Report No. NA65H-1056

MODEL

FAT-28E PROTOTYPE 3

AF 51-3788 (c-13788)

Contract AF33(657)-13737

Modified

Per Navy Contract NL21-4933

at

North American Aviation, Inc.

NORTH AMERICAN AVIATION, INC.

FLIGHT MANUAL

INFORMATION RELEASE (U)

MODEL

YAT-28E PROTOTYPE 3

AF 51-3788 (o-13788)

Contract AF33(657)-12737

Modified

Per Navy Contract N421-4833

at

North American Aviation, Inc.

Columbus, Ohio

This information release is supplemental to T.O. 1T-28A-1. Commanders are responsible for bringing this information release to the attention of all personnel cleared for operation of this airplane.

THIS RELEASE CONTAINS THE LATEST INFORMATION DESCRIBING MODIFICATIONS ACCOMPLISHED UNDER NAVY CONTRACT N421-4833 TO USAF YAT-28E PROTOTYPE 3 (AF 51-3788). ONLY THOSE SYSTEMS AND PROCEDURES CHANGED FROM THOSE OF THE T-28A ARE INCLUDED.

YAT-28E PROTOTYPE 3

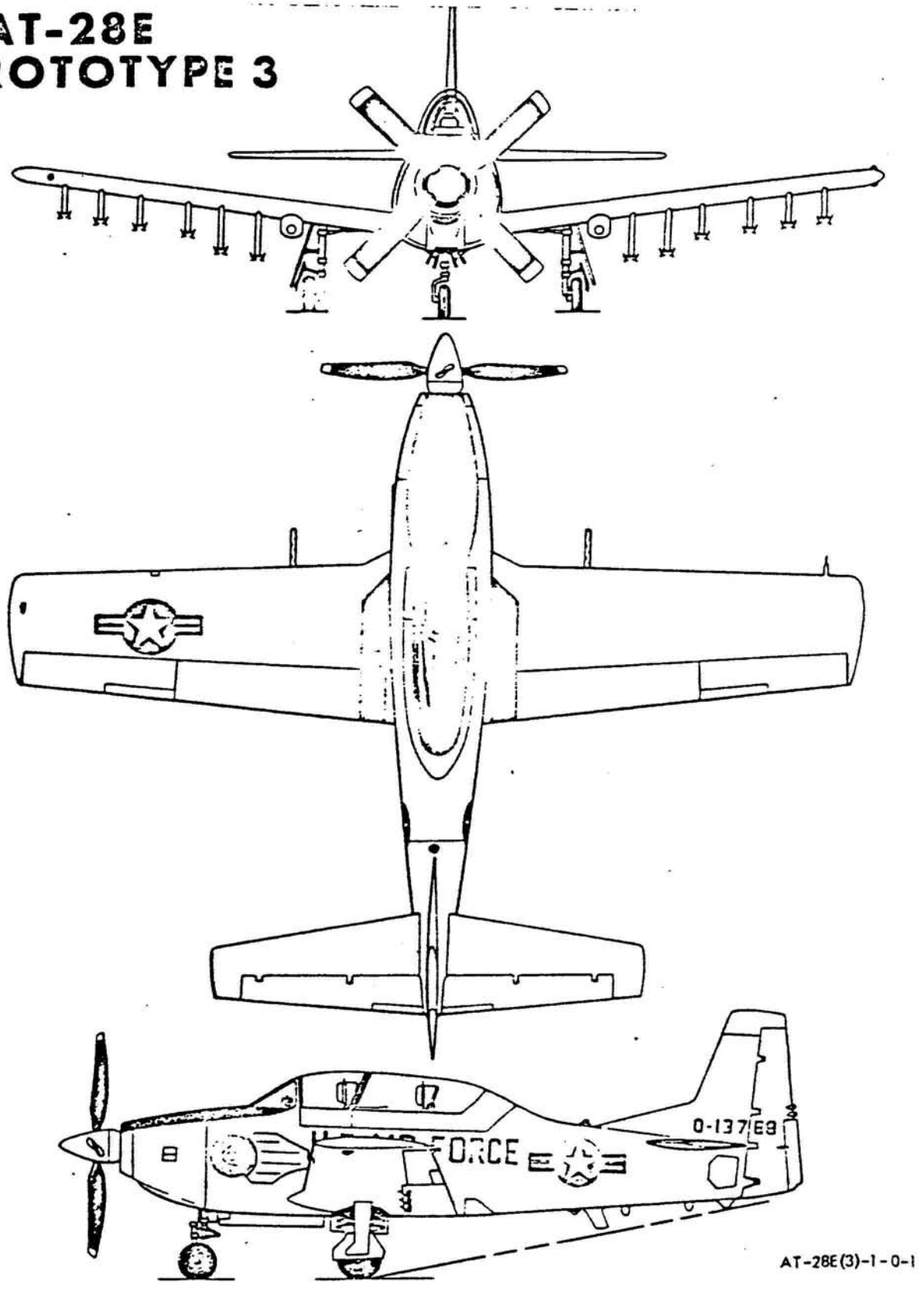


Figure 1-1

SECTION I - DESCRIPTION

THE AIRPLANE

The YAT-28E is a T-28A modified for increased performance and conventional ordnance capability. Appearance is changed by a sharply tapered nose section, a pointed spinner, a four-bladed propeller, and increased-span tail surfaces. Basic unrefueled gross weight is approximately 8375 pounds. Take-off gross weight without external stores is approximately 10,975 pounds.

ENGINE

The airplane is powered by a Lycoming YT-55-L-9 turboprop engine. Maximum rating is 2445 shaft horsepower at 92% gas generator rpm under Standard Day conditions at sea level. The engine compressor is a combination axial-centrifugal unit, containing an eight-stage axial section, and a single-stage centrifugal section. The compressor is driven by a single-stage (N-1) turbine. The propeller gearing is driven by a two-stage (N-2), free power turbine. The engine combustion chamber is an externally mounted, annular unit. An acceleration air bleed system, mounted on the axial compressor frame, exhausts excess compressor flow during starting and rapid acceleration, facilitating optimum operation. Power is extracted at the front of the engine at a propeller shaft and reduction gear assembly (gearbox) which is coupled to the free power turbine (N-2) through a concentric shaft. The recirculating-type engine oil system includes a 4-gallon capacity tank mounted external to the engine. Oil cooling is achieved through ram air. The engine fuel system provides military rated power (MRP) up to 6000 feet in the event of pump (main) fuel tank boost pump failure.

STARTING SYSTEM

Engine starting rotation is provided by a starter-generator unit, powered by external unit . When the start fuel and ignition button (on throttle grips) is depressed, two igniter plugs in the engine combustion chamber are energized, igniting starting fuel supplied by two igniter nozzles. As the engine rotor reaches approximately 12% rpm, fuel starts to flow through the main fuel manifold. The start fuel and ignition button is released at 35% gas generator rpm or at 500°C EGT.

PROPELLER

The engine drives an 11.5-foot, four-bladed Aero Products propeller. Military rated power (MRP) is obtained at 1282 (±13) rpm [98 (±1)%]. Propeller windmilling due to freedom of the power turbine is prevented by a retainer which is installed when the engine is shut down.

PROPELLER OPERATION

With the throttle at GRD IDLE and the propeller control lever at the TAXI stop (full aft), propeller rpm should stabilize at 140 to 180, and gas generator rpm should indicate 40% to 42%. On moving the propeller control lever forward to full INCREASE, propeller rpm increases to between 380 and 400. With the propeller forward of the TAXI position, throttle movement must be restricted to a range between GRD IDLE and 80% gas generator rpm to prevent possible overtorque and/or overtemperature.

CAUTION

To avoid overtorquing the propeller gearing, always increase propeller rpm before advancing the throttle, and retard the throttle before decreasing propeller rpm.

ENGINE AND PROPELLER CONTROLS

THROTTLES

The throttle in each cockpit is the primary control of fuel flow to the engine. Marked positions on the quadrant are OFF, GRD IDLE, and MIL. The throttle grips (9, figure 1-2 and figure 1-3) incorporate an intercom CALL button, a communications microphone (MIKE) button, and an engine start fuel and ignition button (IGN). The throttles are moved forward from OFF through a detent to GRD IDLE. A flight idle position (scribed line) is located approximately 30 degrees forward of the GRD IDLE position. This mark is used as a throttle position reference for air starting.

PROPELLER CONTROL LEVERS

The propeller control levers (10, figure 1-2 and 11, figure 1-3) are located inboard of the throttles and control propeller rpm throughout the available operating range. The lever is maintained at INCREASE (full forward) for start, take-off, and landing. The DECREASE (full aft) position is used for all engine ground operation during taxi before take-off and after landing. For cruising flight, propeller rpm (percent) is adjusted to approximately match engine gas generator rpm (N-1). Refer to ENGINE LIMITATIONS in Section V.

ENGINE MASTER SWITCH

The ENGINE MASTER switch (5, figure 1-6), located in the electrical switch panel in the front cockpit only, provides primary bus electrical power to the engine

starter, the starting fuel and ignition system, and the sump (main) fuel tank boost pump.

START FUEL AND IGNITION BUTTONS

A start fuel and ignition (IGN) button (9, figure 1-2 and 10, figure 1-3) is located on top of each throttle grip. With the ENGINE MASTER switch ON and electrical power available, depressing the button in the cockpit having electrical command provides operation of the engine starting fuel and ignition systems.

ENGINE START SWITCH

The ENGINE START switch (23, figure 1-4) is located on the right forward console in the front cockpit only. Holding the ENGINE START switch momentarily in START with electrical power available energizes the starter-generator in the start cycle. Should a start be aborted before engine light-off occurs, the ENGINE MASTER switch must be moved to OFF to disengage the starter.

ENGINE FUEL SWITCHES

An ENG FUEL switch (4, figures 1-2 and 1-3) is located at the rear of each left console. The NORMAL (forward) position selects engine normal fuel control operation. Selection of EMERG (rear position) in the cockpit having electrical command provides manual throttle control of the engine fuel system.

