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FLIGHT HANDBOOK

G 91 AIRCRAFT

BRISTOL ORPHEUS MK 801 TURBOJET ENGINE

MARCH 1958 ISSUE

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THE AIRPLANE

The FIAT G 91 (fig. 1-1) is a light, single-place airplane specially designed as a tactical attack fighter conforming to the specification issued by NATO. Principal recognition features are its swept-back low wing and empennage and retractable tricycle landing gear.

The airplane is powered by a Model MK.801 Bristol Orpheus turbojet engine (fig. 1-2) capable of supplying a sea-level static thrust of 4850 lbs. (2200 Kg).

Steel armour plates protect the cockpit, which is conditioned and pressurized and is designed to offer and excellent visibility especially downward in the front vie area, thus permitting a prompt locating of targets.

The clamshell-type canopy with the radio compass sense aerial incorporated in the transparent plastic, is provided with an ejection system which can be operated either by the ejection seat firing handles through the time delay ejection mechanism or, independently from the seat, by a manual control.

The Martin Baker MK-W4 seat is provided with a time-delay release mechanism which makes bail-out possible at very low altitudes (50 ft minimum).

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A drag chute is provided on this airplane.

AIRPLANE DIMENSIONS

The principal dimensions of the airplane are as follows:

- Wing span	28.077 feet	8,558 m
- Length	34.173 feet	10,415 m
- Height (to top of fin)	13.123 feet	4,000 m
- Gross wing area	176.74 sq.ft	16,42 m^2
- Swept wing angle (at 1/4 wing chord)	37° 13' 24"	37°13'24"
- Aspect ratio	4.46	4,46
- Average thickness	10%	10%
- Tailplane area	27.8 sq.ft.	2,58 m^2

AIRPLANE WEIGHT

- Empty weight	6,585 lbs.	2.987 Kg
- Take-off gross weight including pilot, fuel, and ammunition (with no external load)	10,450 lbs.	4,738 Kg
- Take-off gross weight including pilot, fuel, and ammunition (with two 500-pound bombs)	11,450 lbs.	5.192 Kg

- Combat weight	8,985 lbs.	4.075 Kg.
- Landing weight (with 150 Kg of fuel remaining, ammunition expended and with no external load)	7,775 lbs.	3.526 Kg.

ARMAMENT

The armament of the G.91 consists of the basic armament and the alternate additional armament (figure 1-8).

The basic armament consists of four 300-round 0.5 inch (12.7 mm) Browning Colt M3 guns mounted on two gun panels (two guns for each panel) on the fuselage sides, just forward of the wing leading edges.

Provision has been made for substituting the four 12.7 mm guns with two 37 mm guns.

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The alternate additional armament consists of two 500-pound bombs hooked on pylons under the airplane wings.

Provision has been made for hooking on each pylon, in substitution for the bomb, a rocket pod with six 3-inch rockets or three 6-inch rockets, or a container with thirty-one 2-inch rockets, or nineteen 2.75-inch rockets, or a Napalm container.

ENGINE

The Model MK.801 Bristol Orpheus is an axial-flow turbojet engine with a seven-stage compressor driven by a single-stage turbine.

The combustion system consists of an annular chamber containing seven separate flame tubes.

The engine weight is 970 lbs; the rated sea-level static thrust is 4850 lbs.

ENGINE FUEL SUPPLY SYSTEM

All fuel is contained in nine fuel cells and is directed to cell No.5 which acts as manifold sump. A submerged electric fuel booster pump incorporating a unit that ensures pump operation during inverted flight, directs fuel (figure 1-9) from cell No.5 through a fuel low pressure cock (manually controlled from the cockpit by the FUEL L.P.COCK lever) and a low pressure fuel filter to the engine-driven pump. A pressure switch is incorporated in the fuel filter. When the pump pressure drops below 5 p.s.i., this switch closes an electrical circuit and the FUEL LOW PRESS. red warning light goes on. This light is of the push-to-test type and is located in the instrument panel to the right of the fuel quantity indicator.

The engine-driven pump directs the high-pressure fuel to the combined control unit (CCU) which, in turn, controls the fuel flow to the burners.

The combined control unit (CCU) includes the following: barometric pressure control, throttle valve and high pressure cock combined unit, fuel flow distributor, and dump valve.

The function of each CCU component is as follows:

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The barometric pressure control (BPC) controls the fuel pump pressure and thus the fuel flow to the burners and maintains engine rpm constant at any given throttle position, in respect to the airplane height and speed.

The throttle valve and high pressure cock combined unit permits regulation of engine rpm and engine shutdown when the throttle is positioned at "STOP".

The fuel flow distributor divides the fuel from the throttle valve and high pressure cock combined unit and directs it to the two circuits that supply the Duplex type burners. This ensures a proper atomization both at low and high engine r.p.m.

The dump valve permits draining overboard all fuel contained in the primary manifold when the engine is shut down.

NOTE

During engine operation, the dump valve is kept closed by the primary pressure. When the engine is shut down, this pressure drops and a spring opens the valve.

An air-fuel ratio control is incorporated in the fuel system. This unit functions only during accelerations to prevent compressor stalls or flame-outs due to excessive feeding which may occur on rapid engine acceleration.

WARNING

This control is fully effective only up to 10,000 feet.

Throttle

The throttle is on the left console (figure 1-10). The throttle grip contains the SPEED BRAKES switch, the air start IGNIT. button, and the MIC button.

The throttle quadrant is labeled "STOP", "CLOSED" and "OPEN". There are three stops on the quadrant: one at the "STOP" position, one at "START & FLIGHT IDLE", and one at the full forward travel end stroke.

The throttle friction can be adjusted by means of the "THR. FRICTION" handwheel. Friction is increased by rotating the handwheel clockwise (to INCREASE).

Between the throttle and the friction adjuster is the fuel low-pressure cock (labeled "FUEL L.P. COCK") which is a two-position lever ("CLOSED" backward and "OPEN" forward).

Adjacent to the throttle, outboard, is the wing flap control lever, which has three position: "DOWN" backward, "UP" forward, and an intermediate neutral position ("HOLD").

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IGNITION SYSTEM

When carrying out a ground start, select BOOSTER COILS switch to "NORM". Depression of the "STARTER" button of the CARTRIDGE SELECTOR will then supply 28 volts D.C. to the two booster coils and also fire a cartridge. The booster coils will in turn supply high tension current to the two ignition plugs mounted in flame tubes No.4 and 7. The discharges from these plugs ignite the mixture in these tubes and the light up progresses through the interconnectors to the remaining tubes. A time switch is provided to cut out the ignition automatically after a 30 second period.

To make and air start depress the ignition button on the throttle.

WARNING

Ensure that the BOOSTER COILS switch is to "NORMAL".

The button may be pressed for 15 seconds, which is the maximum time, the throttle should be kept open without a relight being achieved, and released in any case when the engine has reached 3500 p.r.m. on successful relighting.

STARTER SYSTEM

The MK.801 B.Or. turbojet engine incorporates a cartridge type turbostarter. It is located in the forward section of the engine and it is entirely contained in the nose of the air intake duct and casing.

The turbostarter includes a single-stage turbine driven by the expansion of the cartridge exhaust gases which are directed to the starter through stainless steel tubes. Each cartridge has a safety valve which opens at 1400 p.s.i. (98,5 Kg/cm^2).

The turbine exhaust gases are exhausted to the atmosphere through a duct.

Motion from the starter turbine wheel is transmitted to the compressor by means of a toothed jaw which is automatically disengaged by engine oil pressure when a start is made.

The cartridges are electrically ignited through the selector and time switch, which also prevents a second cartridge from being selected or fired before 30 seconds have elapsed since ignition of the first cartridge.

ENGINE AIR INLET

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The engine inlet air is routed from the air inlet opening, located under the nose of the airplane, to the engine compressor by a duct.

ENGINE INSTRUMENTS

Tachometer

The tachometer is calibrated from 0 to 1000 r.p.m. with 100 r.p.m. intervals.

Exhaust temperature indicator

The exhaust temperature indicator is calibrated in 20-degree increments from 0°C to 800°C.

Fuel quantity indicator

The fuel quantity indicator is calibrated from 0 to 2730 pounds.

Oil temperature indicator

The oil temperature indicator is calibrated from 0°C to 120°C.

OIL SYSTEM

Lubrification of the bearings of the engine and the accessory drives (figure 1-11) is accomplished by means of DERD type 2487 oil which is contained in a tank located on the compressor left side. The tank working capacity is 7.95 lt. of which 2.84 lt. can be used. The maximum allowable consumption is 1.14 lt/hour.

From the tank oil is routed to the main pump which sends it under pressure through a check valve to two lines. One line routes the oil, through a filter, to the forward bearing of the engine; then, through an auxiliary pump, a filter and a scavenge pump, the oil is transferred back to the oil supply tank. The other line routes the oil through a filter to the metering pump which directs it to two lines.

The first line is connected to the accessory drives and thence is transferred back to the oil supply tank through a filter and a scavenge pump.

The second line carries the oil to the rear bearing through check valve. This oil is not reclaimed and is lost in the tail pipe.

Incorporated in the oil pump, alongside the check valve is a pressure relief valve which limits the maximum pressure in the system.

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FUEL SYSTEM

The fuel system consists (figure 1-12) of 9 fuel cells installed in the fuselage. All cells are interconnected. Fuel used in this airplane is MIL-F-5616-AFT.

Cell No.	lt.	Kg.	Imp. gall.	U.S. gall.	lbs.
Forward group 1-2LH-2RH-4	790	~~620~~	174	209	1367
Aft group 3LH-3RH-3'LH-3'RH	650	510	143	172	1125
Sump 5	160	126	35	42	277
TOTAL	1600	1256	352	423	2769

There are two filler points which route the fuel to cells 2RH and 3RH. Fuel from these cells will drain into all the other cells of their respective group.

The two groups supply fuel to the fuel flow proportioner which is operated by hydraulic pressure. The proportioner, in turn, routes the fuel through two float valves to the sump (cell No.5).

Between the fuel flow proportioner and the float valves is the system dump cock. Three other cocks, one in cell No.4 and two in cell No.5, provide a means for draining the fuel overboard.

A submerged booster pump with inverted flight device transfers the fuel from the sump to the engine-driven pump through a remote manual control shutoff cock and a filter.

All tanks are pressurized by means of a system which receives pressure from the engine section and directs it to the cells through two pressure-reducing valves.

Three sets of interconnected Waymouth fuel quantity transmitters:

- 1st set - relative to the forward group, including 4 transmitters,
- 2nd set - relative to the aft group, including 2 transmitters,
- 3rd set - relative to the sump, including 2 transmitters,

join in a junction box, from which one coaxial cable leads to an amplifier which is connected to the indicator in the cockpit.

FUEL FLOW PROPORTIONER

The fuel flow proportioner meters the amount of fuel consumed from the two groups of cells to prevent the airplane center of gravity from varying. (For this would occur if the consumption of fuel from the two groups was not proportional). The proportioner is operated by hydraulic pressure. It must be disconnected before the airplane total fuel quanti-

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ty drops below 450 pounds.

SUBMERGED ELECTRIC BOOSTER PUMP

The fuel booster pump supplies fuel from the sump to the engine-driven pump. It also prevents the fuel pressure at the engine-driven pump inlet from dropping below 5 p.s.i. The pump incorporates a unit that ensures pump delivery also during inverted flight.

ELECTRICAL POWER SUPPLY SYSTEM

Electrical energy in this airplane is supplied through a 28-volt, direct-current system powered by a 140-ampere (max 210 amperes for 3 minutes), engine-driven Labinal generator.

The generator normal operating range is between 3300 and 10000 rpm.

The system powers the following: engine ignition system, fuel quantity indicator, Pitot heater, electrical instruments and accessories, servo system valves, fuel pumps, radio systems, gun firing control, gun sight, bomb and rocket release gear, gun camera control, position indicators, fuel and oil low pressure warning lights, fire warning light, etc.

