operation at altitude by controlling the fuel/air mixture. Operationally, the APU is used as an alternate source of electrical power for starting the aircraft's engines, to supply power for essential equipment after failure of the engine generators in flight, and as a precaution against electrical power loss due to engine generator failure during take-offs and landings. The APU may also be operated to charge the battery and to supply power for electrical equipment during ground checking procedures when the engines are not running. However, it is desirable to use an external power source whenever possible rather than run the APU unnecessarily.

APU Governor Lever.

The governor lever (figure 4-26) on the APU control panel is mechanically connected to the APU carburetor and functions as a throttle to control engine speed. Lever positions are CHOKE, IDLE, and RUN and the lever is movable through 180° travel. The CHOKE position of the lever is utilized in starting; the IDLE position, for warm-up and standby operation. For normal operation at the unit's rated power, the lever is placed full right to the RUN position. Intermediate positions of the lever vary the speed of the unit because the lever acts as a throttle in this range. However, operation in some intermediate position is not recommended because no lever locking device is provided and vibration may cause the lever to return to the IDLE position.

APU Ignition Switch.

The APU ignition switch (figure 4-26), located on the APU control panel, is a two-position switch with OFF and ON positions. When the switch is turned to ON, the output of the APU magneto is permitted to energize the spark plugs. Positioning the switch to OFF will ground the output of the magneto and shut down the APU.

APU Starter Switch.

The APU starter switch (figure 4-26), located on the APU control panel, is a three-position switch with START, OFF and ON positions. When the switch is positioned to START, the fuel solenoid opens and the generator is energized as a starting motor. In the OFF position, the fuel supply to the unit is shut off at the fuel solenoid but the engine will continue to run until the fuel in the line is depleted. The ON position of the starter merely permits the field control relay to be reset by the generator switch.

Note

Since the APU starter switch in the ON position does not hold the fuel valve open, it is necessary to operate the APU generator switch to RESET immediately after starting the APU. When the field control relay is reset the fuel solenoid valve is held open by the output of the APU generator.

APU Generator Switch.

The APU generator switch (figure 1-58) is mounted on the copilot's instrument panel. The three positions of the switch are RESET, OFF, and ON. The RESET position is a momentary-contact position which resets the field control relay thereby energizing the field windings of the APU generator and permitting the output of the APU generator to hold the fuel solenoid valve open until the relay is again tripped. On aircraft AF 54-552 through 55-4577, positioning the switch to ON will connect the output of the generator to the flight emergency dc bus; on subsequent aircraft, positioning the switch to ON will connect the output of the generator to the primary dc bus. When the switch is placed in OFF, generator output is excluded from the bus.

APU Generator Field Control Relay Button.

The APU generator field control relay button may be mechanically reset if the RESET position of the generator control switch fails to perform this function. The relays are located in the terminal junction box forward of the right wheel well. Manually depressing the reset button which protrudes from the case of the relay unit resets the relay.

Altitude Compensator Valve.

A three-position altitude compensator valve (figure 4-28) is provided on the carburetor of the auxiliary power unit to compensate for atmospheric conditions at altitude. The positions of this manually-operated valve are, 0, 5, and 10 for sea level, 5000 feet, and 10,000 feet, respectively. The pointer should be set directly opposite the setting nearest the altitude of operation.