OIL COOLER DOOR SWITCHES

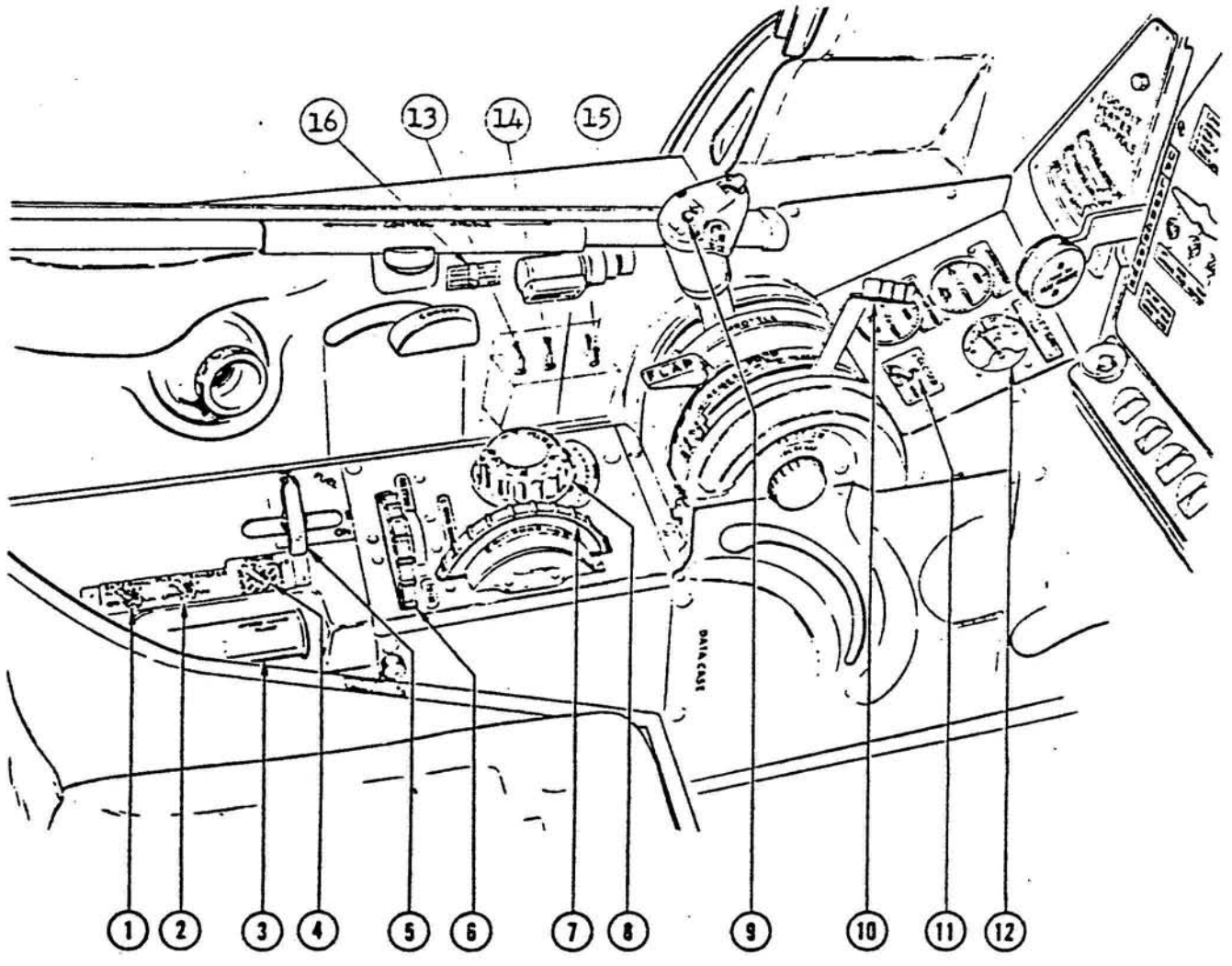
An OIL COOLER DOOR switch (11, figure 1-2 and 13, figure 1-3) on each left console controls operation of the engine oil cooler system. The OIL COOLER DOOR switches receive power through the electrical control shift system, and oil cooler operation is controlled in the cockpit having command. The switch is normally left in AUTO during take-off and landing, which allows the oil cooler ram-air door to close automatically when the airplane is airborne and to open when the airplane is on the ground. In the event of oil overtemperature, the switch should be moved to OPEN, providing maximum oil cooling airflow. The CLOSED position may be used in extremely cold weather for start and initial operation until oil temperature increases to normal.

ENGINE AND PROPELLER INDICATORS

GAS GENERATOR RPM INDICATORS

The gas generator rpm indicators (15, figure 1-4 and 14, figure 1-5) reflect the rpm of the engine gas generator (N-1) in percent of rated maximum.

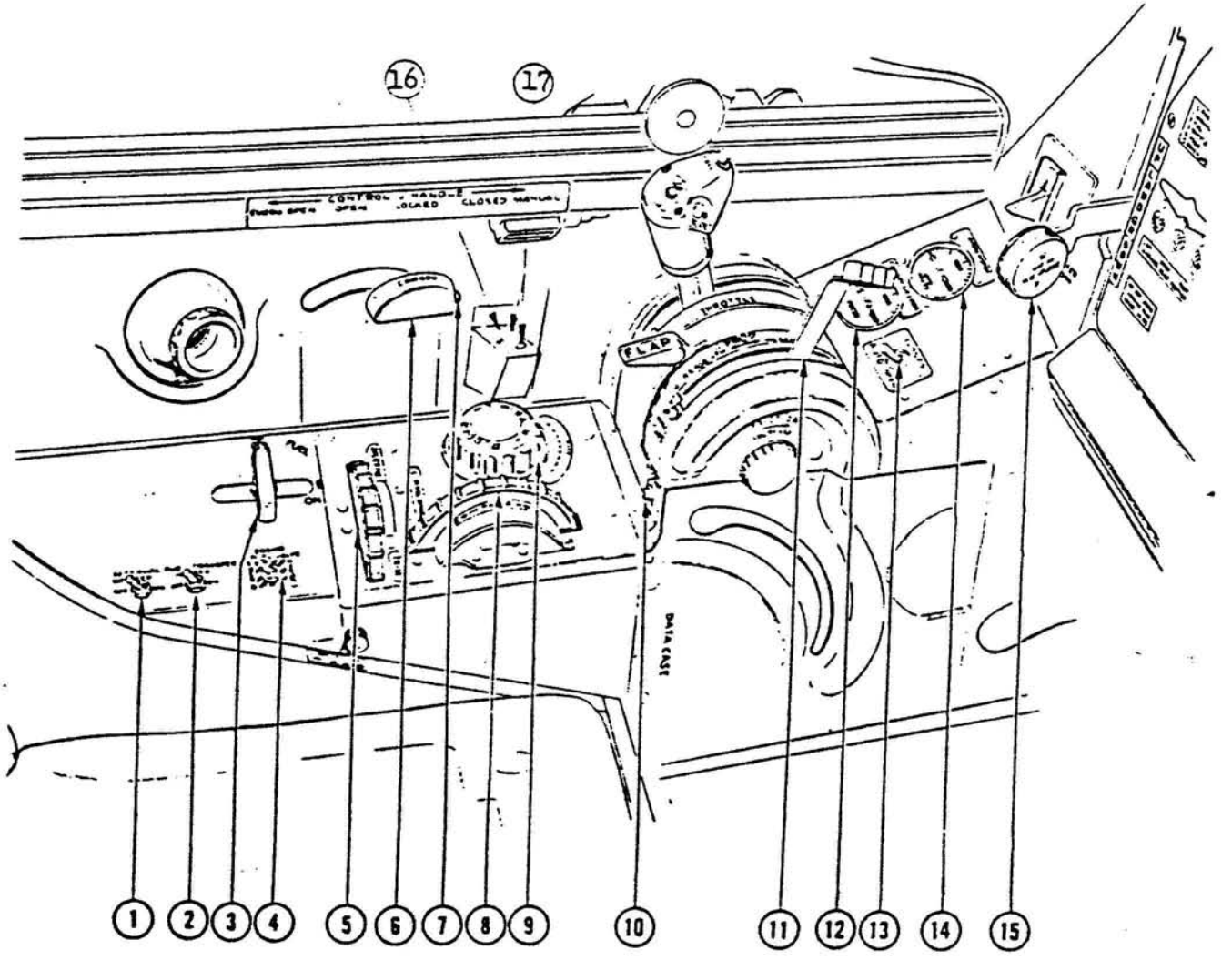
FRONT COCKPIT - LEFT SIDE



1. OUTBOARD EXTERNAL FUEL TRANSFER SWITCH
2. INBOARD EXTERNAL FUEL TRANSFER SWITCH
3. HYDRAULIC HANDPUMP
4. ENGINE FUEL SWITCH
5. FUEL SHUTOFF HANDLE
6. AILERON TRIM WHEEL
7. ELEVATOR TRIM WHEEL
8. RUDDER TRIM WHEEL
9. START FUEL AND IGNITION BUTTON
10. PROPELLER CONTROL LEVER
11. OIL COOLER DOOR SWITCH
12. COCKPIT SUPPLY AIR TEMPERATURE INDICATOR
13. Rudder Trim Switch
14. Electric Trim Select Switch
15. Rudder and Elevator "Take-Off Trim" Indicator Lights
16. Canopy Locked Indicator

Figure 1-2

REAR COCKPIT - LEFT SIDE



1. OUTBOARD EXTERNAL FUEL TRANSFER SWITCH
2. INBOARD EXTERNAL FUEL TRANSFER SWITCH
3. FUEL SHUTOFF HANDLE
4. ENGINE FUEL SWITCH
5. AILERON TRIM WHEEL
6. CANOPY HANDLE
7. CANOPY BUTTON
8. ELEVATOR TRIM WHEEL
9. RUDDER TRIM WHEEL
10. START FUEL AND IGNITION BUTTON
11. PROPELLER CONTROL LEVER
12. CANOPY EMERGENCY AIR PRESSURE GAGE
13. OIL COOLER DOOR SWITCH
14. HYDRAULIC SYSTEM PRESSURE GAGE
15. LANDING GEAR HANDLE
16. Rudder Trim Switch
17. Rudder and Elevator "Take-Off Trim" Indicator Lights

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Figure 1-3

PROPELLER RPM INDICATORS

The propeller rpm indicators (13, figure 1-4 and 12, figure 1-5) reflect the rpm of the propeller in hundreds of revolutions per minute. These indicators are modified to express the rpm of the free power turbine (N-2) in percent of rated maximum from 60% to 90%. The percent marks may be used to match propeller rpm with gas generator rpm for cruising flight.