ELECTRICALLY OPERATED EQUIPMENT

See figures 1-13/1, 1-13/2 and 1-14.

CAUTION

If the electrical equipment is to be ground-operated, such operation will not exceed 30 minutes unless the access panels covering the electrical equipment are removed. Heat generated in the electrical compartments will cause immediate failure or a serious reduction in life of equipment.

D.C. ELECTRICAL POWER DISTRIBUTION

The d.c. electrical power necessary for operation of the electrical units in the airplane is distributed by a group of three busses: a battery bus, a primary bus, and a secondary bus.

The battery bus is hot at all times when the battery is on, so that emergency equipment is always operable.

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The primary bus is powered from the generator. It supplies power to all essential equipment. In case of a power failure to the generator, the primary bus will be powered from the battery bus, provided the "BATTERY" switch is in the "ON" position. The "BATTERY" switch is set at "OFF" only during starting or ground tests, that is, when an external power source is connected.

The secondary bus is powered from the primary bus. It supplies power to all non-essential equipment. In case of a power failure to the generator a relay automatically disconnects the primary bus from the secondary bus.

External power receptacle

The external power receptacle is located on the right lower side of the airplane just aft of the wing trailing edge. When an external power unit is connected to it, current is supplied to the primary bus and to the secondary bus.

Circuit breakers

Most of the electrical circuits are protected by push-pull circuit breakers mounted on a panel at the rear end of the right console (figure 1-15).

Only the canopy circuit breaker, the bomb lock circuit breaker, and the horizontal stabilizer trim fuse are not on this panel, but on the right side of the airplane in a bay just aft the armament bay.

"BATTERY" switch

The battery switch is on the right side of the instrument panel. It is a two position ("ON" and "OFF")toggle switch. This switch permits connecting the battery bus to the primary bus through a relay.

"BATTERY OUT" warning light

The "BATTERY OUT" light warns, going on, that battery bus is disconnected from the primary bus. This light is located in the right lower side if the instrument panel and it is red.

"GENERATOR" switch

The "GENERATOR" switch has three positions: "ON", "OFF" and "RESET", and is spring-loaded to "OFF" from the "RESET" position. It is located on the right side of the instrument panel. When positioned at "ON" ,this switch permits connecting the generator to the primary bus. The "RESET" position permits connecting the generator to the primary bus if it had been disconnected by an overvoltage condition.

"GENERATOR OUT" warning light

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This light goes on whenever the generator does not supply power to the primary bus. It is located in the right lower corner of the instrument panel, next to the "BATTERY OUT" warning light, and it is red.

Voltmeter

The voltmeter is mounted on the right lower corner of the instrument panel. This instrument provides a visual indication of the voltage available at the primary bus. The voltmeter should normally indicate 28 volts.

Loadmeter

The loadmeter is mounted beside the voltmeter on the right lower corner of the instrument panel. This instrument indicates percent of maximum amperage and reads "1" when this current is 140 amperes.

A.C. ELECTRICAL POWER DISTRIBUTION

The a.c. electrical power is distributed to the a.c. electrical equipment throughout the airplane by the 115-volt, 400 ampere, a.c. bus. The a.c. bus is powered from the secondary bus.

The a.c. bus supplies power to the following: slaved gyromagnetic compass, attitude gyro (vertical gyro), cockpit air conditioning and pressurization system temperature regulator, AN/APX-6 IFF set, and yaw damper.

Inverter

The inverter transforms 28-Volt d.c. secondary bus power into 400-ampere, 115-Volt, single phase a.c. power.

"INVERTER" switch

The "INVERTER" switch is on the right side of the instrument panel and it is protected by a cap, which, when depressed, maintains it in the "ON" position. This switch has two positions: "ON" and "OFF". Placing it in either position, energizes or de-energizes, respectively, the inverter.

A.c. fuses

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The a.c. circuits are protected by fuses grouped together on the circuit breaker panel (figure 1-15), aft of the circuit breakers, on the right console, except the fuse that is on the connection between the inverter and the a.c. bus. This fuse is mounted in the bay covered by the stainless steel panel that carries the right side gun slots.

UTILITY HYDRAULIC POWER SUPPLY SYSTEM

The hydraulic power system consists of a 22-liter hydraulic fluid reservoir, an engine-driven pump, a pressure regulator, ac accumulator, and a pressure transmitter which leads to a gage in the cockpit.

This system supplies power for operation of the landing gear, speed brakes, fuel flow proportioner, flight control system, and wheel brakes.

The hydraulic fluid is directed through a filter to the engine-driven pump which in turn, routes it under pressure through a second filter to the accumulator. A pressure regulator mounted between the filter and the accumulator unloads excessive fluid into the fluid reservoir.

After the accumulator, the fluid under pressure flows to the above systems. (See figures 1-16/1, 1-16/2, 1-23 and 1-26).

Utility hydraulic system pressure gage

After the accumulator there is an electric pressure transmitter which is directly connected to the "UTILITY" gage in the "HYDRAULIC SYSTEM" panel(lower side of instrument panel).

This gage, which is calibrated from 0 to 5000 p.s.i. and indicates the pressure available in the utility hydraulic system.

The normal values range between 3150 and 3550 p.s.i.

FLIGHT CONTROL SYSTEM

The Flight Control system incorporates aileron and elevator servo controls.

The airplane attitude relative to the longitudinal axis is controlled by the ailerons through stick movement. Hydraulic servo controls are provided before each aileron to overcome stick forces. Thus, the rigid mechanical linkage between control stick and servo controls is connected to a spring-loaded hydraulic artificial feel system to provide normal stick feel to the pilot.

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No control surface trim tabs are required on the ailerons. The airplane lateral trim is effected by changing the artificial feel neutral position by means of the trim electric actuator and by moving the stick from its neutral position.

The airplane attitude relative to the lateral axis is controlled by the elevator (through stick movement) by means of a servo control. There is automatic transfer to mechanical operation will occur in the event of hydraulic system failure. No control surface trim tabs are required on the elevator as the stabilizer is mobile in virtue of an electric actuator controlled either by the control stick grip normal trim switch or by the alternate trim switch located in the flight control panel and labeled "EMERG.LONGL.TRIM".

The airplane attitude relative to the vertical axis is mechanically controlled by the rudder through the rudder and brake pedals. The rudder incorporates a trim tab which is actuated by an electric actuator controlled by the "RUDDER TRIM" switch located in the flight control panel.

NOTE

In case of hydraulic system failure devices incorporated in the servo controls make the transmissions rigid and operation becomes merely mechanical.

ARTIFICIAL FEEL SYSTEM

The artificial feel system (figure 1-17) is connected to the mechanical transmission extending from the control stick to the ailerons, behind the aft frame of the left armament bay. Essentially, it consists of a spring-loaded actuating cylinder.

To move the control stick, the spring load must be overcome. The artificial feel system makes the effort vary with the movement.

Movement of the system by means of a motor that is connected to it on the side opposite to the mechanical transmission connection, permits control stick movement from neutral position and thus functions as lateral trim.

YAW DAMPER

A yaw damper (figure 1-18) is installed to increase the directional stability of the airplane. The yaw damper senses rate of directional changes and electrically varies (through a servo control) rudder position to dampen out the change. It may be on at any time that yawing oscillation must be reduced (for instance, during the search and attack phase of the mission).

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"YAW DAMPER" switch

The YAW DAMPER switch is in the armament control panel on the left console, controls the yaw damper. It has two positions: "ON" and "OFF".

FLIGHT CONTROLS AND INDICATORS

Control stick

The control stick grip (figure 1-19) mounts an aileron and horizontal stabilizer trim switch, a camera and gun firing trigger, a microphone button, and a-bomb release and rocket firing button.

Rudder pedals

The rudder pedals (figure 1-20) can be adjusted fore and aft by means of a toothed handwheel inboard of the pedals.

Control lock

The control surfaces can be locked (figure 1-21) by means of a lever located forward of the control stick. When the lever is pulled up to the height of the lug on the control column, and the spring-loaded pin is inserted, the control stick becomes locked. At the same time, a pin becomes engaged by means of a leverage; this pin locks the pedals

in the center position, while the throttle is locked in the "STOP" position by means of a teleflex cable.

Normal trim switch

Normal trim of the airplane is provided through a four-position switch on top of control stick grip. (See figure 1-19). This switch is spring-loaded to the center position.

The center position is the neutral position. Holding the normal trim switch forward or aft changes the position of the horizontal stabilizer leading edge and trims the nose down or up. Holding the normal trim switch to either side changes the control stick neutral position by means of a motor that changes the artificial feel system neutral position and causes the corresponding wing to be trimmed down.

Alternate longitudinal trim switch

The three-position "EMER.LONG'L TRIM" switch, on the flight control panel on the left console, provides an alternate,independent, trim circuit for the horizontal stabilizer. The switch positions are "NOSE DOWN" "OFF" and "NOSE UP".

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Horizontal stabilizer position indicator

The horizontal stabilizer position indicator is mounted on the instrument panel and is marked "TRIM". Its scale ranges from "NOSE UP" to "NOSE DOWN" and an "0" marking is provided to indicate the keying position with respect to the airplane longitudinal axis. The stabilizer incidence can be varied from +4°30' to -2°.

Rudder trim tab control switch

The three-position "RUDDER TRIM" switch is located in the flight control panel (figure 1-22). Its positions are "LEFT","OFF" and "RIGHT". Through a motor, this switch moves the tab right or left, trimming the airplane left or right, respectively.

Take-off position indicator light

Operating the control switch, when the trim tab passes through the take-off position, will cause the "TAKE-OFF POSIT" warning light, located on the flight control panel, to come on (figure 1-22).

FLIGHT CONTROL HYDRAULIC SYSTEM

The flight control idraulic system (figure 1-23) receives its power from the utility hydraulic power system and has an independent return line to the hydraulic fluid reservoir. The flight control hydraulic

system is divided into three other systems: aileron normal system, aileron emergency system, and elevator system. Each system has an accumulator, preceded by a check valve, and followed, on the supply line, by a pressure relief valve, which calibrated at 4000 p.s.i. A pressure reducing valve is provided on the emergency system supply line to reduce the pressure from 3550 to 2850 p.s.i.

Aileron servo systems pressure gage

The "AILERON SERVO" dual gage is installed in the "HYDRAULIC SYSTEM" panel. It has two pointers, "NORMAL" and "EMERG.", to indicate the working pressure in the flight control normal and emergency systems.

Aileron servo switch

This switch is indicated by the marking "AILERON SERVO NORMAL SYSTEM PRESSURE" and has two positions: "ON" and "OFF". It is used to engage or disengage the aileron servo control.

Normal system low pressure warning light

The normal system low pressure red warning light, marked "LOW PRESS" is calibrated at 2630 ± 107 p.s.i. This light will illuminate whenever the normal system pressure drops below this value, indicating automatic transfer to flight control alternate system.

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Elevator servo switch

This switch is on the left console forward of the throttle. It is labeled "PRESSURE" and it has two positions, "ON" and "OFF". It controls the elevator.

Elevator servo disengage warning light

The "ELEV.SERVO RELEASE DISENGAGE" amber light is located forward of the elevator servo control switch. This light will illuminate when this switch is at "OFF" and stick-to-elevator connection is mechanical.

WING FLAP SYSTEM

Each flap is operated by an individual electrical actuator. The actuators are mechanically interconnected by a flexible shaft to synchronize the flap travel. In case of a power failure to one of actuator, the other can drive both flaps (at a reduced speed) through the synchronizing shaft. The actuators are of the worm-screw type, and are mechanically irreversible.

WING FLAP LEVER

The wing flap lever, located outboard of the throttle and marked "FLAP", moves on a quadrant marked "UP", "HOLD" and "DOWN".

Placing the lever to "UP" or "DOWN", current is sent to the retraction or lowering cycle of the actuator. Power is automatically removed from the actuator when the flaps reach the extreme position by means of limit-stops. To position the flaps at an intermediate position, the flap lever will be positioned to "HOLD" when the flaps will have reached the desired position.