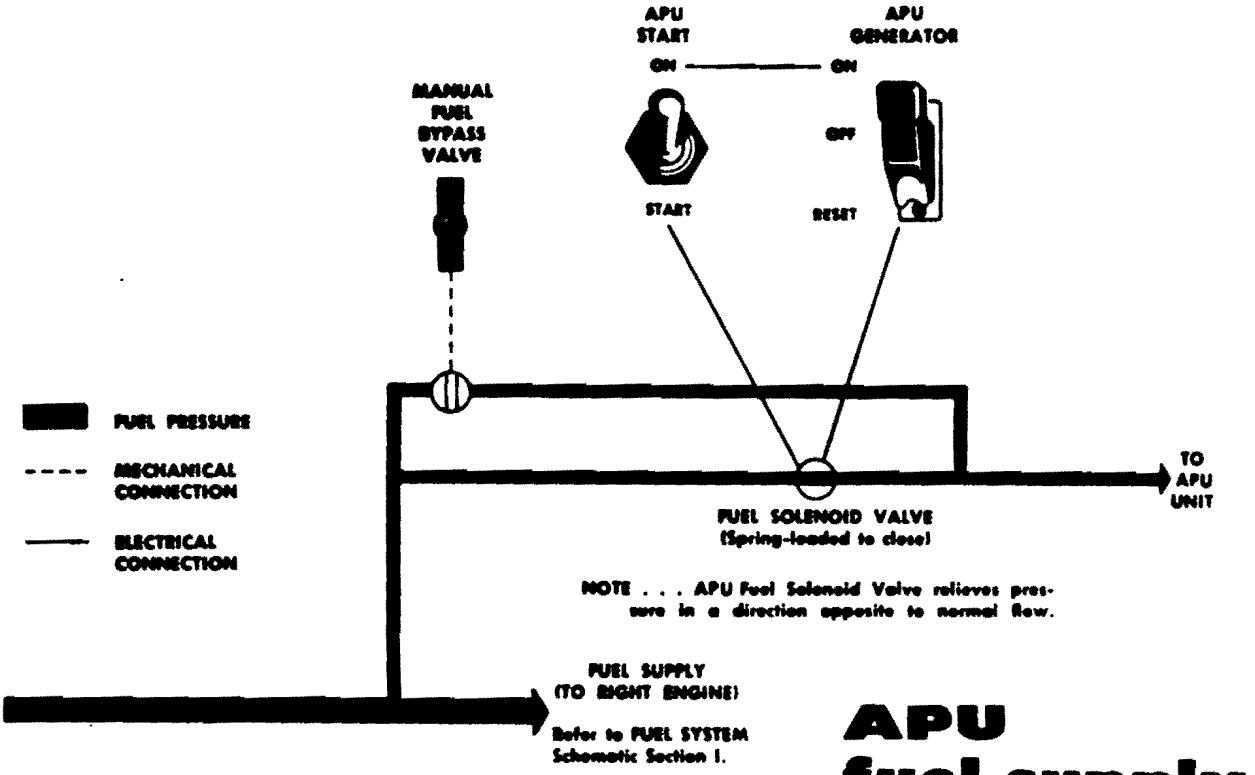


Figure 4-27

17613

Note

Do not set pointer in any intermediate position as the engine will not operate properly. The compensator valve is a disc valve with three different-sized orifices controlling vacuum in the carburetor float chamber. Intermediate positions do not align the orifices properly with the air passages of the carburetor.

Manual Fuel Bypass Valve.

The manual fuel bypass valve (figure 4-28) permits fuel to be supplied to the auxiliary power unit if the fuel solenoid in the APU fuel line should fail to open. The bypass valve is also used when the solenoid valve is not energized during manual starting of the APU. Located on the right side of the cargo compartment above the APU compartment ledge, the valve is manually turned to the OPEN position which offers an alternate path for the fuel to bypass the solenoid valve. In the CLOSED position, fuel for operation of the APU is controlled by the action of the solenoid valve.

APU Rewind Starting Handle.

A self-rewind starting handle is provided for manual starts of the APU. The handle is connected to a cable which, when pulled, will start the APU. This cable is coiled around a reel that is mounted on the crankshaft of the APU.

APU Generator Warning Light.

A red warning light (figure 1-58) on the copilot's instrument panel will glow whenever the APU generator field control relay is tripped. Thus, the light will illuminate during starting operations or at any time an overvoltage condition trips the overvoltage and field control relays disconnecting the APU generator from the dc bus.

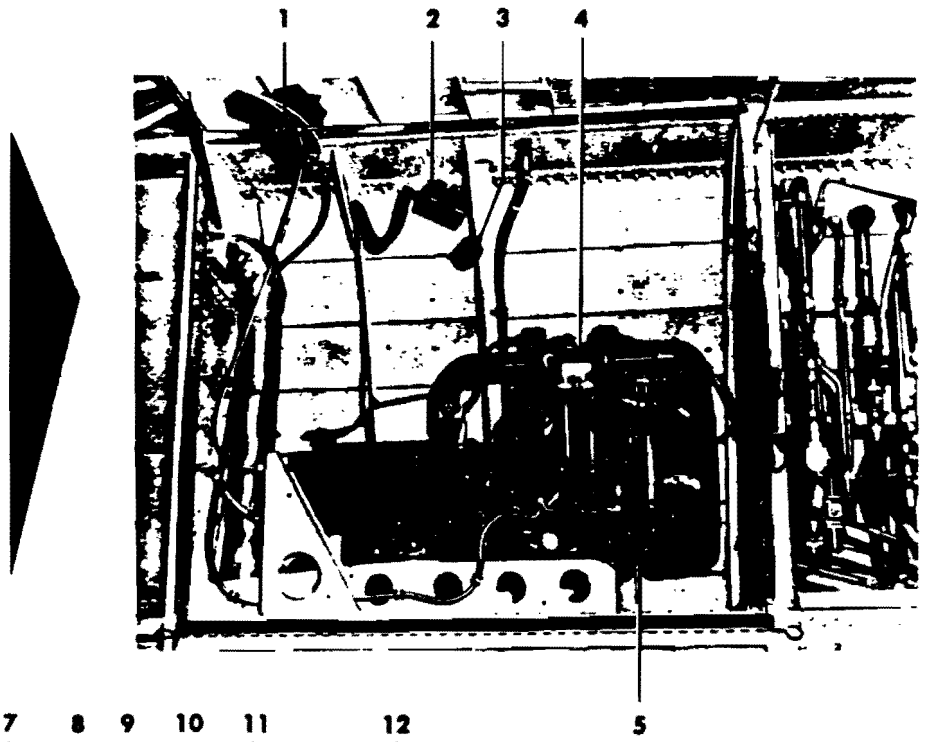
APU Loadmeter.