EGT INDICATORS

The exhaust gas temperature (EGT) indicators (21, figure 1-4 and 18, figure 1-5) reflect engine exhaust gas temperature in degrees centigrade.

OIL PRESSURE INDICATORS

The oil pressure indicators (26, figure 1-4 and 20, figure 1-5) show engine oil pressure at the pump outlet in pounds per square inch.

OIL TEMPERATURE INDICATORS

The oil temperature indicators (28, figure 1-4 and 21, figure 1-5) reflect the temperature of the engine oil from -70^{o} to 150^{o}C.

FUEL FLOW INDICATORS

The fuel flow indicators (17, figure 1-4 and 16, figure 1-5) express engine fuel consumption in hundreds of pounds per hour.

ENGINE FIRE WARNING LIGHTS

If illuminated, the ENG FIRE warning lights (11, figure 1-4 and 10, figure 1-5) indicate the presence of extreme overheat or fire in the engine compartment.

FUEL SYSTEM

INTERNAL FUEL TANKS

Fuel tanks are located in the wings and fuselage. The wing tanks consist of inboard and outboard cells. The sump (main) fuel tank is located below the rear cockpit, in the space formerly used as baggage compartment. Two jowel cells are installed above the nose gear well, forming a forward fuel tank. Fuel from the wing and forward tanks flows by gravity into the main tank. Sump tank fuel is supplied to the engine-driven fuel pump by an electrically operated boost pump. The wing tanks and sump tank are filled through the wing tank filler caps. A separate filler access

for the forward fuel tank is located on the right side of the forward fuselage below the windscreen.

EXTERNAL FUEL TANKS

Provisions are made for installing 230-gallon external tanks at inboard stations 3 and 4, and 105-gallon external tanks at inboard stations 1 and 6. External tank fuel is forced into the wing tanks by air pressure extracted from the engine compressor.

FUEL SYSTEM CONTROLS AND INDICATORS.

Fuel Quantity Indicators

The fuel quantity indicators (41, figure 1-4 and 25, figure 1-5) provide a reading of fuel remaining in pounds in the sump, wing, or forward tanks. No total fuel or drop tank fuel quantity readings are available.

FUEL QUANTITY Check Switches

The FUEL QUANTITY check switches (40, figure 1-4 and 24, figure 1-5) allow a check of sump, wing, or forward tank fuel. The switches are spring loaded to SUMP, and must be held manually in WING or FUS (forward tank check position) to obtain tank quantity checks.

Fuel Low Warning Lights

The fuel LOW LEVEL WARN lights (16, figure 1-4 and 15, figure 1-5) illuminate when sump tank fuel level drops to less than approximately 200 pounds.

EXTERNAL FUEL TRANSFER Switches

The EXTERNAL FUEL TRANSFER switches (1, 2, figures 1-2 and 1-3) provide control of external tank transfer from either cockpit. The INBOARD switch controls air pressure to tanks installed at stations 3 and 4. The OUTBOARD switch controls air pressure to tanks installed at stations 1 and 6. Sufficient tank pressurization air is available to continue transfer of fuel from a tank remaining after a tank is jettisoned from the opposing station.

FUEL QUANTITY DATA

The following table presents fully serviced capacities at 6.5 pounds per gallon.

TANK	POUNDS	US GALLONS
Wings	1105	170
Forward (FUS)	780	120
Sump	715	110
TOTAL: Internal	2600	400
Two 105-gallon External	1364 (682 each)	210 (105 each)
TOTAL: Internal + 2 External (105)	3964	610
Two 230-gallon External	2990 (1495 each)	460 (230 each)
TOTAL: Internal + 4 External	6954	1070

ELECTRICAL POWER SYSTEM

D-C POWER

Basic d-c electrical power is supplied by an engine-driven, 28-volt, 300-ampere starter-generator. Generator operation starts as engine (gas generator) rpm passes approximately 35% on start. Emergency d-c power is provided by a 24-volt, 34-ampere/hour nickel-cadmium battery.

A-C POWER

The a-c power system consists of a main (2500 volts ampere) inverter and a spare (750 volts ampere) inverter. With the main inverter operating, a-c power is distributed to a primary and a secondary a-c bus. When installed, the AN/ARN-21 TACAN unit is powered by the secondary bus, and is inoperative with the spare inverter operating.

ELECTRICAL SYSTEM CONTROLS

Electrical Control Shift Switches

A CONT SHIFT switch (8, figure 1-6 and 7, figure 1-7) operates electrical circuit control relays, transferring control of systems between cockpits. The cockpit in command is indicated by illumination of the LT ON CONTROL light in the cockpit having command. The shift system includes the following items:

A-C Inverter Control
Start Control (ENGINE START Switch)
Electric Trim System Control

Emergency Fuel Switch
Landing Lights
Start Fuel and Ignition Buttons (IGN)
Position Lights
Anticollision Lights
Generator Control
Oil Cooler Door System

Battery-Generator Switches

The BATT-GEN switches (1, figures 1-6 and 1-7) control d-c power to the primary and battery d-c buses. In BATT ONLY (used in emergencies), the primary and battery buses are powered by the battery. In the BATT-GEN position with the generator on the line, the primary and battery buses are powered by the generator and the battery is charged by generator power. The BATT-GEN switch incorporates a lever lock, requiring that the switch be lifted before it can be moved to a new position.

Generator Off Lights

The GEN OFF lights (2, figures 1-6 and 1-7) are illuminated by battery bus power if the generator is not on the line. The BATT-GEN switch must be in the BATT-GEN or BATT ONLY position, or external d-c power must be applied for generator off light operation.

NOTE

The generator off lights will not extinguish until external d-c power is removed following engine start.

Generator Reset Switches

The GEN RESET switches (2, figure 1-6 and 3, figure 1-7) are used to regain generator output in the event the GEN OFF lights come on in flight or remain on after engine start and external power removal.

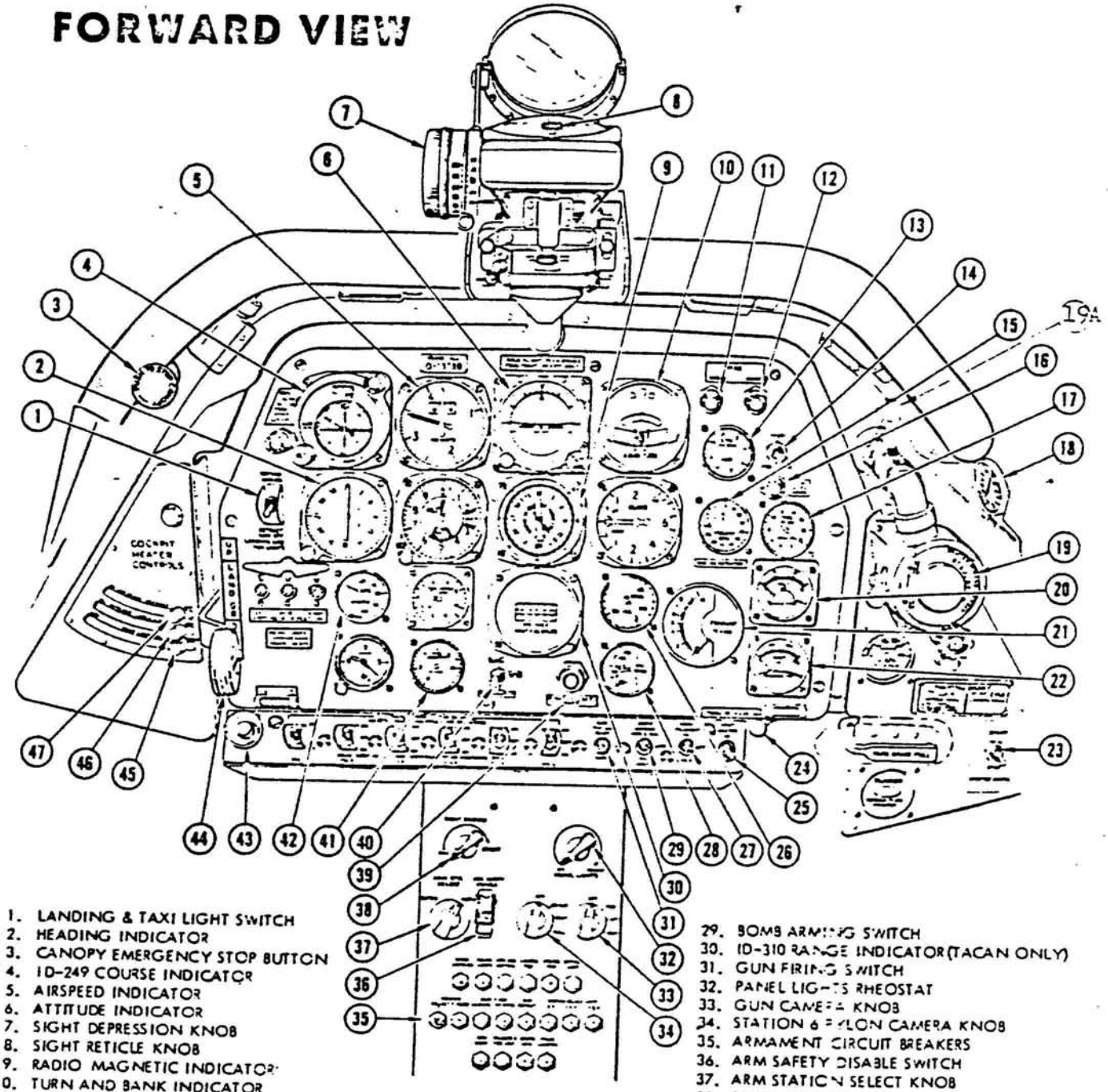
Inverter Switches

Lever-lock-type INVERTER switches (6, figure 1-6 and 5, figure 1-7) control a-c inverter operation. The MAIN ON position provides power to both the primary and secondary a-c buses, and the SPARE ON position provides power to the primary a-c bus only.