Wing flap position indicator

The "FLAP" indicator, located below the altimeter, moves on a quadrant marked "UP" and "DOWN". It indicates flap position from fully retracted to fully extended.

SPEED BRAKE SYSTEM

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The speed brakes consist of two rigidly interconnected belly doors and a single electrically controlled hydraulic actuating cylinder (figure 1-16/1).

Speed brake switch

The speed brake switch is mounted on the throttle grip and is labeled "SPEED BRAKES". It has two positions "IN" and "OUT", and it is spring-loaded to the center position which is indicated by a mark. The speed brakes can be stopped in any desired position by releasing the switch to neutral (center position).

Speed brake ground safety switch

This switch prevents accidental speed brake closing when the airplane is on the ground. The switch interrupts the circuit of the retraction control valve and is controlled by introducing a key into the hole located just forward of the speed brakes on the left side. The key must be pushed full in and rotated until the stop "click" is heard.

Speed brake position indicator

The "AIRBRAKE" indicator is mounted below the altimeter. The pointer dial ranges from "IN" to "OUT" positions; pointer movement is proportional to speed brake opening.

LANDING GEAR SYSTEM

The landing gear is hydraulically actuated and all the wheel fairing doors are mechanically actuated by the movement of the landing gear (figure 1-16/2).

An accumulator supplies pressure to the nose gear actuating cylinder for emergency lowering of the nose gear. The main gear, once the uplock hooks are opened, during emergency operation, extends by gravity and can be downlocked by abrupt side movements of the control stick.

NOSE GEAR GROUND SAFETY LOCK

While the airplane is parked, or is being maneuvered on the ground, a mechanical ground safety lock should be installed to prevent inadvertent retraction of the nose gear. A red streamer is attached so that intallation of the lock is apparent (figure 1-24).

LANDING GEAR LEVER

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The landing gear lever is located in the left side of the instrument panel and is marked "LANDING GEAR" (figure 1-25). This lever has two positions "UP" and "DOWN". It receives its power from the primary bus.

When the gear is down and locked and the weight of the airplane is on the gear, a ground safety switch prevents movement of the gear lever from "DOWN" to "UP".

LANDING GEAR EMERGENCY RETRACT BUTTON

If it is necessary to retract the gear during take-off or landing, the "LDG GR EMERG UP" button (figure 1-25) is provided above the gear lever. This button unlocks the gear lever and permits movement of it.

LANDING GEAR EMERGENCY RELEASE LEVER

This lever is located below the instrument panel, the left side (figure 1-25). It unlocks the uplock hooks and opens the emergency system accumulator supply line to the nose gear actuating cylinder.

The main gear will fall by gravity.

LANDING GEAR POSITION INDICATORS

The "LDG GR POSITION" indicator (figure 1-25) provides a visual indication of the landing gear position. A warning light is located in the landing gear control lever.

There are three kinds of signals to indicate the landing gear position:

The word "UP" - If the gear is up and locked.

RED CROSSHATCHING - If the related gear is in an unlocked condition. (This indication will also appear if the gear is locked but the electrical system is inoperative).

A MINIATURE WHEEL - If the gear is down and locked.

Gear unsafe warning light

A gear unsafe warning light is located in the landing gear control lever. The light goes on intermittently when any gear is not locked up or locked down.

GEAR UNLOCKED WARNING HORN

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A warning horn in the aft left side of the cockpit sounds when the gear is in any position other than down and locked if the throttle is at less than 5000 r.p.m.

Advancing the throttle silences the horn.

WARNING HORN CUTOUT BUTTON

The "LDG GR HORN CUT OUT" button is located in the left lower side of the instrument panel. Depressing it cuts out power to the horn circuit. Advancing the throttle resets the horn circuit.

ANTISHIMMY UNIT

A unit that acts as a shimmy damper is installed on the nose gear strut (figure 1-26).

WARNING

Before the airplane is towed, the antishimmy unit must be disengaged by pulling out the pin that connects the lever to the control connecting rod. The antishimmy unit should be engaged prior to flight.

WHEEL BRAKE SYSTEM

The wheel brake system (figure 1-27) is of the hydraulic servo control type.

The braking units consist of self-compensating rotor plates; they are applied to the main landing gear wheels and are actuated by servo control hydraulic actuating cylinders. The actuating cylinders are operated by toe action on the rudder pedals.

The braking action of each unit is proportional to the force applied on the pedals.

EMERGENCY AND PARKING BRAKE

In case of failure of the brake system, braking is still possible in virtue of the pressure stored in the system accumulator. In this case braking is not effected through the pedals but through the emergency brake handle.

Pulling this handle will supply pressure to the braking units and the braking action will be same as if it was applied through the pedals. The braking action will be proportional to the pulling force on the handle. When released, this handle will return to its normal position.

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When parking, the wheels must be locked. Therefore, once the handle is pulled out, rotating it 90 degrees will lock it in that position.

Emergency brake handle

The emergency brake handle is located to the right of, and above the instrument panel. It is marked "EMERG.WHEEL BRAKE".

DRAG CHUTE SYSTEM

A drag chute is provided in this airplane to reduce landing distances (figure 1-28). The ring-slot type drag chute, packaged in a deployment bag, is provided with a spring-loaded pilot chute. It is stowed in a compartment located between the base of the vertical empennage and the exhaust pipe.

The drag chute is manually controlled from the cockpit through teleflex cable.

CAUTION

The drag chute is for operation only after touchdown has been made and at speeds of 150 knots IAS or below.

DRAG CHUTE HANDLE

The drag chute handle is located above the instrument panel, on the left, and is marked "DRAG CHUTE".

Pulling the drag chute handle opens the compartment door and allows the pilot chute to come out. Pushing it back in, will jettison the drag chute.

INSTRUMENTS

Most of the instruments are electrically operated.

The tachometer and the exhaust temperature gage are connected to self-generated equipments.

AIRSPEED AND MACH NUMBER INDICATOR

The airspeed and Mach number indicator is essentially a conventional airspeed indicator with the addition of a pointer which gives indication of the Mach number.

G.91-P

ACCELEROMETER

The accelerometer indicates the airplane instantaneous accelerations and maximum accelerations (positive and negative). It has three pointers: one indicates the max positive accelerations, one indicates the max negative accelerations, and one indicates the instantaneous acceleration and moves the other two. A knurled button resets the instrument to zero.

STAND-BY COMPASS

It is a conventional magnetic compass mounted on the windshield (on top to the right).

It is furnished for navigation in the event of slaved gyro magnetic compass failure.

SLAVED GYRO MAGNETIC COMPASS

Refer to "Navigation Equipment" in section IV.

ATTITUDE GYRO

The attitude gyro receives its power from the secondary bus and the a.c. bus. It indicates the attitude of the airplane in relation to the horizon. Erection of the gyro requires approximately 2½ minutes.

The "OFF" flag will appear on the quadrant in case of a complete a.c. or d.c. power failure.

Should the gyro tumble, which is very unlikely to happen, it will erect in approximately 2½ minutes if the circuit breaker labeled "VERTICAL GYRO" is momentarily pulled out and then pushed back in.

As level-flight pitch attitude of the airplane varies with different loadings and speeds, a pitch trim knob is provided on the indicator for the pilot to center the horizon bar after the airplane has been trimmed for level flight.

EMERGENCY EQUIPMENT

G.91-P

ENGINE FIRE-WARNING SYSTEM

The engine fire-warning system consists of fire detectors radially mounted around the engine compressor. These detectors permit detection of a fire condition by energizing a circuit, which causes illumination of the "FIRE" warning light located on the right upper side of the instrument panel (fig. 1-29).

Operation of the circuit can be checked by moving the spring-loaded "TEST CIRCUIT" lever (below the warning light) downward. If the circuit is inoperative, the warning light will not illuminate.

CANOPY SYSTEM

The electrically actuated canopy (figure 1-30) opens and closes by rotating about a hinge point at the rear. The canopy is locked mechanically by means of a lever located in the upper left side of the cockpit. Locking the canopy will permit inflation of the canopy pneumatic seal which runs around the canopy portion that is in contact with the hatchway.

CANOPY SWITCH

The canopy switch is located in the left lower corner of the instrument panel. It has two positions, "OPEN" and "CLOSED", and it is spring-loaded to the center position. This switch controls the opening and closing of the canopy. The canopy can also be left partially open by simply releasing the canopy switch when the canopy has reached the desired position.

CANOPY UNSAFE WARNING LIGHTS

Two unsafe warning lights, connected in parallel, are provided in left lower side of the instrument panel, adiacent to the canopy switch.

These lights, which are covered by a common red cover glass, will illuminate and remain on as long as the canopy latches are unlocked.

EXTERNAL CANOPY SWITCHES

External control of the canopy is accomplised by means of two push buttons, located on the left lower side of the fuselage just above the upper gun port, where the writing "EXT CANOPY SWITCHES" appear. The upper button "OPEN") opens the canopy while the lower button ("CLOSE") closes the canopy.

G.91-P

There is no functional difference between the canopy switch in the cockpit and the external canopy switches, provided an external electrical power source is connected to the airplane.

CANOPY JETTISON HANDLE

This handle is located below the instrument panel and is marked "EMERG.CANOPY JETT.". It permits jettisoning the canopy independently of seat ejection.

CANOPY RELEASE HANDLE

The canopy release handle is mounted in the left side of the fuselage, aft of the gun panel, and is covered by a door marked "EMERG.CANOPY RELEASE". It unlatches and releases the canopy from its hinge point.

CANOPY LOCK LEVER

A canopy lock lever, located in the left side of the cockpit, above the throttle, provides a means for locking the canopy in the down position. When the canopy iw fully locked, the canopy unsafe warning light circuit opens and air under pressure is supplied to the canopy seal.

GROUND SAFETY PIN

A canopy ground safety pin is installed on the right side (up) of the ejection seat. This safety pin prevents movement of the canopy unlock control rod.

EJECTION SEAT

The Martin-Baker fully automatic type MK-W4 ejection seat is designed to provide safe escape at all altitudes and speeds and, after ejection, to deploy the parachute automatically and lift the occupant from the seat. If an ejection is made at high altitude, a barostatic control attached to the seat delays the opening of the main parachute and separation of the occupant from the seat to a more tolerable altitude where the automatic mechanism operates.

Firing of the ejection charges is a completely manual operation. Height adjustment of seat and locking of belts are also manually controlled operations.

G.91-P

The seat incorporated a main stabilizer drogue and a controller drogue, stowed in the headrest.

The main parachute and its controller drogue are stowed in a "horseshoe" wedge shaped pack behind the occupant's shoulder. This gives a high degree of comfort to the seated occupant.

FACE BLIND FIRING HANDLE

The face blind firing handle projects from the headrest. Pulling the handle will extract the face blind which serves to cover the pilot's face.

ALTERNATE FIRING HANDLE

The alternate firing handle is located in the leading edge of the seatpan, between the pilot's legs. It has the same function as the normal handle and it is used when, due to high acceleration, the arms cannot be raised above the head.

In ejection is made through the alternate firing handle the face will not be protected by any face blind; therefore, if this is the case, sit erect with head and back tight against seat.

TIME DELAY FIRING MECHANISM

Pulling one firing handle will cause operation of this mechanism,

which regulates the sequence of the following operations during seat ejection canopy release, canopy ejection and seat ejection.

GROUND SAFETY PINS

Ground safety pins are installed to prevent accidental firing. One safety pin is provided to lock the face blind firing handle and is installed on top of the headrest; another safety pin is provided to lock the alternate firing handle and is located in the front side of the seat. The third safety pin prevents the striker lockpin from sliding out and is located on the seat catapult head.

SEAT VERTICAL ADJUSTMENT LEVER

Vertical seat adjustment is accomplished by operation of the seat vertical adjustment lever, located on the right side of the ejection seat. The seat up and down maximum travel is aaproximately 15 cm.