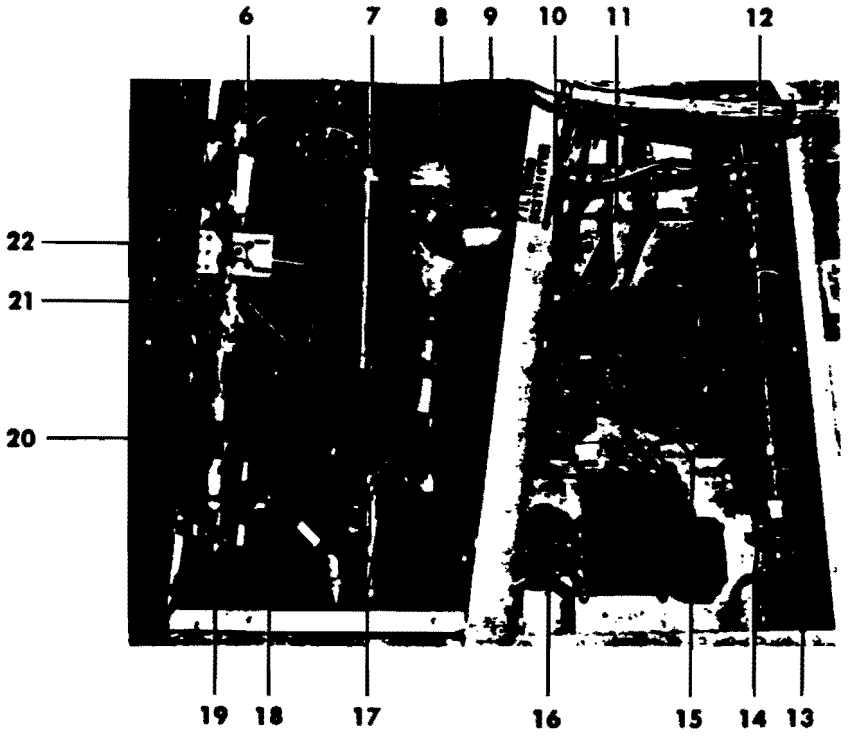
An APU generator loadmeter (figure 1-58) is mounted on the copilot's instrument panel. This meter indicates the percent of output of the generator as compared with the shunt value in the loadmeter circuit. On aircraft AF 54-552 through 55-4577, a 250-ampere shunt is used and a 0.4 loadmeter reading would indicate an output of 100 amperes. On subsequent aircraft a 200-ampere shunt is installed and a 0.4 reading would indicate an output of 80 amperes.

APU and HYDRAULIC POWER UNITS . . .

1. APP FUEL BYPASS VALVE
2. APP COMPARTMENT SPOTLIGHT
3. SPOTLIGHT RED LENS
4. ALTITUDE COMPENSATOR VALVE (BEHIND ROCKER BOX VENT)
5. APP MANUAL STARTING CORD WHEEL

(TYPICAL)





6. FILTER
7. SIGHT GAGE
8. HYDRAULIC RESERVOIR
9. HYDRAULIC FLUID FILLER POINT
10. RUDDER AND ELEVATOR LOCK RELEASE VALVE
11. RUDDER AND ELEVATOR LOCK SOLENOID VALVE
12. HYDRAULIC MAIN SYSTEM ACCUMULATOR
13. HYDRAULIC SYSTEM ACCUMULATOR PRESSURE GAGE
14. ACCUMULATOR AIR PRELOAD FILLER POINT
15. AUTOMATIC PRESSURE SWITCH
16. ELECTRICALLY-DRIVEN HYDRAULIC PUMP
17. HYDRAULIC RESERVOIR DRAIN VALVE
18. LANDING GEAR SOLENOID VALVE
19. LANDING GEAR MANUAL CONTROL BUTTONS
20. LANDING GEAR CONTROLLABLE CHECK VALVE
21. MAIN HYDRAULIC SYSTEM PRESSURE RELIEF VALVE
22. HYDRAULIC AIR PRESSURE VALVE

Figure 4-28

17604

APU Voltmeter Selector Switch And Voltmeter.