EXTERNAL POWER

Two external electrical plugs are installed in a receptacle access on the lower right fuselage, forward of the wing leading edge. The START power plug requires d-c

FRONT COCKPIT - FORWARD VIEW



1. LANDING & TAXI LIGHT SWITCH
2. HEADING INDICATOR
3. CANOPY EMERGENCY STOP BUTTON
4. ID-249 COURSE INDICATOR
5. AIRSPEED INDICATOR
6. ATTITUDE INDICATOR
7. SIGHT DEPRESSION KNOB
8. SIGHT RETICLE KNOB
9. RADIO MAGNETIC INDICATOR
10. TURN AND BANK INDICATOR
11. ENGINE FIRE WARNING LIGHT
12. EQUIPMENT FIRE WARNING LIGHT
13. PROPELLER (N-2) RPM INDICATOR
14. FIRE LIGHTS TEST SWITCH
15. GAS GENERATOR (N-1) RPM INDICATOR
16. FUEL LOW LEVEL WARNING LIGHT
17. FUEL FLOW INDICATOR
18. FREE AIR TEMPERATURE INDICATOR
19. OXYGEN REGULATOR

19A. "Auxiliary Ram-Air Knob"

20. VOLTMETER
21. EGT INDICATOR
22. AMMETER
23. ENGINE START SWITCH
24. PEDAL RELEASE KNOB
25. ARMAMENT MASTER SWITCH
26. OIL PRESSURE INDICATOR
27. SIGHT FILAMENT SWITCH
28. OIL TEMPERATURE INDICATOR

29. BOMB ARMING SWITCH
30. ID-310 RANGE INDICATOR (TACAN ONLY)
31. GUN FIRING SWITCH
32. PANEL LIGHTS RHEOSTAT
33. GUN CAMERA KNOB
34. STATION 6 PYLON CAMERA KNOB
35. ARMAMENT CIRCUIT BREAKERS
36. ARM SAFETY DISABLE SWITCH
37. ARM STATION SELECT KNOB
38. SIGHT DIMMER KNOB
39. EJECT SELECT WARNING LIGHT
40. FUEL QUANTITY CHECK SWITCH
41. FUEL QUANTITY INDICATOR
42. FLAP POSITION INDICATOR
43. STORES JETTISON BUTTON
44. LANDING GEAR HANDLE
45. TEMPERATURE CONTROL KNOB
46. CABIN AIR KNOB
47. DEFROST KNOB

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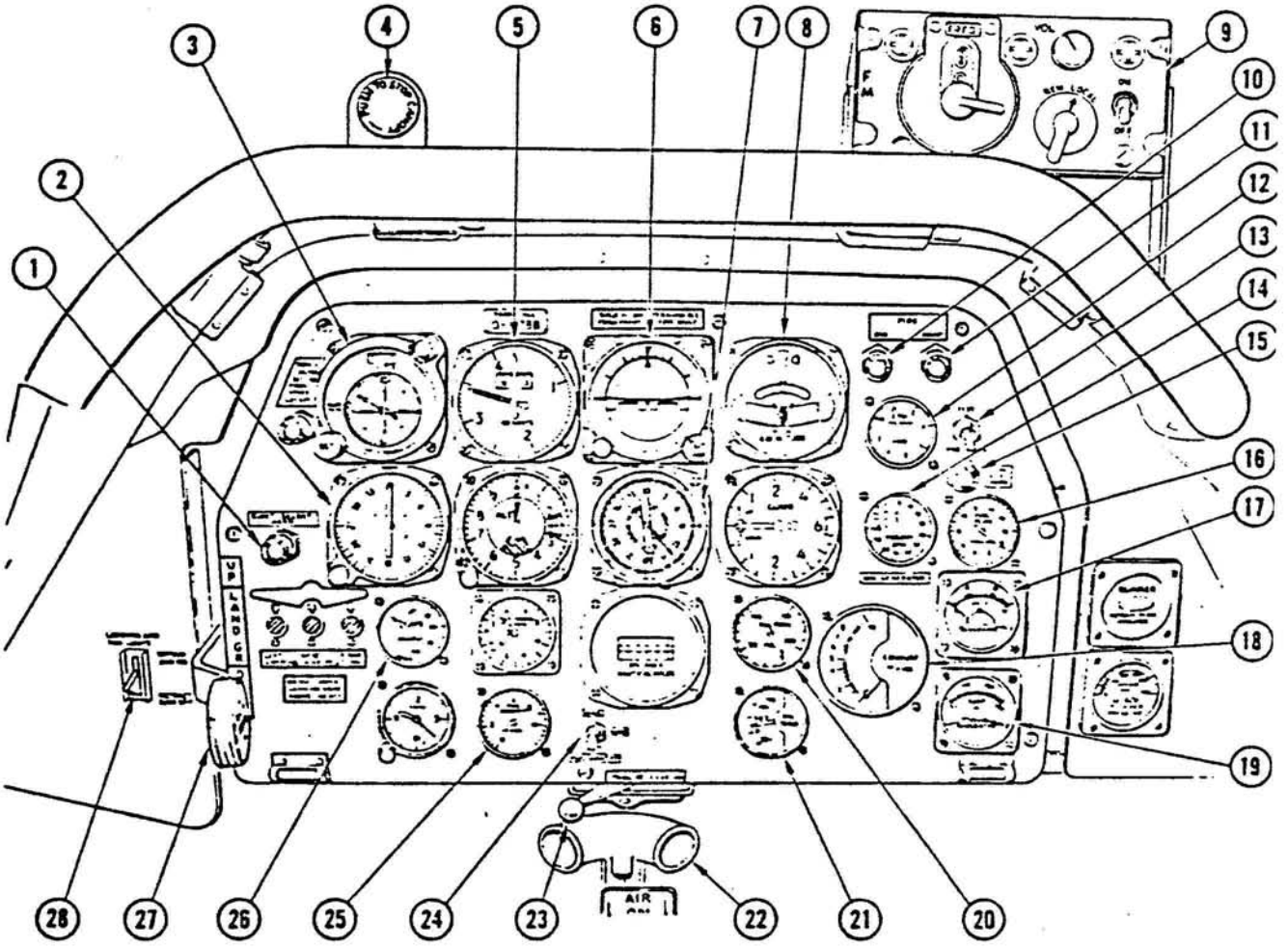
Figure 1-4

REAR COCKPIT - FORWARD VIEW



1. EJECT SELECT WARNING LIGHT
2. HEADING INDICATOR
3. ID-249 COURSE INDICATOR
4. CANOPY EMERGENCY STOP BUTTON
5. AIRSPEED INDICATOR
6. ATTITUDE INDICATOR
7. RADIO MAGNETIC INDICATOR
8. TURN AND BANK INDICATOR
9. AN/ARC-44 CONTROL PANEL (Provisions only)
10. ENGINE FIRE WARNING LIGHT
11. EQUIPMENT FIRE WARNING LIGHT
12. PROPELLER (N-2) RPM INDICATOR
13. FIRE LIGHTS TEST SWITCH
14. GAS GENERATOR (N-1) RPM INDICATOR
15. FUEL LOW LEVEL WARNING LIGHT
16. FUEL FLOW INDICATOR
17. VOLTMETER
18. EGT INDICATOR
19. AMMETER
20. OIL PRESSURE INDICATOR
21. OIL TEMPERATURE INDICATOR
22. AIR OUTLET
23. PEDAL RELEASE KNOB
24. FUEL QUANTITY CHECK SWITCH
25. FUEL QUANTITY INDICATOR
26. FLAP POSITION INDICATOR
27. LANDING GEAR HANDLE
28. LANDING AND TAXI LIGHT SWITCH