PILOT EMERGENCY RELEASE LEVER

G.91-P

Pulling this lever upward will release belts, leg restraining belts, and parachute from seat.

"GO FORWARD" RELEASE LEVER

Pulling this lever will unlock the shoulder harness, permitting adjustment of the distance from the seat. When the lever is released, the shoulder harness will lock in the desired position.

THREE VIEWS

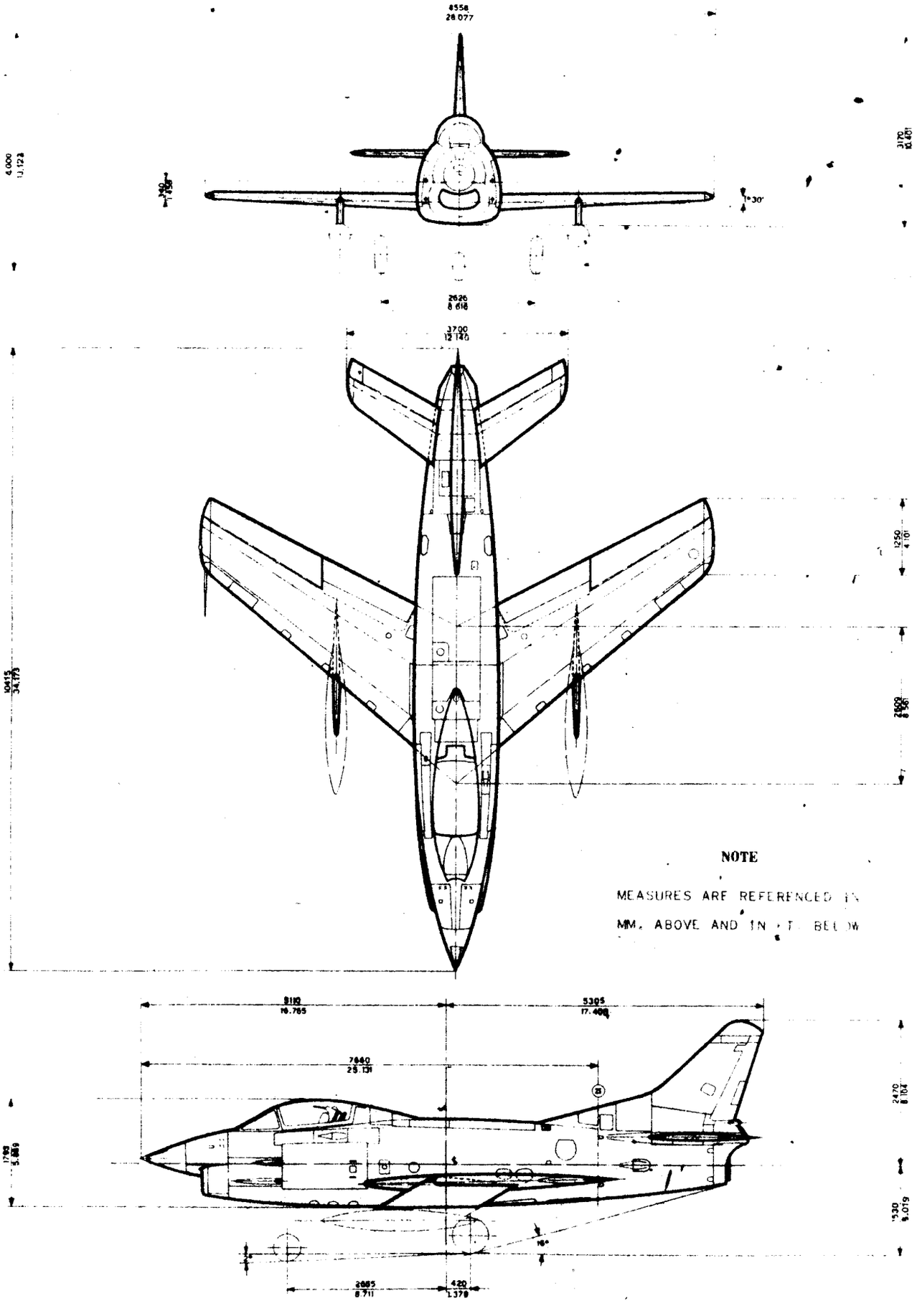


Figure 1-1

F-0000

BRISTOL ORPHEUS MK 801 JET ENGINE

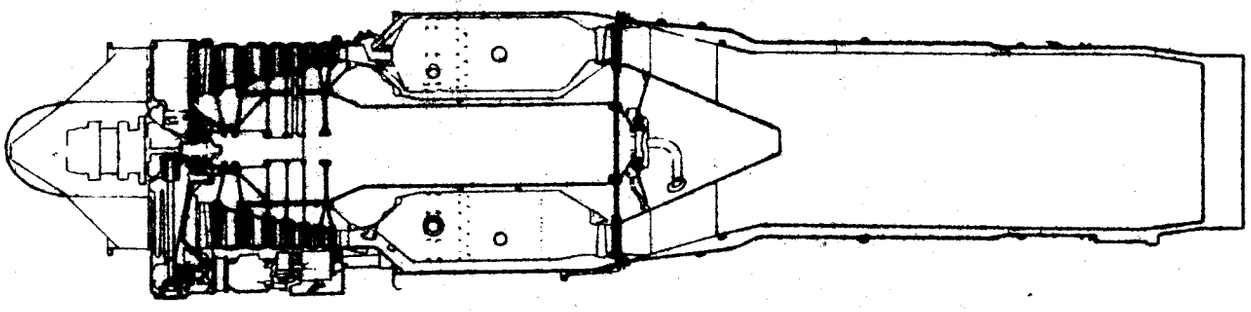


Figure 1-2

A-0001

AIRCRAFT SECTION

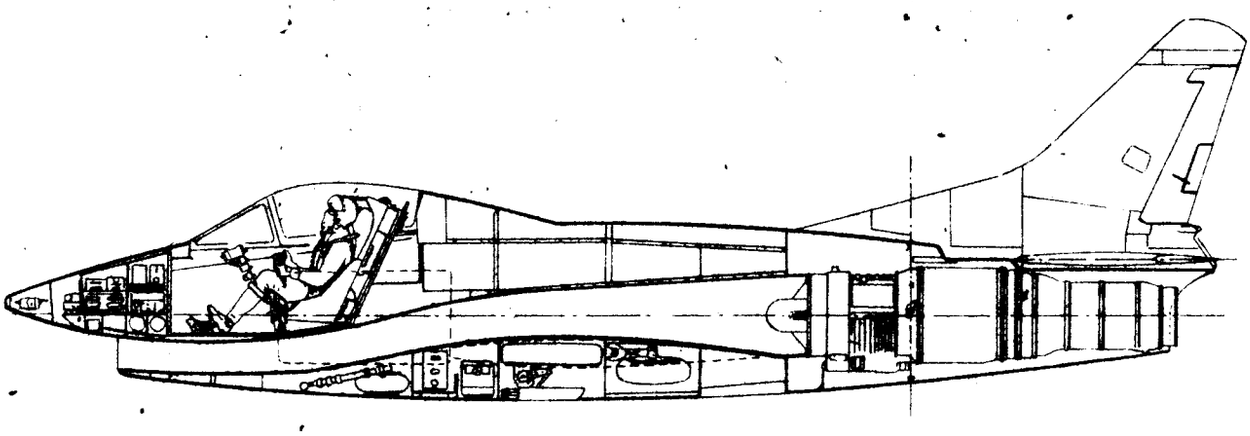


Figure 1-3

COCKPIT

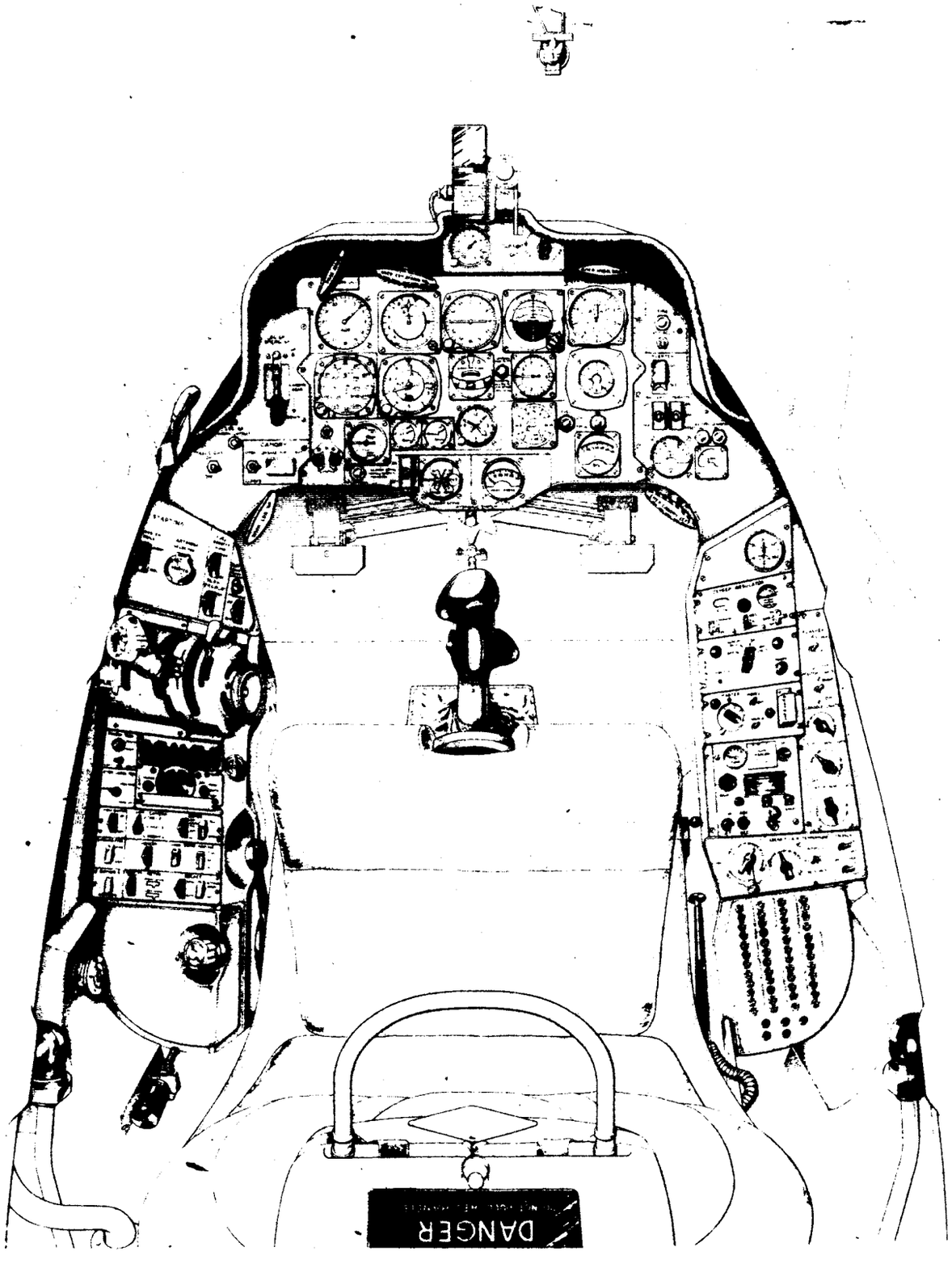


Figure 1-4

INSTRUMENT PANEL

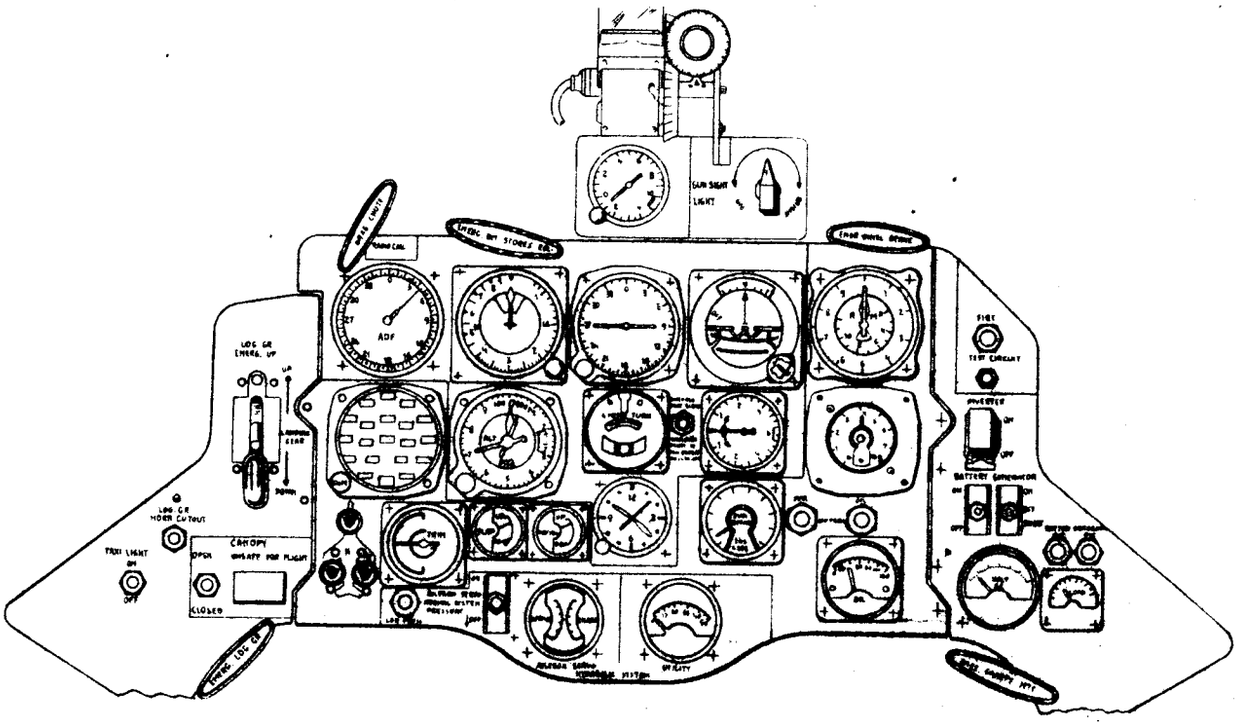


Figure 1-5/1

KEY TO INSTRUMENTS, CONTROLS AND INDICATORS

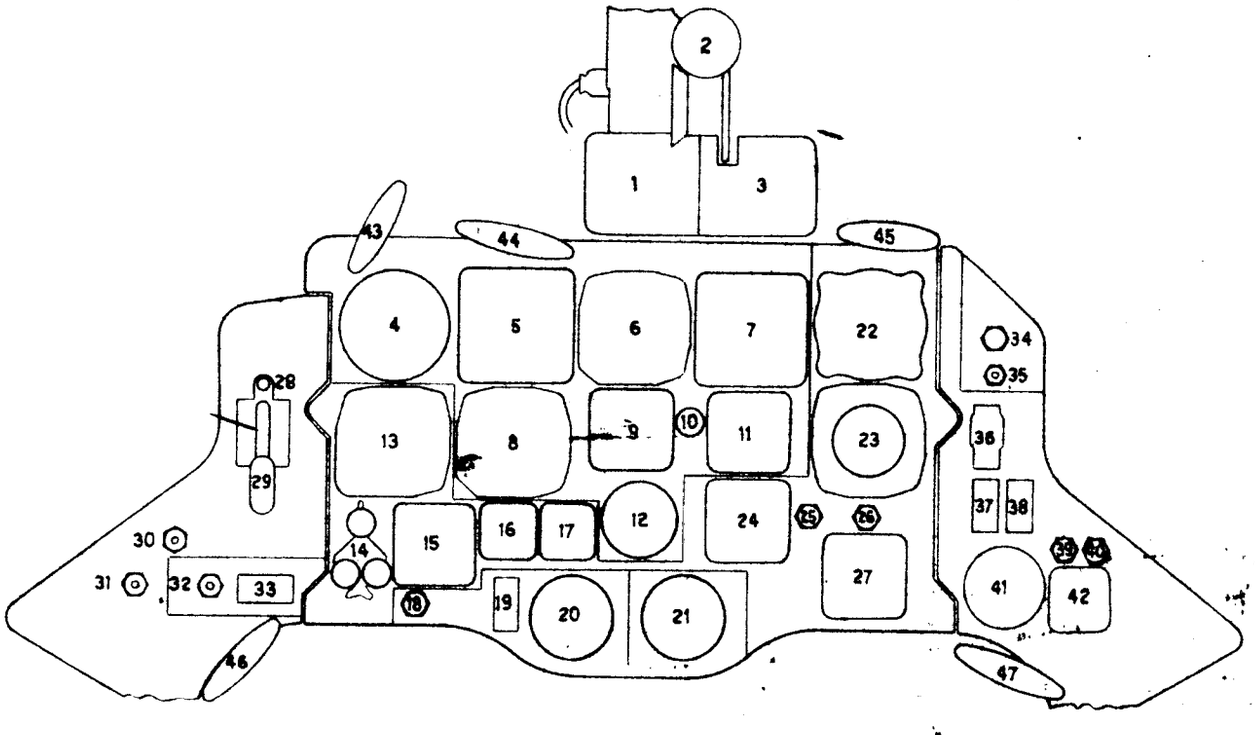


Figure 1-5/2

INSTRUMENT, CONTROL AND INDICATOR PANEL

1) Accelerometer.
2) Sight horizontal adjustment control.
3) Sight illumination intensity control rheostat.
4) Marconi AD-722 radio compass indicator.
5) Mach & air speed indicator.
6) Directional indicator (slaved).
7) Attitude gyro indicator.
8) Altimeter.
9) Turn-and-slip indicator.
10) Directional indicator fast slave switch.
11) Vertical velocity indicator.
12) Clock.
13) AN/APW & AN/APA-90 radar indicator.
14) Landing gear indicator.
15) Stabilizer position indicator.
16) Flap position indicator.
17) Air brakes position indicator.
18) Aileron servo normal system L.P. warning light.
19) Aileron servo control switch.
20) Flight control system normal and alternate hydraulic pressure gage.
21) Utility system hydraulic pressure gage.

G.91-P

22) Tachometer.
23) Exhaust temperature gage.
24) Fuel quantity gage.
25) Fuel L.P. warning light.
26) Oil L.P. warning light.
27) Oil temperature gage.
28) Landing gear emergency up.
29) Landing gear control.
30) Landing gear horn cutout.
31) Taxi light control switch.
32) Canopy control switch.
33) Canopy unsafe for flight warning lights.
34) Fire warning light.
35) Fire circuit test switch.
36) Inverter control switch.
37) Battery control switch.
38) Generator control switch.
39) Battery out warning light.
40) Generator out warning light.
41) Loadmeter.
42) Voltmeter.
43) Drag chute control and release handle.
44) External stores emergency release handle.
45) Wheel brake emergency handle.
46) Landing gear down emergency handle.
47) Canopy jettison emergency handle.