When the voltmeter selector switch (figure 1-58) on the copilot's instrument panel is placed in the APU position, the voltage output of the APU is indicated on the voltmeter (figure 1-43). The same instrument is also used to measure the output of the engine-driven generators and the voltage of the dc busses. Refer to ELECTRICAL SYSTEM, Section I.

Voltage Regulator Rheostat.

A voltage regulator located in the aft main electrical panel controls the voltage output of the APU generator. The regulator is placarded APU voltage regulator. The regulator is adjusted by a rheostat knob on the side of the regulator case. The APU voltage is adjusted to 27 volts. A precision voltmeter is used in setting the rheostat; however, the voltmeter mounted on the instrument panel may be used in an emergency.

CAUTION

Generator voltage adjustment is a ground maintenance item. The rheostat should normally not be adjusted during flight except as stated in Section III.

NORMAL OPERATING PROCEDURE.

To Start The Auxiliary Power Unit.

The following procedure should be employed when electrical power is available for starting the APU.

a. Battery switch - ON.

Note

The battery switch must be ON if the battery is to be used to start the APU. If external power is connected, the battery switch should remain OFF.

b. Voltmeter selector - APU.

c. Altitude compensator valve - Set.

Place valve at setting nearest the altitude at which the aircraft is being operated. Do not set pointer between altitude positions.

d. APU ignition - ON.

e. Governor - CHOKE, or as required.

CAUTION

Under no circumstances should the APU governor lever be advanced beyond IDLE (toward RUN) while the APU starter switch is in the START position. Failure to comply with this precautionary measure will cause an overvoltage condition which may possibly burn out all light bulbs that are turned on and disconnect the engine-driven generators from the bus.

f. Starter - START until engine is firing; then move to ON.

g. Generator - RESET, then OFF.

Note

If the noise level is such that it is impossible to determine aurally when the APU has started, place starter switch to START for approximately 10 seconds and then to ON. Turn APU generator switch to RESET momentarily, then OFF, and check voltmeter for approximately 15-20 volts which indicates APU is running. If no voltmeter reading is observed, repeat this procedure until the observed voltage indicates that the APU is operating. It should also be noted that the voltage indicated on the voltmeter when the starter switch is held in the START position does not mean the unit is operating; it is only an indication of the voltage applied for starting.

h. Governor - IDLE.

Note

The APU should be warmed for approximately two minutes in IDLE. Prior to turning the APU generator switch ON, allow engine to stabilize in the RUN position.

i. Governor - RUN.

j. Generator - ON.

To Stop The Auxiliary Power Unit.

The following procedure is recommended for shutting down the APU:

a. APU generator - OFF.

b. Governor - IDLE. Allow engine to idle approximately five minutes.

c. APU ignition - OFF.

d. APU start switch - OFF.

EMERGENCY OPERATING PROCEDURES.

Refer to Section III for Emergency Operating Procedures (Manual Starting).

CASUALTY CARRYING EQUIPMENT.

A total of 50 litters, six seated casualties, four medical attendants, and approximately 1000 pounds of supplies and medical equipment can be carried when the aircraft is used for ambulance purposes. On aircraft with a navigator's station installed, when a navigator is carried, a total of 46 litters and one less seated person may be transported since the navigator's position occupies the space of four of the litters and the navigator must occupy one of the troop seats during take-offs and landings. Litter support poles are stowed along the walls of the cargo compartment forward of the wheel wells. The litter poles may be easily removed from their stowed location for erection in the cargo compartment to support litters or center-row troop seats. Litter support straps are stowed overhead at appropriate locations throughout the cargo compartment. Floor fittings for litter pole erection are stowed at placarded locations along the side walls of the cargo compartment. On aircraft with a navigator's station installed, the litter pole for station 145 is in two sections connected by a removable pin. If a navigator is to be carried only the bottom half of the litter pole is installed.

TROOP CARRYING EQUIPMENT.