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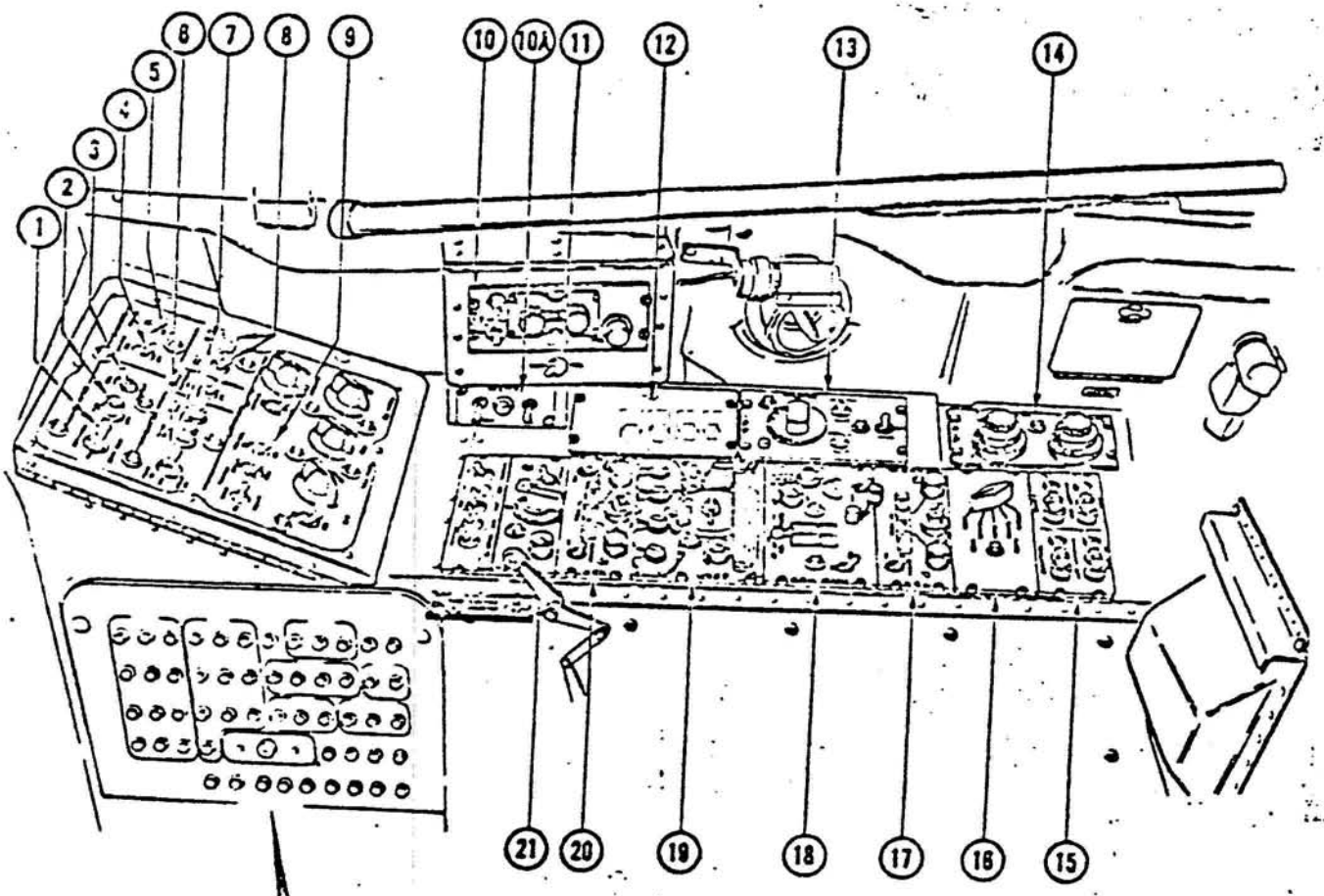
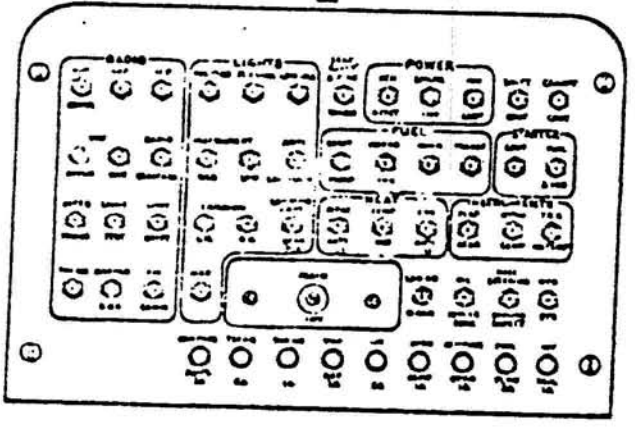
Figure 1-5

FRONT COCKPIT - RIGHT SIDE





1. BATTERY-GENERATOR SWITCH
2. GENERATOR OFF LIGHT
3. GENERATOR RESET SWITCH
4. ENGINE ANTI-ICE SWITCH
5. ENGINE MASTER SWITCH
6. INVERTER SWITCH
7. INVERTER OUT LIGHTS
8. ELECTRICAL CONTROL SHIFT SWITCH AND LIGHT
9. ANTICOLLISION LIGHTS SWITCH
10. TACAN CONTROL PANEL
10A. VHF NAV, FM AUDIO SWITCHES
11. VOR/TACAN SWITCH
12. Trim System Circuit Brakers
13. IFF CONTROL PANEL
14. SIF CONTROL PANEL
15. RADIO CONTROL SHIFT PANEL
16. RADIO COMPASS FILTER
17. VHF NAV (VOR-101) OR TACAN CONTROL PANEL
18. RADIO COMPASS PANEL (AN/ARN-59)
19. UHF CONTROL PANEL (AN/ARC-34)
20. VHF RADIO PANEL (VHF-101)
21. EJECT COMMAND SELECT HANDLE

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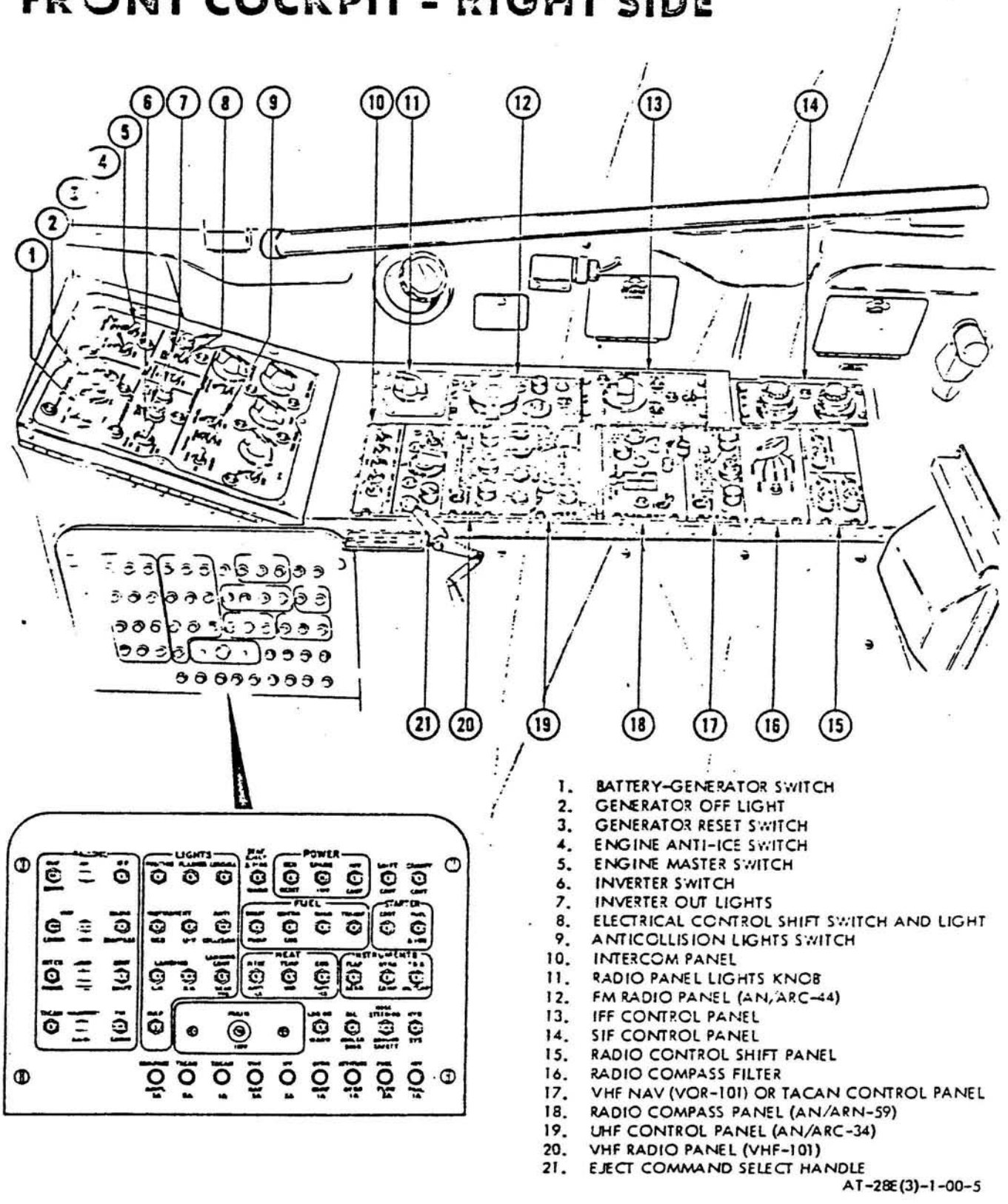
Figure 1-6

FRONT COCKPIT - RIGHT SIDE



1. BATTERY-GENERATOR SWITCH
2. GENERATOR OFF LIGHT
3. GENERATOR RESET SWITCH
4. ENGINE ANTI-ICE SWITCH
5. ENGINE MASTER SWITCH
6. INVERTER SWITCH
7. INVERTER OUT LIGHTS
8. ELECTRICAL CONTROL SHIFT SWITCH AND LIGHT
9. ANTICOLLISION LIGHTS SWITCH
10. INTERCOM PANEL
11. RADIO PANEL LIGHTS KNOB
12. FM RADIO PANEL (AN/ARC-44)
13. IFF CONTROL PANEL
14. SIF CONTROL PANEL
15. RADIO CONTROL SHIFT PANEL
16. RADIO COMPASS FILTER
17. VHF NAV (VOR-101) OR TACAN CONTROL PANEL
18. RADIO COMPASS PANEL (AN/ARN-59)
19. UHF CONTROL PANEL (AN/ARC-34)
20. VHF RADIO PANEL (VHF-101)
21. EJECT COMMAND SELECT HANDLE