A-0004

LEFT HAND CONSOLE

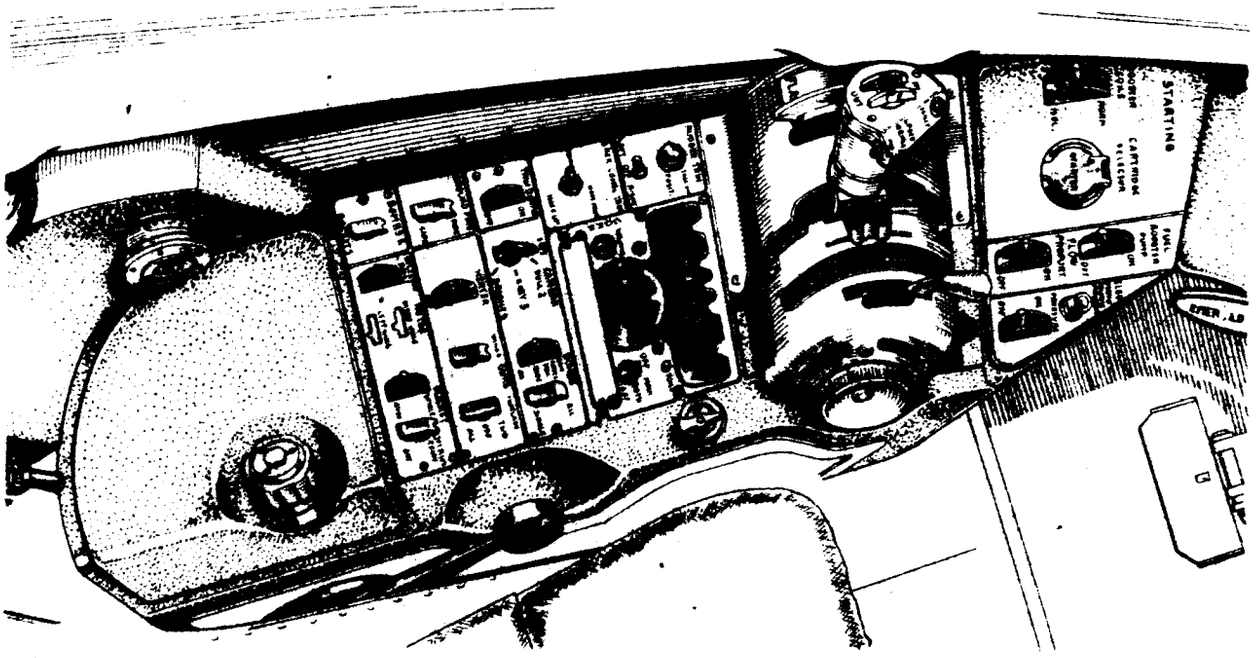


Figure 1-6

A-0005

RIGHT HAND CONSOLE

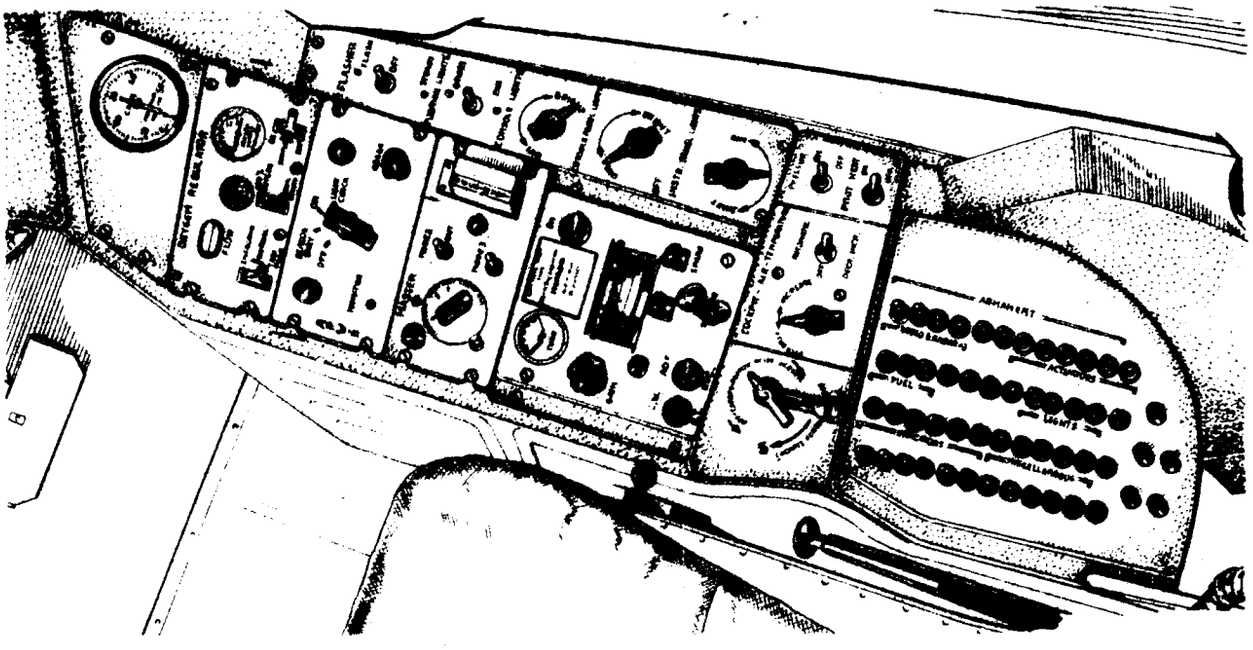
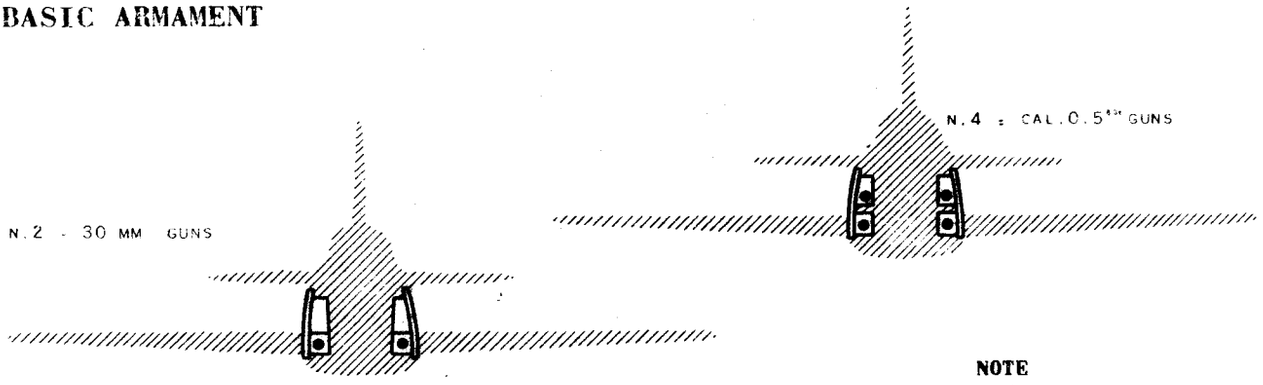