Provisions for the installation of removable one-man, two-man and three-man seats for 60 troops are made in the cargo compartment. The seats are removable but normally are folded against the side of the fuselage when not in use. Center seats and supporting structure are removed from the aircraft when troops are not being transported. All seats are equipped with safety belts. Troop seats will be left unoccupied for occupancy of flight mechanic, loadmaster and/or navigator during takeoff and landing.

WARNING

Unless necessary for the accomplishment of the assigned mission, the first two seats in each row aft of the front entrance door, or litter in this location, will not be utilized during take-off, landing, propeller overspeed, or other propeller malfunctions.

PARATROOP ANCHOR CABLES.

Paratroop anchor cable for troop jumps from the aft troop doors or for jumps from the open cargo ramp and door are provided along with the required installation facilities. For jumps from the troop doors, two cables extend aft on each side of the cargo compartment from the anchor cable attachment fitting to the spreader cable assembly. Aft of the spreader assembly, tensioning cables are routed outboard and aft to the fuselage sides. For jumps from the open cargo ramp and door, a cable extends aft on each side of the cargo compartment from the forward bulkhead.

STATIC LINE RETRIEVERS (Some Aircraft).

Two portable two-speed, 28-volt dc, electrically-driven, reversible winches (figure 4-28A) and accessory equipment are provided to retrieve static lines after troop jumps from the troop doors or cargo ramp. Each winch is protected against overoperation by a clutch set to slip at a pull of approximately 1500 pounds and against overheating by a thermal switch. The motor incorporates a radio noise suppressor. Fifty feet of one-eighth inch diameter cable is supplied on the spool. The cable terminates in a fork-type swaged fitting drilled to accommodate a pin. The electrical power lead is connected to the receptacle provided on the corresponding side wall of the cargo compartment near the forward bulkhead. The operation of the winch is controlled by a gear shift knob and a cable release knob mounted on the winch and a remote control head by which the winch may be electrically operated either to retrieve or to let out cable. The winch, without electrical power applied, will hold loads up to approximately 1500 pounds without reversing. The winch unit, excluding power leads, weighs 35 pounds.

GEAR SHIFT KNOB (Some Aircraft).

A gear shift knob protruding from the retriever gearbox permits selection of HIGH or LOW gear operation of the winch. High gear is capable of pulling 500 pounds at 30 fpm; low gear, 1000 pounds at ten fpm. High gear operation is normally satisfactory for retrieving 32 static lines while flying at 130 knots IAS. At higher airspeeds, or in an emergency, low gear should be used. It is necessary to stop the winch before shifting gears. Should difficulty be encountered in shifting gears, the winch should be energized momentarily in order to reposition the gears to permit proper meshing. A placarded NEUTRAL position is provided between the HIGH and LOW positions of the knob.

Winch Cable Release Knob (Some Aircraft).

The winch reel may be disengaged from the gear drive by pulling out the cable release knob located on the side of the retriever reel housing. This action permits the reel to turn freely so that the cable may be extended manually by pulling on it. Sufficient friction remains in the reel mechanism to prevent the spool from continuing to unwind after the pulling force is removed.

attaching STATIC LINE RETRIEVER

ATTACH RETRIEVER TO OUTBOARD TROOP DOOR JUMP ANCHOR CABLE FOR TROOP DOOR JUMPS AND TO RAMP JUMP ANCHOR CABLE FOR RAMP JUMPS.