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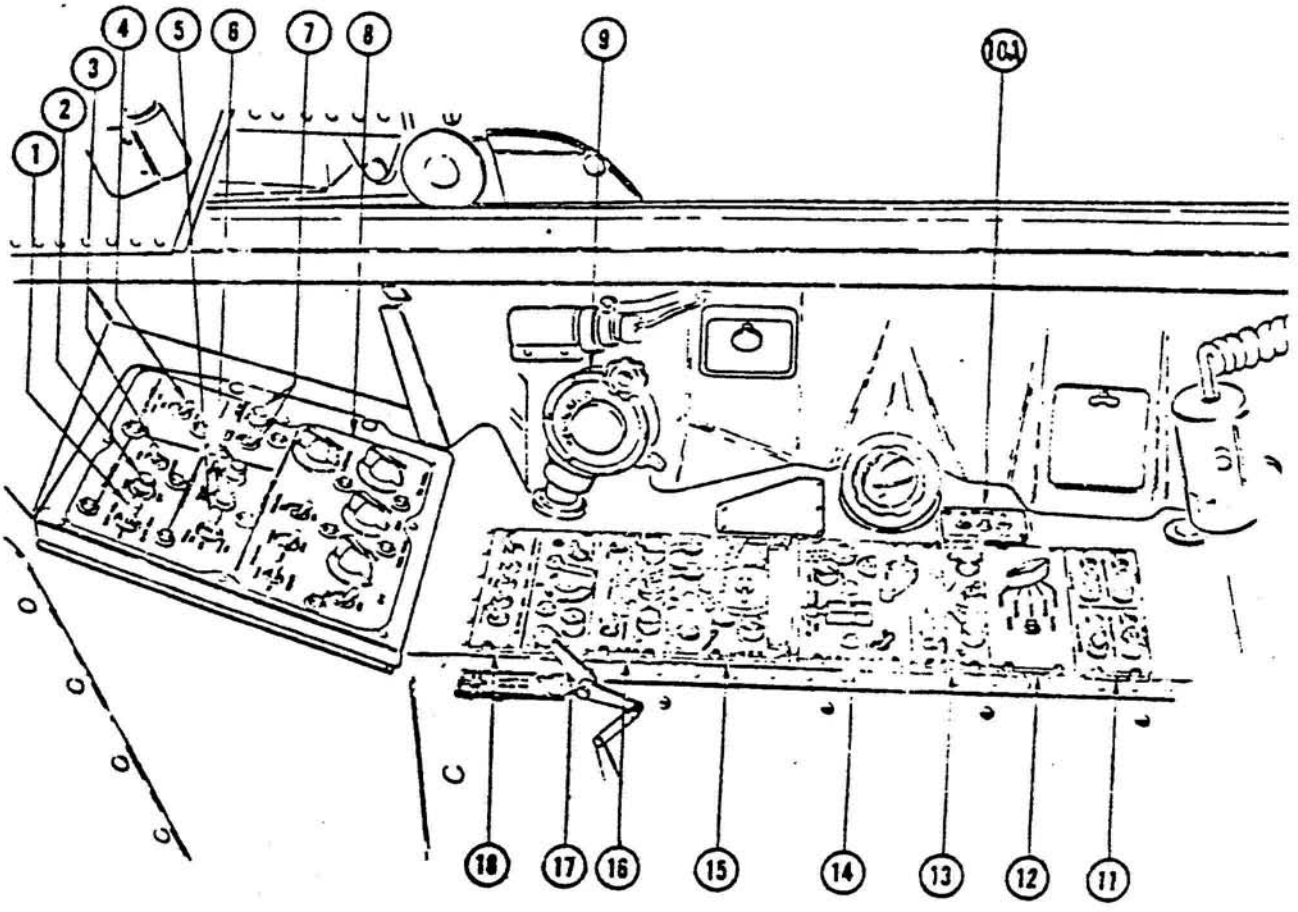
Figure 1-6

REAR COCKPIT - RIGHT SIDE



1. BATTERY-GENERATOR SWITCH
2. GENERATOR OFF LIGHT
3. GENERATOR RESET SWITCH
4. ENGINE ANTI-ICE SWITCH
5. INVERTER SWITCH
6. INVERTER OUT LIGHTS
7. ELECTRICAL CONTROL SHIFT SWITCH AND LIGHT
8. LIGHTS CONTROL PANEL
9. OXYGEN REGULATOR
10. DELETED
10A. VHF NAV, FM LISTEN SWITCHES
11. RADIO CONTROL SHIFT PANEL
12. RADIO COMPASS PANEL
13. VHF NAV (VOR-101) OR TACAN CONTROL PANEL
14. AN/ARN-59 RADIO COMPASS PANEL
15. UHF RADIO PANEL AN/ARC-34
16. VHF-101 CONTROL PANEL
17. EJECT COMMAND SELECT HANDLE
18. INTERCOM CONTROL PANEL

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Figure 1-7

power at 28 volts, 800 amperes. The EXT (maintenance access) plug requires 28-volt d-c power at a minimum of 200 amperes. The engine-driven generator will not operate with either external power plug connected.

FLIGHT CONTROLS

CONTROL STICK GRIP

The control stick grip in each cockpit incorporates a five-position lateral/longitudinal trim switch and an electric trim systems "kill" switch. The armament switches (bomb-rocket release and gun firing trigger) on both stick grips are inoperative.

TRIM

Electrically operated trim systems have been incorporated in the lateral, longitudinal and directional flight control systems. The trim systems will operate from either the front or rear cockpit depending on the position of the Electrical Control Shift Switch.

Longitudinal Trim

Elevator trim tabs provide the longitudinal trim function and can be positioned either manually or electrically, the primary mode being electrical. A trim indicator adjacent to the manual trim wheel provides trim indication for both modes.

Lateral

Lateral trim is provided by an electrically operated spring trim system which can apply fifteen pounds of stick force left or right. Trim setting is controlled from either cockpit by the switch on the stick grip. Trim force is applied at the rate of approximately 3 #/sec. Stick position is used as takeoff trim indication. The basic trim tab system has been disabled.

Directional

Directional trim is provided by an electrically operated spring trim system which can apply pedal forces of 125 pounds at 25° trailing edge right and 93 pounds at 4° trailing edge left. Trim setting is controlled from either cockpit by a 3-position switch on the throttle. A takeoff trim position indicator light is provided. The basic trim tab system, modified to provide tab travels of 14 degrees left and right, remains installed as a backup trim system in case of failure of the electrical trim system.

WING FLAPS

The wing flaps operate to a maximum of 40 degrees extension through the FLAP handles, and extend to 40 degrees through the manual external operating lever. A "blow up" provision allows the flaps to retract automatically from 40 degrees if inadvertently left extended. Automatic blow up results in retraction to approximately 20 degrees at 160 knots and complete retraction at 205 knots. For limit airspeed with flaps extended, refer to Section V.

NOSE WHEEL STEERING SYSTEM

The nose wheel hydraulic steering system in this airplane is inoperative.

CANOPIES

The canopy system is designed to provide closed position reliability at increased airspeeds and simplified open/close operation. The canopy is mechanically locked upon reaching the closed position. Moving the canopy operating handle from the "close" position releases the mechanical lock.

CAUTION

The canopies do not lock mechanically in the open position. For emergency landings, it is recommended that the canopies be left closed until forward motion stops, then opened by pulling a handle to the EMER position.

CANOPY HANDLES AND BUTTONS

The canopy handles (figure 1-2 and 6, 7, figure 1-3) are moved to either the CLOSED or OPEN position to obtain desired operation and are then left in that position. The HOLD positions are not to be used. The canopy handle buttons are used only to start canopy movement in the open cycle and are inoperative in the close cycle.

ESCAPE SYSTEM

glass only;

The escape system provides ejection of both crew members through the canopy and recovery under all feasible conditions from zero airspeed to limit airspeed, including ground level escape. Once initiated, the sequence is fully automatic. The rear seat is ejected first, under all conditions, to prevent the rear cockpit occupant from being burned by the rocket blast of the front seat. Alternate escape (bail-out over the side) capability is not provided. The advantages of forced parachute deployment and the reliability of dual systems outweighs the lack of bail-out capability An eject command selection system permits ejection of both crewmen by the pilot's selecting command prior to ejection. Refer to EJECT COMMAND SELECT SYSTEM, in this section.

EJECTION SEATS

The NAA LW-2 ejection seats (figure 1-8) are padded for comfort and ejection shock absorption. Seat controls include an inertia reel lock handle, an ejection "D" ring, an emergency oxygen "D" handle, and a parachute emergency deployment handle (harness release handle). The seats are ejected by a catapult rocket which provides sufficient thrust to allow safe escape and recovery.

NOTE

Seat height adjustment must be obtained on the ground before flight, and cannot be changed in flight by the crew.

Drogue Chutes

A 52-inch drogue parachute is packed in both seat headrests (2, figure 1-8). This chute is ballistically deployed on ejections above 10,000 feet and/or 200 knots to provide stability and "pulloff" deployment of the main personnel parachute. On separation (and after free-fall as required) in the high-speed/high-altitude mode, the lower attach points are released, allowing the seat to rotate in line with the drogue chute upper attach line. Through a slip ring system, the drogue is then released, pulling the canopy of the main chute into the air stream. Inflation of the main chute pulls the crew member from the seat, providing positive separation.