Figure 1-7

AIRCRAFT ARMAMENT SOLUTIONS

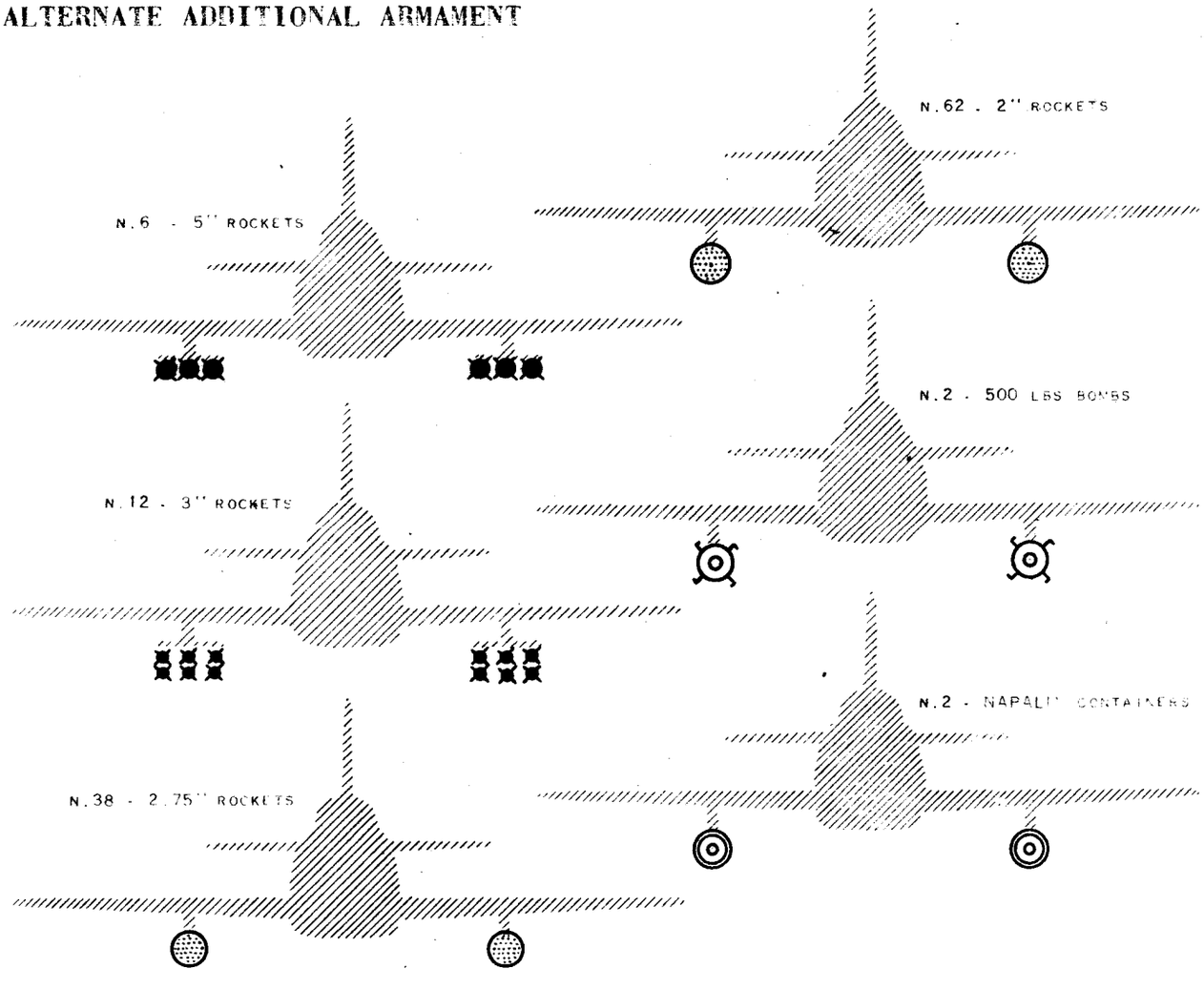
BASIC ARMAMENT



NOTE

AIRCRAFT CAN BE ARMED WITH VARIOUS COMBINATIONS BETWEEN BASIC ARMAMENT AND ALTERNATE ADDITIONAL ARMAMENT

ALTERNATE ADDITIONAL ARMAMENT



R-0000

Figure 1-8

F-0001

ENGINE FUEL SYSTEM