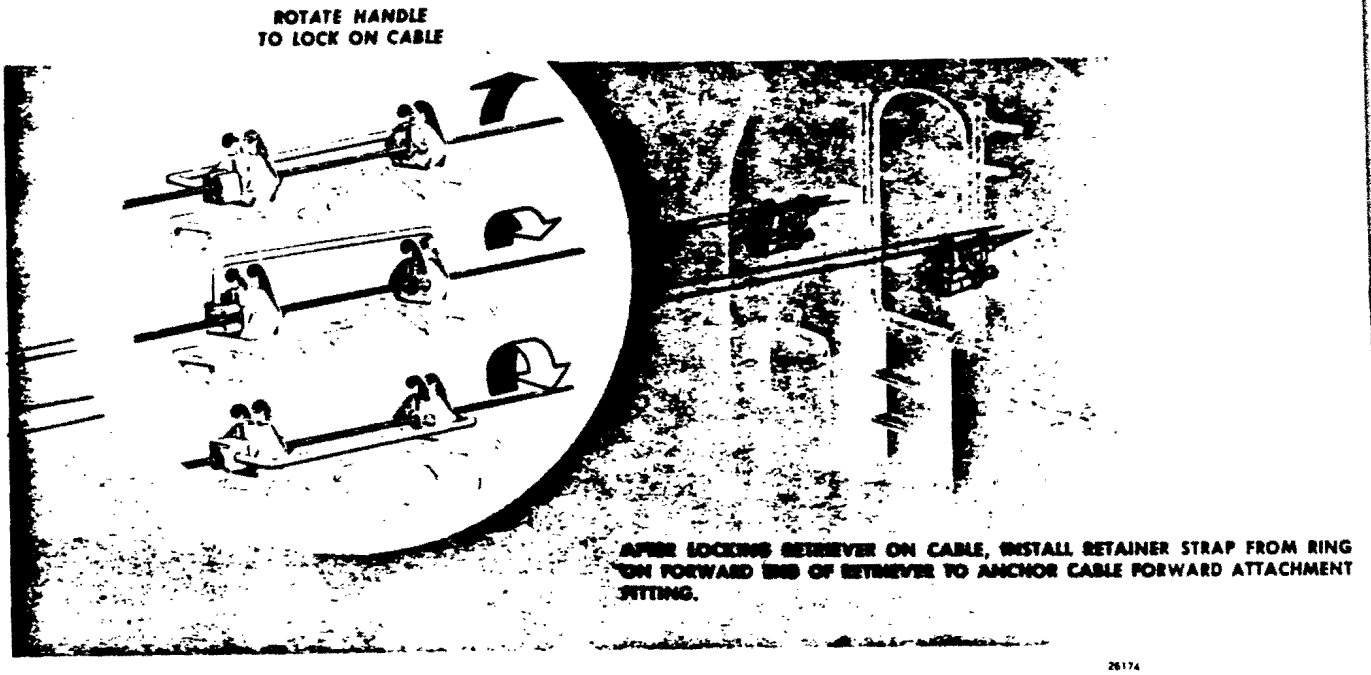


Figure 4-28A.

CAUTION

To prevent damage to the clutch mechanism do not engage nor release the cable while the winch is running. Never release the cable while it is under load since the cable will be permitted to real out at an ungoverned speed without the possibility of slowing travel or re-engagement of the clutch.

Remote Control Head (Some Aircraft).

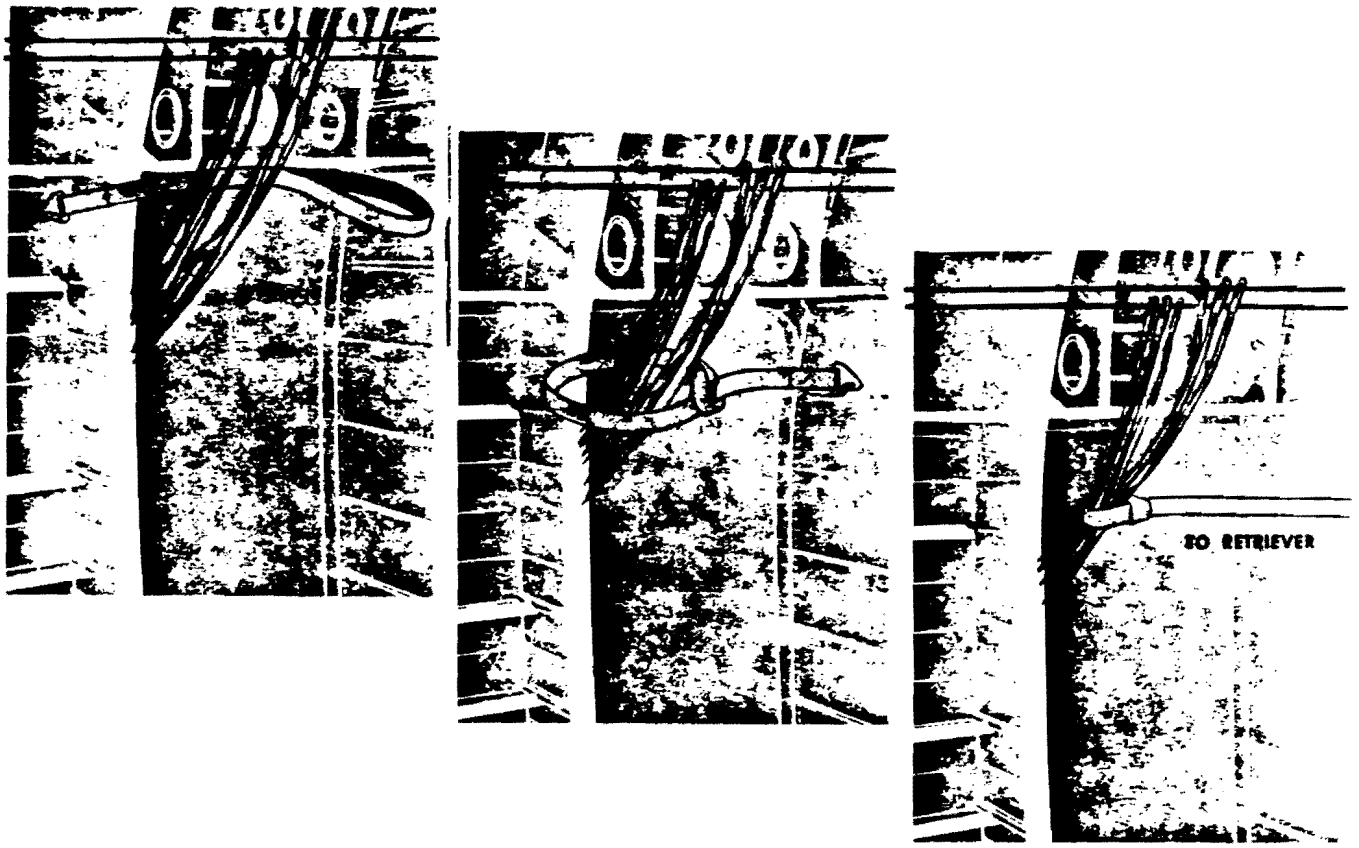
Each winch is equipped with a remote control head connected to the winch by an electrical extension cord. Two push-button switches on the control head operate the winch. To reel in the cable and retrieve the static lines, the RETRIEVE button is depressed and held. To extend the winch cable, the LET OUT button is depressed and held. Fouling of the cable in the reel housing is prevented by the minimum-pull switch which renders the LET OUT function of the winch inoperative unless sufficient pull is maintained on the cable to extend it as it leaves the spool.