EJECTION SEAT

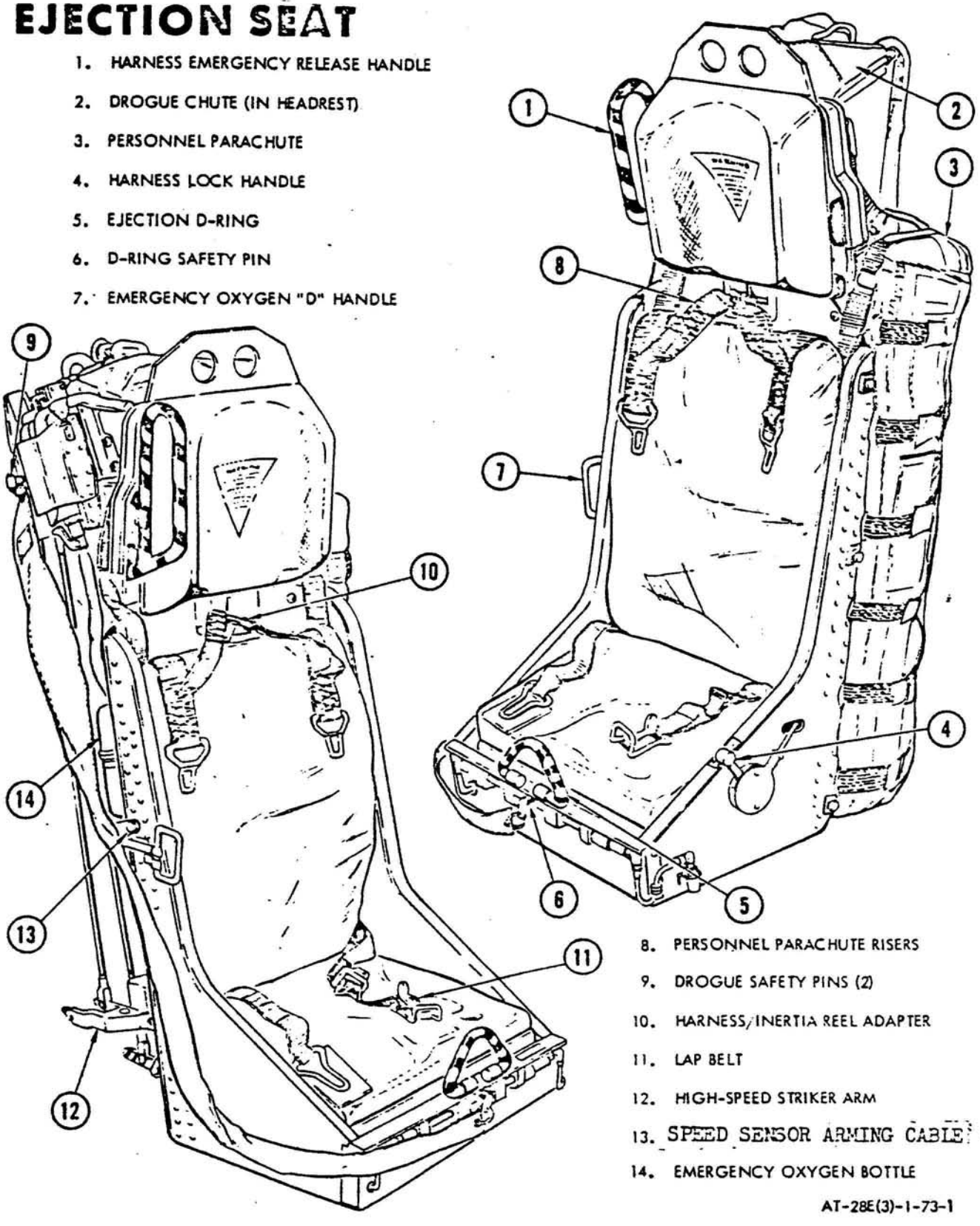

Figure 1-8

On ejections below 10,000 feet (if speed is less than 200 knots), the drogue is NOT deployed. In this mode, the drogue deployment gun mechanism is sequenced by a speed sensor system to immediately deploy after a 0.2-second time delay, providing quick separation with minimum loss of altitude.

Personnel Parachutes

A 28-foot personnel parachute (3, figure 1-8) is installed as an integral part of each seat and is mounted at the left rear corner of the seat frame. Deployment and inflation of the parachute provide positive pulloff separation of the crew member from the seat during ejections. Should the separation system fail, the main parachute may be deployed by pulling down on the harness release handle at the right side of the headrest.

Parachute Harnesses

USAF 59J6709 parachute harnesses are used. The ... harness has the necessary attachments to accept the parachute risers at the quick-disconnects, which also accomplishes hookup to the inertia reel. The parachute riser adapters and connecting links remain in the seat, attached to the riser adapter. The normal and emergency oxygen hoses are connected to a standard CRU-8/P adapter mounted on each harness.

Lap Belts

A narrow nylon lap belt (11, figure 1-8) with standard fastener is installed on each seat. At separation, the lap belt ends are mechanically released from the seat by a ballistic charge from the separation cartridge.

Inertia Reels

The inertia reels are mechanically locked or unlocked by using the harness lock handles. The reels lock automatically if a deceleration force of more than approximately 2 "g's" is encountered. Restraint is imposed through the parachute riser straps, which are attached to the harness quick-disconnects through bungees. For ejection, the reels are ballistically retracted, positioning and restraining the crew members in the proper position.

Separation System

The separation system for each seat consists of a speed sensor, a preset aneroid timer, a 0.5-second delay harness release actuator, and the drogue/personnel parachute deployment gun. The speed sensor, located on the bulkhead behind the seat, is connected to the airplane pitot-static system. The drogue gun deploys either the drogue

chute or the main chute canopy, depending upon speed and altitude (speed sensor position) at ejection. At low speeds and altitudes, deployment of the main chute occurs after a 0.2-second delay, and separation of the lap belt and inertia reel attachments occurs after a 0.5-second delay. At altitudes above 10,000 feet and/or speeds greater than 200 knots, the gun deploys the drogue chute, and the remaining separation sequence is delayed until 0.5 second after the seat descends through 10,000 feet.

SEAT CONTROLS AND SAFETY PINS

Inertia Reel Lock Handle

An inertia reel (shoulder harness) lock handle (4, figure 1-8) is located at the left side of each seat.

Ejection "D" Ring

An ejection "D" ring (5, figure 1-8), composed of a flexible material, is located at the front of each seat frame. The ring must be pulled directly upward about 1-1/4 inches to initiate ejection. All operation following the pulling of the "D" ring is automatic.

Harness Emergency Release Handle

A harness emergency release handle (1, figure 1-8) is located on the right side of each headrest. Pulling this handle mechanically separates the lap belt end fittings from the seat, releases the parachute harness from the inertia reel, and deploys the personnel parachute through a linkage-operated ripcord assembly. This handle may be used to deploy the chute and provide escape from the seat in the event of a postejection separation failure. To abandon the airplane following ditching or a ground emergency, release the chest and leg links of the harness, unlatch the lapbelt, disengage the disconnect for the oxygen hose and communication leads.

WARNING

In the event of failure of a seat to eject, using the emergency release handle for "over-the-side" or inverted airplane bail-out is NOT FEASIBLE, due to the method of mounting the main parachute.

Safety Pins

Three safety pins are installed on each seat when not occupied for flight. One pin secures the ejection "D" ring (5, figure 1-8) and two safety the drogue gun assembly behind the seat (9, figure 1-8). These pins are fastened to a single red banner, which should be stowed after the pilot is strapped in.

EJECT COMMAND SELECT SYSTEM

The eject command select system provides maximum safety by permitting the pilot in command to assume full authority over escape system actuation. This system also protects the occupant of the rear seat from rocket blast by ejecting the rear seat first. NOTE: This system inoperative in this airplane when instrumentation equipment is installed in the aft cockpit. Pulling "D" ring will eject front seat regardless of position of eject command handle.

Eject Command Handles

An eject command select handle (21, figure 1-6 and 17, figure 1-7) is installed on the right console in both cockpits. These handles are interconnected by teleflex cable and operate as one unit.

NOTE

The occupant of either cockpit can assume control of the escape system and eject both seats by moving his eject command select handle to BOTH EJECT and pulling the "D" ring.

The handles operate a manual selector manifold which determines the selective routing of gas initiator charges for ejection. A red warning light on both instrument panels (EJECT COMMAND WARN light) is illuminated if the handles are not positively seated in one of the usable positions. These warning lights are powered by the battery bus (hot at all times) and may be pressed to test. With the eject command select handle at BOTH EJECT in the front cockpit, the pilot in the front cockpit has ejection control for both cockpits, while the handle in the rear cockpit is automatically positioned to REAR ONLY. At REAR ONLY, the pilot in the rear cockpit can eject; however, the pilot in the front cockpit will not be ejected unless ejection is initiated from the front cockpit. With the handle positioned to BOTH EJECT in the rear cockpit, the pilot in the rear cockpit has ejection control for both cockpits, since the handle in the front cockpit is automatically positioned to NO EJECT.

WARNING

With the front cockpit handle positioned to NO EJECT, the front seat "D" ring ballistic actuators may be fired, but the front seat will not eject. With the handle positioned to NO EJECT in the front cockpit, ejection must be initiated from the rear cockpit.

The following table illustrates eject command select system operation:

HANDLE POSITION		FRONT PILOT INITIATES	REAR PILOT INITIATES
FRONT COCKPIT	REAR COCKPIT		
BOTH EJECT	REAR ONLY	Normal ejection sequence	Rear seat ejects alone
NO EJECT	BOTH EJECT	Front inertia reel operates - no ejection	Normal ejection sequence

EMERGENCY OXYGEN

A standard high-pressure emergency oxygen bottle is installed on the right side of each seat. The supply hose from the bottle is attached to the bail-out oxygen hose fitting on the CRU-8/P connector mounted on the parachute harness. Emergency oxygen flow is automatically provided on ejections in the high-speed/high-altitude mode (above 10,000 feet and/or 200 knots). *The emergency bottle gages should be checked for a reading of 1800 psi before each flight.

Emergency Oxygen "D" Handle

An emergency oxygen "D" handle (7, figure 1-8) is mounted on the right side of each seat frame. When desired, emergency oxygen flow may be obtained by pulling this handle. On ejections above 10,000 feet and/or 200 knots, emergency oxygen flow is initiated automatically by the high-speed striker mechanism as the seat rises from the cockpit.

NOTE

A suggested method of manually obtaining emergency oxygen flow is to reach for the handle with the left hand.

* Emergency oxygen during flight may be obtained by pulling the "D" ring on the right-hand side of the seat. In addition, during the ejection if the automatic feature does not function, the handle may be manually actuated to obtain emergency oxygen.

ESCAPE SYSTEM OPERATION

The seat ejection and separation sequence for ejections at both low and high speeds and altitudes is as follows:

HIGH SPEED/ALTITUDE

1. Inertia reel retracted.
2. Catapult rocket fired.
3. Drogue chute deployed.
4. Seat free-fall, if required.
5. Belt, reel, drogue released.
6. Main chute inflated; separation.

LOW SPEED/ALTITUDE

1. Inertia reel retracted.
2. Catapult rocket fired.
3. Main chute deployed; belt, reel released.
4. Main chute inflated; separation.

WARNING

The LW-2 seats are designed to be ejected through the canopies. DO NOT OPEN the canopies before ejection, as injury from seat/canopy frame interference will occur.

EMERGENCY EQUIPMENT

EQUIPMENT FIRE WARNING LIGHTS

Illumination of the EQUIP FIRE warning lights (12, figure 1-4 and 11, figure 1-5) indicates the presence of fire or extreme overheat in the electronic equipment compartment.

FIRE ACCESS DOORS

Spring-loaded fire emergency access doors are located on the left side of the engine compartment.