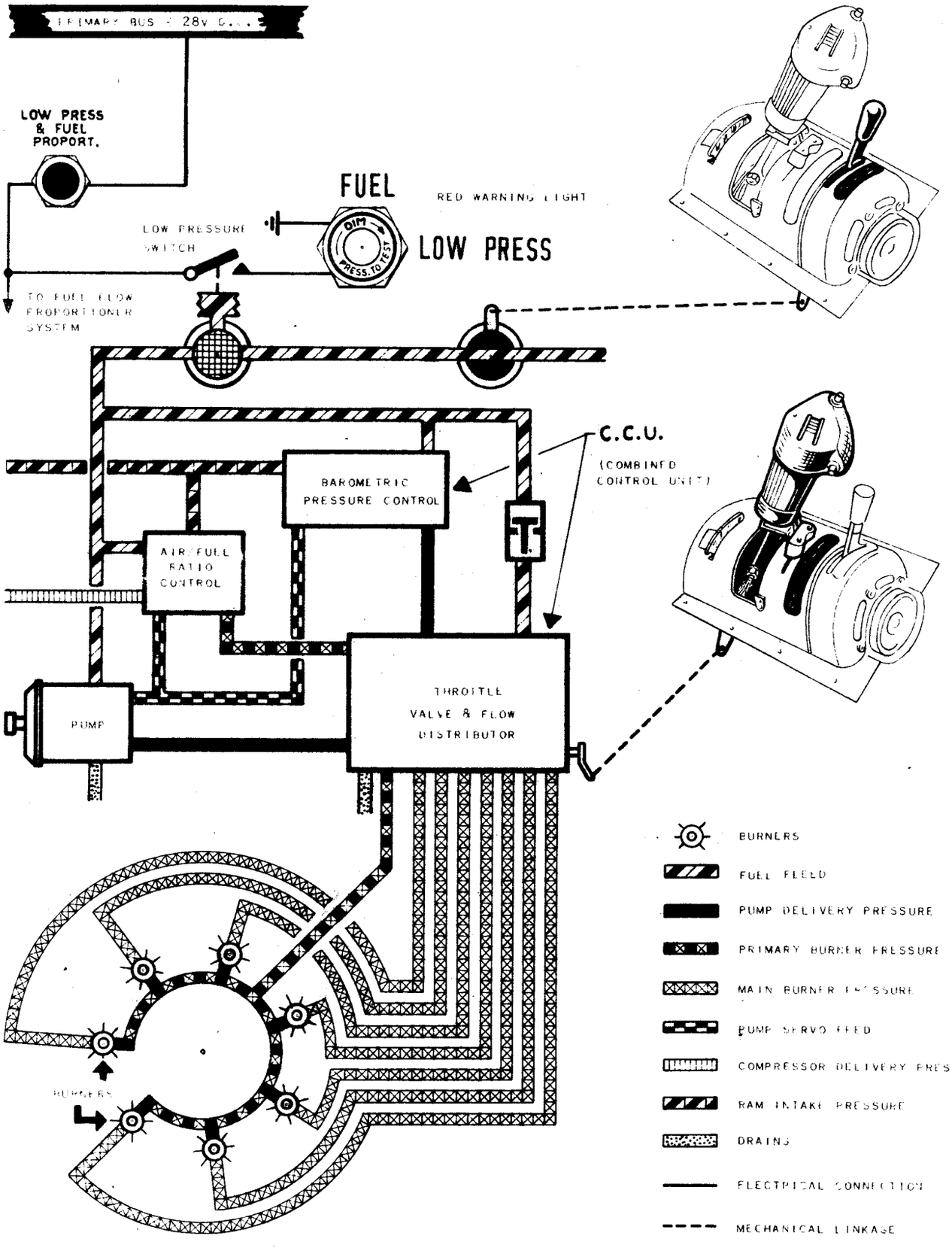


Figure 1-9

THROTTLE

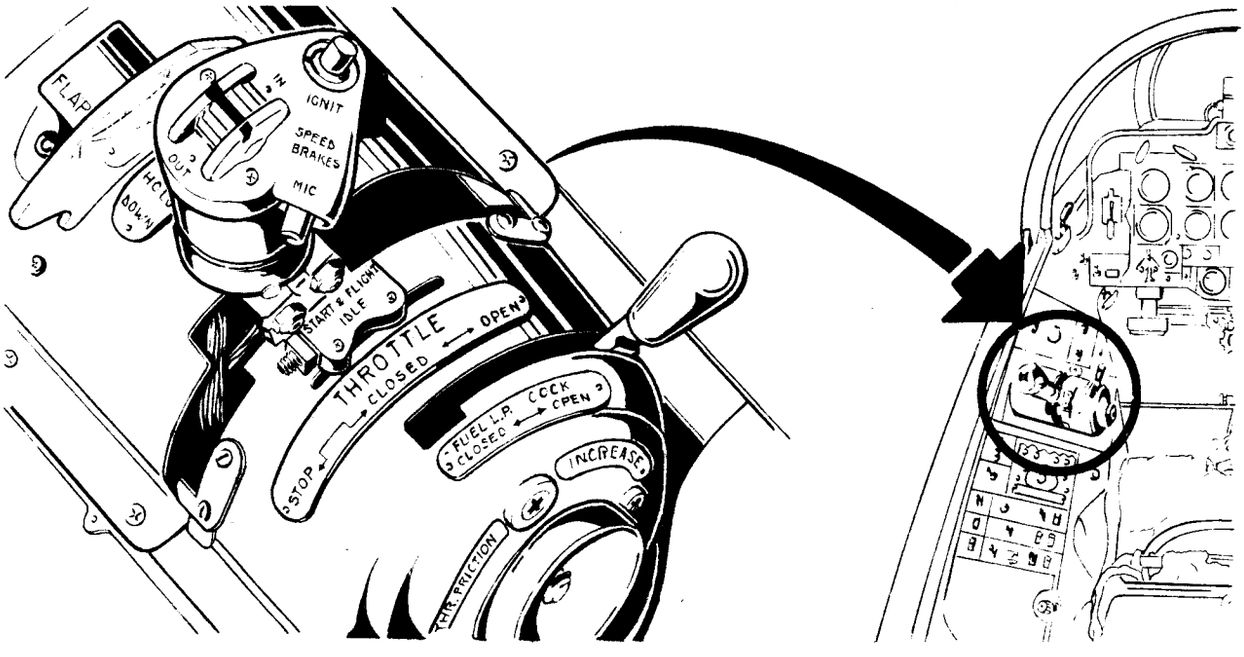


Figure 1-10

F-0003

ENGINE LUBRICATION SYSTEM

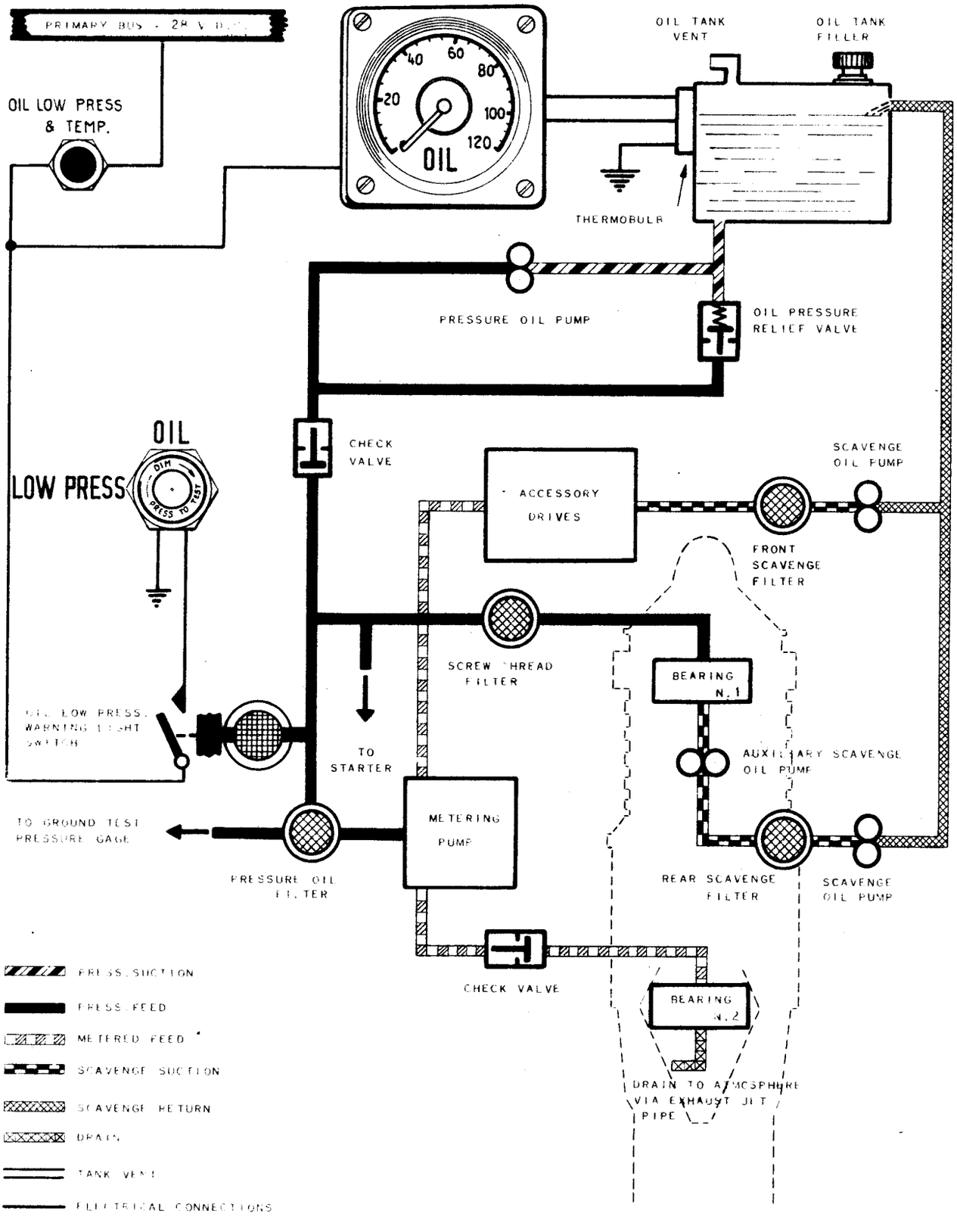


Figure 1-11

FUEL SYSTEM

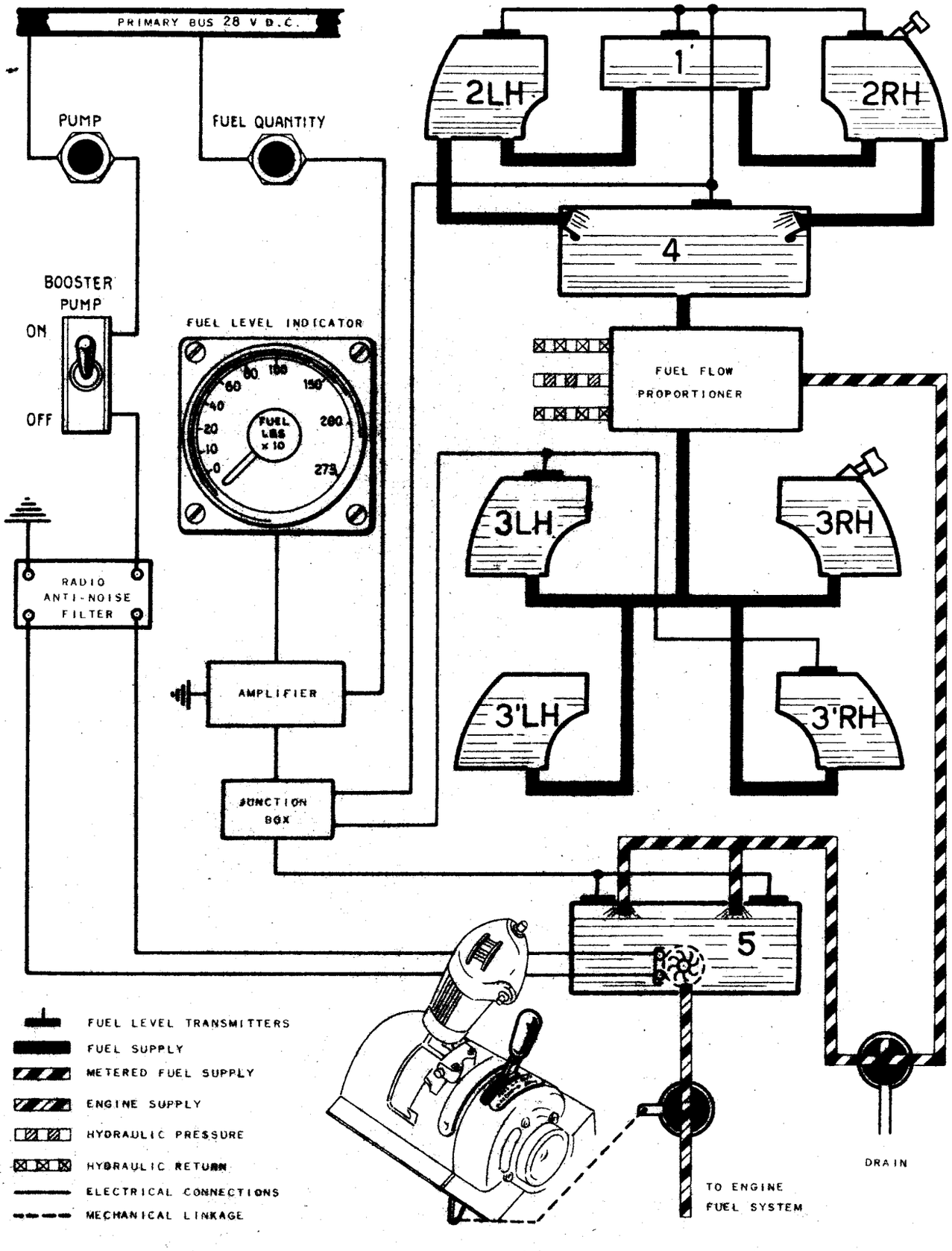
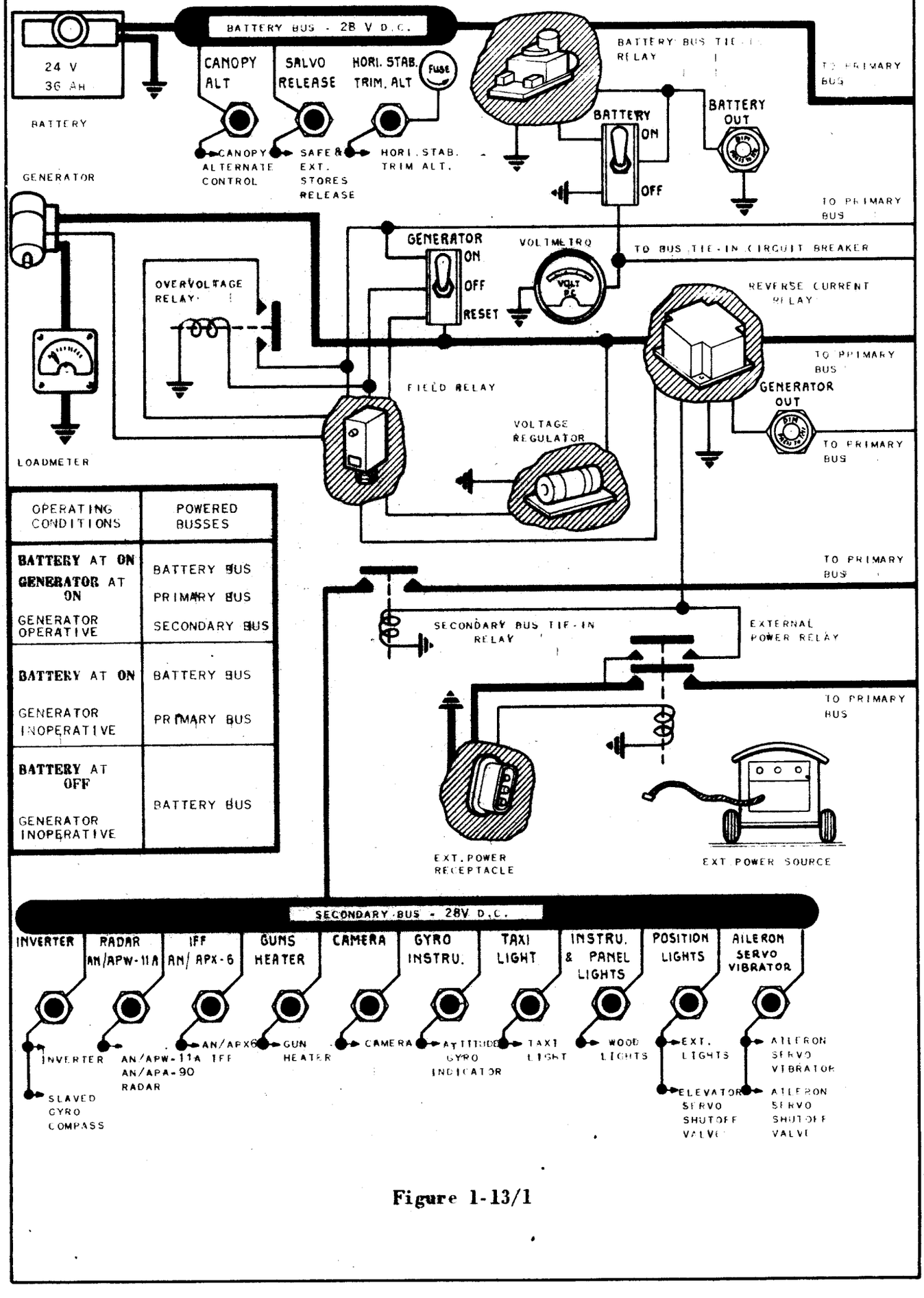