Minimum-Pull Switch (Some Aircraft).

A switch mounted internally in the retriever prohibits fouling of the cable in the reel housing by preventing electrical reversing of the winch unless sufficient tension is mounted on the cable to extend it as it leaves the spool. The switch is actuated by a spring-loaded arm supporting a roller which bears on the cable. As long as a pull exceeding approximately ten pounds is maintained on the cable, the spring is overcome, the arm is raised, and the minimum-pull switch is closed so that reversing of the winch is possible. When slack occurs in the cable, the spring depresses the arm so that the circuit to reverse the winch motor is opened and the LET OUT function of the winch is inoperative.

Static Line Slings (Some Aircraft).

Four web-strap slings (figures 4-28B, 4-28C, 4-28D), with a metal hook on one end and a loop on the other, loop around the static lines for the retrieving operation. The two short slings are used to retrieve static lines after jumps from the troop doors; the two long slings are used to retrieve static lines after jumps



THE SHORT SLING IS TAKEN FROM THE ANCHOR CABLE STOWAGE BAG, LOOPED AROUND THE STATIC LINES AND DRAWN TIGHT IN THE ABOVE MANNER. HOOK IS THEN ATTACHED TO THE FITTING ON THE END OF THE RETRIEVER CABLE. LINES ARE THEN PULLED IN BY OPERATION OF THE RETRIEVER WINCH.

retrieving STATIC LINES

(AFTER TROOP DOOR JUMP)

Figure 4-28B.

from the cargo ramp. After a jump is completed, the straps are placed around the bundle of static lines and the hook end passed through the loop to form a sling. The hook is then engaged with the fork-type fitting on the end of the retriever winch cable for the retrieving operation. The slings used after jumps from the troop doors are kept stowed until after the jump. The slings used after jumps from the cargo ramp must be properly rigged prior to the jump.

NORMAL OPERATION (Some Aircraft).

For retrieving operations, assuming one man to be available to operate the equipment, the following procedures are recommended.

Retrieving Static Lines After Troop Door Jumps (Some Aircraft).

Prior to flight, remove the winches from their stowed positions and suspend them from the outboard anchor cables. Ascertain that the cam-type locks are fully rotated and the winches are secure on the cable. Fasten and check the retaining straps and connect the power leads.