SERVICING

The following servicing material specifications apply:

Fuel	MIL-J-5624 (JP-4)
Engine oil	MIL-L-7808C (or later)
Hydraulic fluid	MIL-H-5606
Oxygen (high- and low-pressure)	MIL-O-27210
Canopy air bottle	Dry air or nitrogen (MIL-N-6011)

REFUELING

The sump tank gravity-fills from the first wing tank to be serviced. Additional time is required to allow drainage from the wing tanks before the wings can be topped-off. Caution should be used when checking the fuel level in the forward tank before flight. Expansion can cause sufficient pressure to expel fuel from the filler access.

ENGINE OIL

Engine oil from different manufacturers should NOT be intermixed in this engine. The engine oil system should be completely drained and flushed and then filled with the different oil rather than mixing oils.

TIRE INFLATION

A standard Type VII, tubeless, 24 x 7.7 aircraft tire is used on all three landing gears. The following pressures should be used:

TIRE	GROSS WEIGHT (POUNDS)	PRESSURE (PSI)
Main	8,500	60
	9,000	65
	10,000	70
	11,000	75
	12,000	80
	13,000	90
	14,000	100
	15,000	115
	16,000	130
Nose	All	70

SECTION II - NORMAL PROCEDURES

FLIGHT RESTRICTIONS

For all current flight limitations and restrictions, refer to Section V.

EXTERIOR INSPECTION

The exterior inspection is modified as follows:

1. External and forward fuel tanks - check.
2. Exhaust cover - check removed.
3. Intake cover - check removed.
4. Intake duct - check clear.
5. Propeller retainer - check removed.
6. Oil cooler inlet cover (under nose) - check removed.
7. Seat height - check and have adjusted as required.
8. Seat arming cable (right side) - check attached.
9. Emergency oxygen bottle pressure - check (1800 psi).

INTERIOR CHECK (ALL FLIGHTS)

1. Parachute risers - Fasten.
2. Lap belt - Fasten, check tight.
3. Oxygen connections - Fasten, check.
4. Harness lock - check.
5. Eject command handles - as desired.
6. Seat pins - Pull and Stow.
7. Rudder pedals - Adjust.
8. Parking brake - Set.
9. Flight controls - Unlock and check.
10. Hydraulic hand pump - down.*

*Front cockpit only

11. Fuel shutoff handle - OFF.
12. EXTERNAL FUEL TRANSFER switches - OFF.
13. ENG FUEL switch - NORMAL.
14. .
15. .
16.
17. Wing flap handle - check DOWN.
18. Throttle - OFF.
19. Propeller control lever - full INCREASE.
20. Friction lock knob - check friction.
21. OIL COOLER DOOR switch - AUTO.
22. TEMP CONTROL knob - as desired.*
23. CABIN AIR knob - as desired.*
24. DEFROST knob - OFF.*
25. Landing and taxi lights switch - OFF.
26. Landing gear handle - DOWN.
27. Altimeter - Set.
28. Battery-generator switch - OFF.
29. INVERTER switch - OFF.
30. Pitot heater switch - OFF.*
31. Lights switches and rheostats - OFF.
32. Interphone - MIXED SIGNALS.
33. Avionics equipment - OFF.
34. Interphone mixing switches - Set.
35. IFF - OFF.*
36. Circuit breakers - check in.

#36a. Electric Trim Switch - OFF

37. External d-c power - applied (if available).

*Front cockpit only

NOTE

If external d-c power is not available, move BATT-GEN switch to BATT ONLY.

38. CONT SHIFT switch - forward.

39. Battery-generator switch - BATT-GEN (external power available).

40. INVERTER switch - MAIN ON.

40a. Electric trim switch - ON.

40b. Check trim operation - Elevator, Ailerons. Rudder. (both directions).

40c. Depress trim systems "kill switch".

40d. Check no trim power - Elevator. Ailerons. Rudder (both directions).

40e. Electric trim switch - ON.

40f. Aileron trim - Trim to center stick.

40g. Rudder trim - Trim to "take-off" light.

40h. Elevator trim - Trim to "take-off" light.

41. Landing gear position indicators - check.

42. Landing gear warning light - check.

43. Fuel quantity - check.
Hold FUEL QUANTITY check switch in WING and FUS to check fuel quantities.

44. Fuel LOW LEVEL WARN light - Press to test.

45. Fire warning lights - Test.

46. Exterior and interior lights - as desired.

STARTING ENGINE (External D.C. Starting & Utility Power Connected)

1. Fire guard - posted.

2. Propeller and exhaust areas - clear.

3. Fuel shutoff handle - ON.

3a. Battery-generator switch - BATT-GEN.

4. ENGINE MASTER switch - ON.*

5. ENGINE START switch - START (Hold momentarily).*

6. On indication of engine rpm increase:
(a) IGN button - Depress and Hold.
(b) Throttle - GRD IDLE.

7. IGN button - Release when:
(a) EGT reaches 500°C, or
(b) Gas generator rpm reaches 35%.

NOTE:

If light-off does not occur within 20 seconds with the IGN button depressed, abort start by retarding the throttle to OFF, releasing the IGN button, and moving the ENGINE MASTER switch to OFF.

* Front cockpit only

NOTE

- If fuel flow exceeds 300 pounds per hour before light-off, abort start to avoid overtemperature. Wait 15 seconds after gas generator rpm is zero to allow the combustion chamber to drain before attempting another start.
- If EGT approaches 746°C, it may be necessary to modulate the throttle between OFF and GRD IDLE to prevent overtemperature.
- For EGT limits, refer to Section V.

8. Engine instruments - check.
9. External power - disconnected.

IDLE CHECK

1. Fuel flow - check (250 to 270 pph).
2. Oil pressure - check (10 psi minimum).
3. Gas generator rpm - check (40% to 42%).
4. Propeller rpm - check (330 to 400).
5. EGT - check (approximately 490°C).
6. Propeller control lever - TAXI stop.
7. Propeller rpm - check (140 to 180).

WARNING

- Do not advance the throttle above 80% gas generator rpm with the propeller control lever at the DECREASE (taxi) position.
- Do not attempt engine ground run-up to full power. Unless the airplane is securely tied down and the nose wheel strut is supported, the propeller may strike the ramp.

TAXI

The canopy should be closed while taxiing to avoid discomfort and possible burns from exhaust gas entry into the cockpits.

BEFORE TAKE-OFF

1. Flight controls - check.

2. Trim - Aileron, stick centered; Elevator & Rudder, Trim lights ON
3. Radios - check control and operation.
4. IFF - STANDBY.*
5. Flap handle - DOWN.
6. Canopy handle - CLOSED.
7. Shoulder harness - LOCKED.
8. Eject command handles - as desired.
   Check EJECT COMMAND WARN light out.
9. Propeller control lever - full INCREASE.
10. Throttle - Advance to 80% gas generator rpm.
11. Engine instruments - check.

TAKE-OFF

1. Release brakes and advance throttle to 92% gas generator rpm, or 1700 pph fuel flow, whichever is less.
2. Use nose wheel steering until rudder is effective.
3. At 5 KIAS below take-off speed, rotate to lift-off attitude.

CAUTION

- Do not exceed 1700 pph fuel flow for take-off, as propeller torque limits may be exceeded.
- Fuel flow is limited to 1650 pph for all conditions except take-off.

RECOMMENDED MINIMUM TAKE-OFF SPEEDS

GROSS WEIGHT (POUNDS)	KNOTS IAS FLAPS 40°	FLAPS 20°
8,000	63	68
9,000	67	72
10,000	72	77
11,000	76	81

*Front cockpit only

GROSS WEIGHT (POUNDS)	KNOTS IAS FLAPS 40°	FLAPS 20°
12,000	80	85
13,000	85	90
14,000	90	95
15,000	95	100
16,000	100	105

AFTER TAKE-OFF

1. When safely airborne, retract landing gear.
2. Below 140 KIAS, move flap handle to UP.
3. IFF - NORM (SIF code as required).*

CLIMB

1. Retard throttle to 1500 pph fuel flow.
2. EXTERNAL FUEL TRANSFER switches - ON as required.

NOTE

Do not exceed 1650 pph fuel flow.

CRUISE

1. On reaching desired altitude, set throttle to fuel flow recommended for best cruise.
2. Retard propeller rpm to match gas generator rpm (percent).
3. Allow airspeed to stabilize.
4. Adjust fuel flow to hold speed recommended for best cruise.

NOTE

- For optimum efficiency, gas generator rpm and propeller rpm are identical in percent at normal rated power (86% rpm) and below.
- Always advance propeller rpm before advancing gas generator rpm, and retard throttle (gas generator rpm) before retarding propeller rpm.

*Front cockpit only

DESCENT

For economical descent, retard the throttle to GRD IDLE and maintain 200 knots IAS.

LANDING

1. Harness - LOCK.
2. Fuel - check.
3. Landing gear - DOWN.
4. Propeller control lever - full INCREASE rpm.
5. Flaps - DOWN.

For a power-on final approach, adjust fuel flow between 400 and 500 pph. The following final approach speeds are recommended, based on 1.20 V_{spa} with 40-degree flaps:

GROSS WEIGHT (POUNDS)	KNOTS IAS
9,000	85
10,000	90
11,000	95
12,000	98
13,000	100
14,000	105
15,000	110
16,000	115

AFTER LANDING

1. After touchdown, propeller control lever - TAXI stop.
2. IFF - OFF.*

ENGINE SHUTDOWN

1. Flap handle - DOWN.
2. Parking brake - Set.*
3. Throttle - GRD IDLE (Stabilize for 1 minute).

*Front cockpit only

4. Throttle - OFF.
5. Run-down time - check.
6. ENGINE MASTER switch - OFF.*
7. BATT-GEN switch - OFF.
8. Fuel shutoff handle - OFF.
9. Propeller retainer - check installed.
10. Engine oil cooler and intake covers - check installed.

NOTE

Nominal engine run-down time is 20 seconds to zero percent indicated gas generator rpm. The propeller may continue to rotate for an undetermined time, depending on wind conditions.

*Front cockpit only