After the jump is completed:

a. Pull out the cable release knob on the winch.

b. Pull out sufficient cable to reach the static lines.

c. Push in the cable release knob.

attaching

(FOR RAMP JUMPS ONLY)

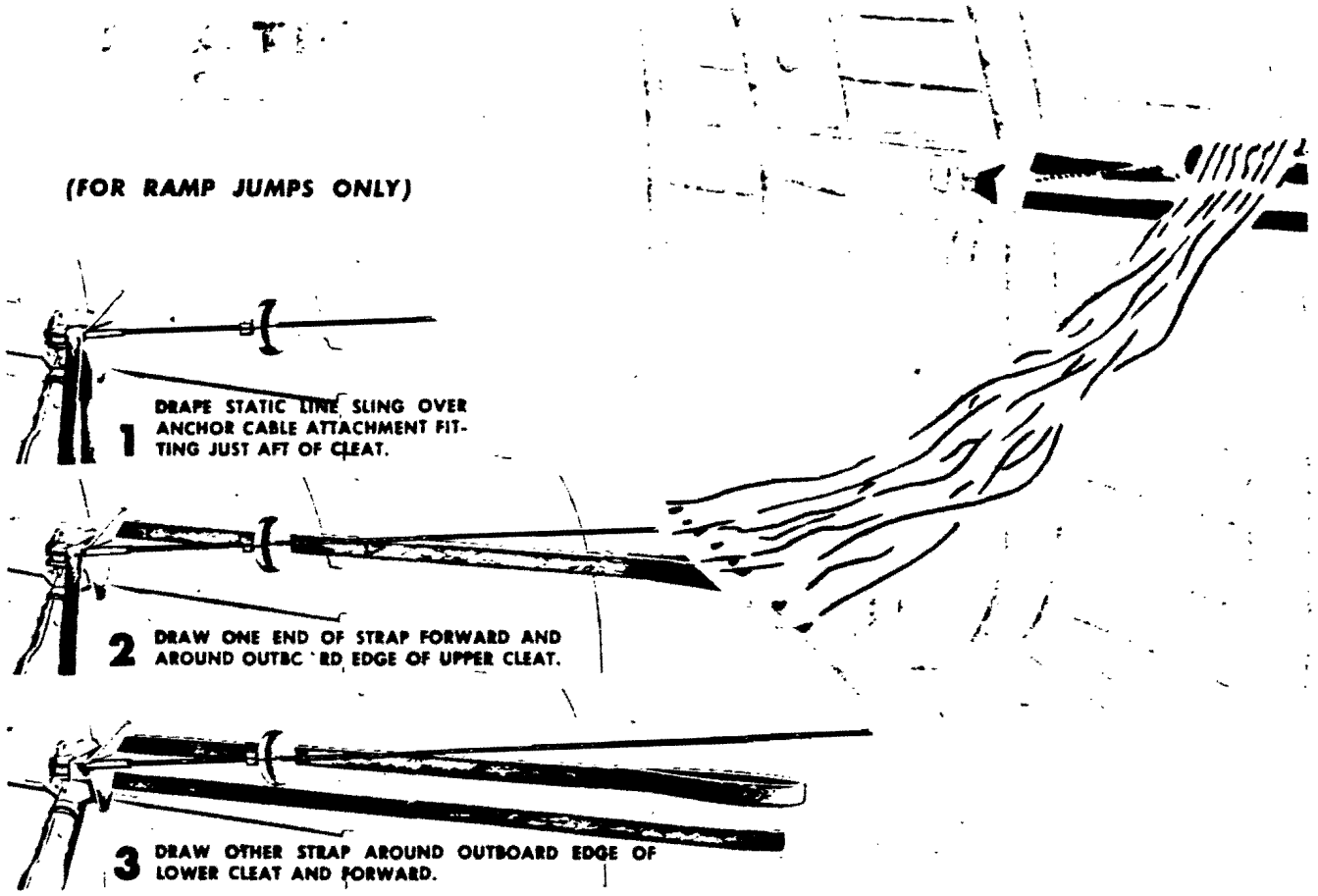


Figure 4-28C.

d. Place the gear shift knob in HIGH, unless LOW gear is required.

e. Remove the sling from the anchor cable stowage bag, pass the strap around the bundle of static lines approximately one foot outboard of the outboard anchor cable, draw the hook end of the strap through the loop on the other end and snug the sling so formed around the bundle of static lines.

f. Hook the sling to the retriever cable fitting.

g. Depress the RETRIEVE button on the remote control head.

h. Should the static lines become caught, or a new approach of the bundle to the door be desired, the LET OUT button may be depressed to let out the static lines slightly. If the winch should stall in HIGH gear because of high airspeed or a man fouled in the static lines, LOW gear should be employed.

Note

Should the static lines offer undue resistance, try to ascertain the cause before resorting to the use of LOW gear in order to avoid possible damage to the aircraft.

i. Repeat the procedure for the other side of the aircraft. Or, if preferred, the slings may be connected to the retriever cables on both sides of the aircraft and all the lines recovered simultaneously.