Figure 1-12

N-0000/1

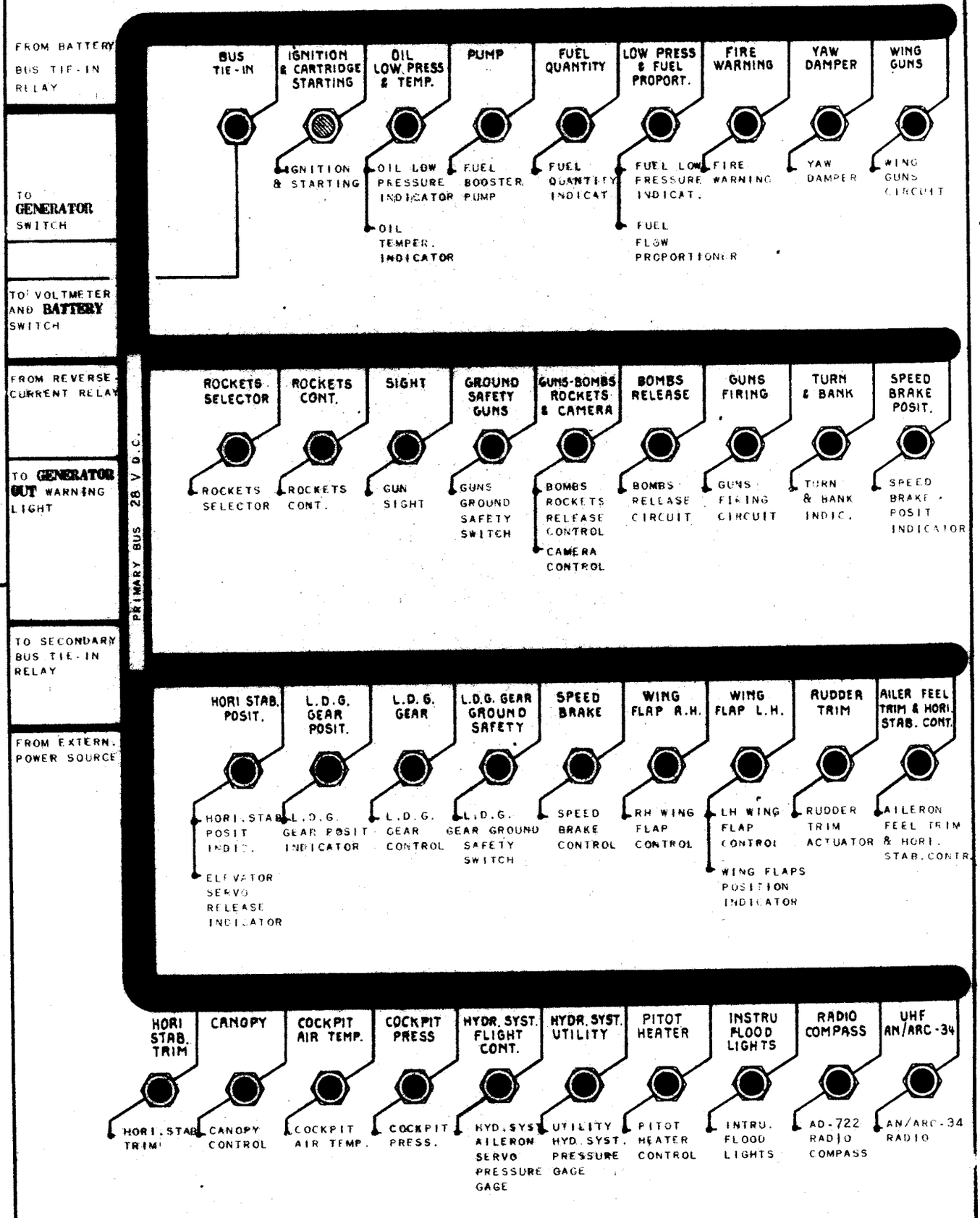
D. C. ELECTRICAL SYSTEM



OPERATING CONDITIONS	POWERED BUSSES
BATTERY AT **ON** **GENERATOR** AT **ON** GENERATOR OPERATIVE	BATTERY BUS PRIMARY BUS SECONDARY BUS
BATTERY AT **ON** GENERATOR INOPERATIVE	BATTERY BUS PRIMARY BUS
BATTERY AT **OFF** GENERATOR INOPERATIVE	BATTERY BUS

Figure 1-13/1

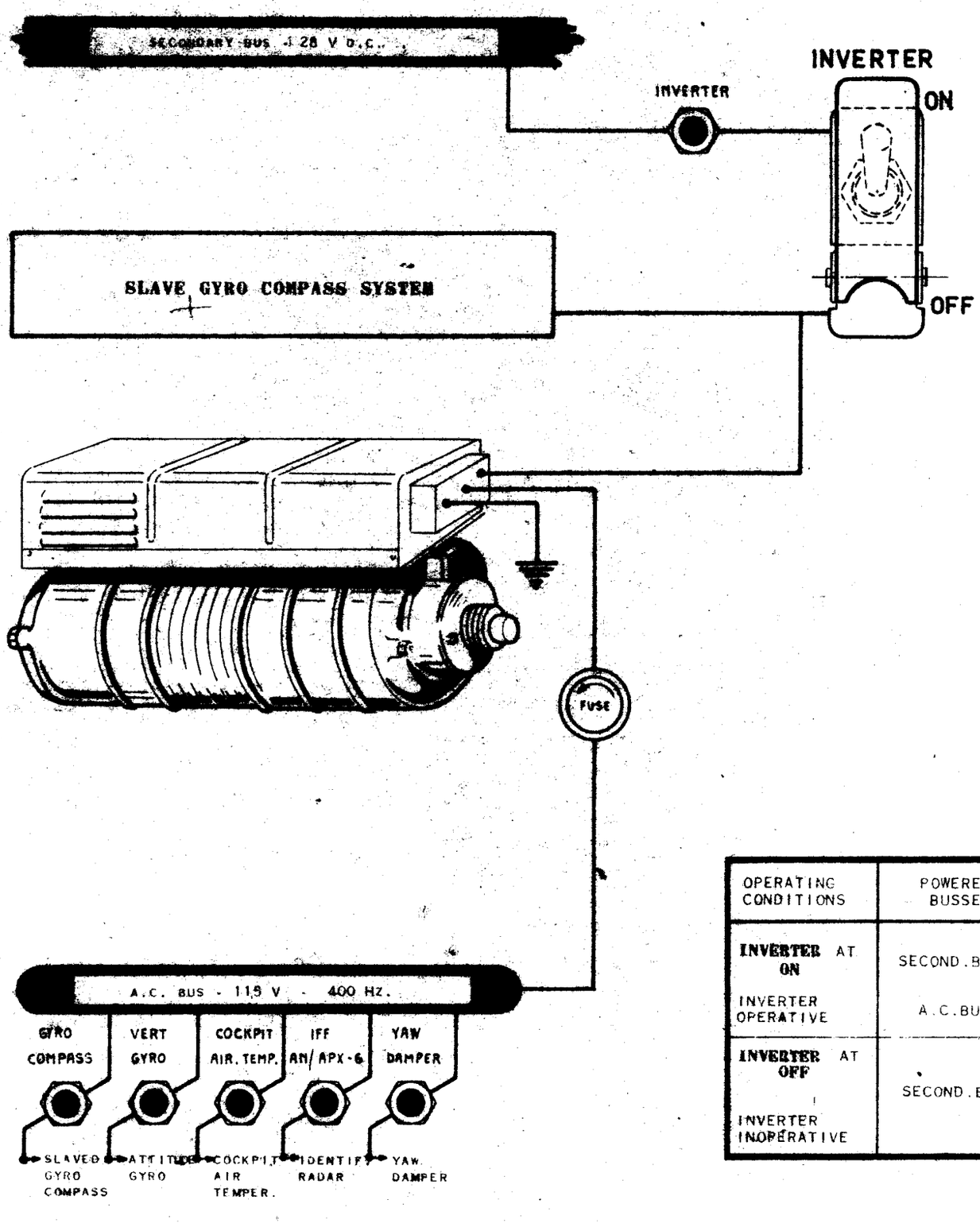
D. C. ELECTRICAL SYSTEM



N-0000/2

Figure 1-13/2

A. C. ELECTRICAL SYSTEM



OPERATING CONDITIONS	POWERED BUSSES
INVERTER AT ON	SECOND. BUS
INVERTER OPERATIVE	A.C. BUS
INVERTER AT OFF	SECOND. BUS
INVERTER INOPERATIVE	

Figure 1-14

CIRCUIT BREAKERS & FUSES PANEL

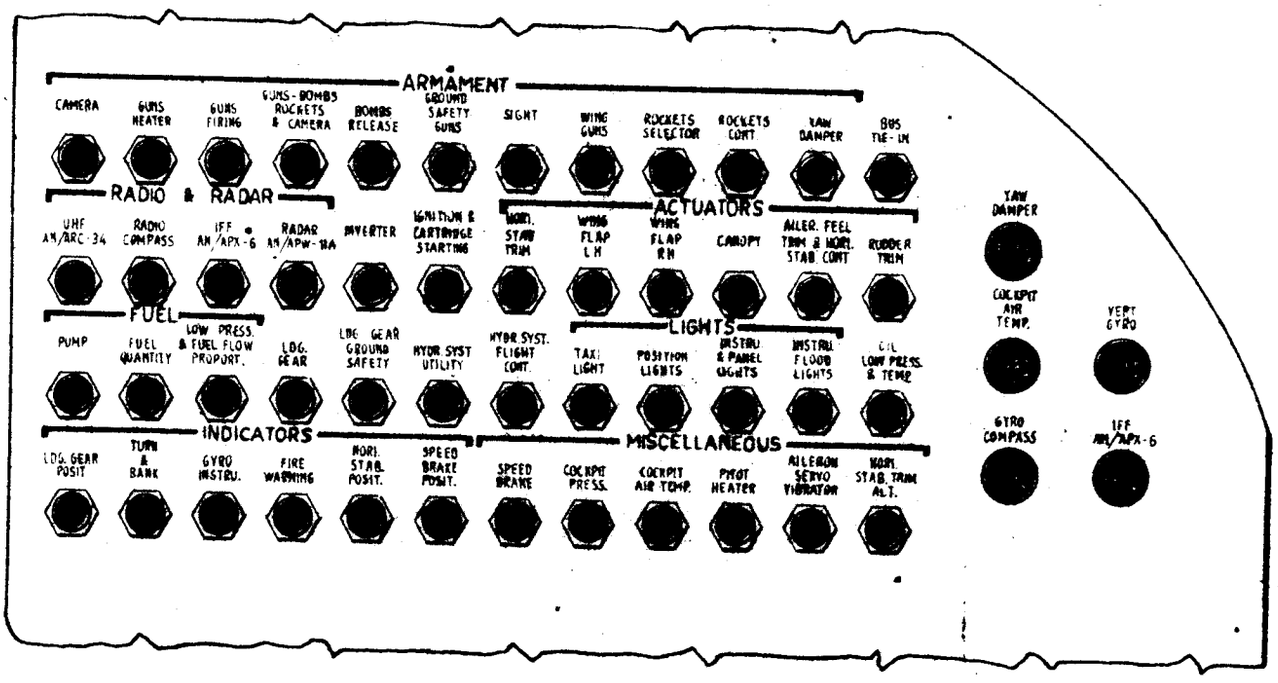


Figure 1-15

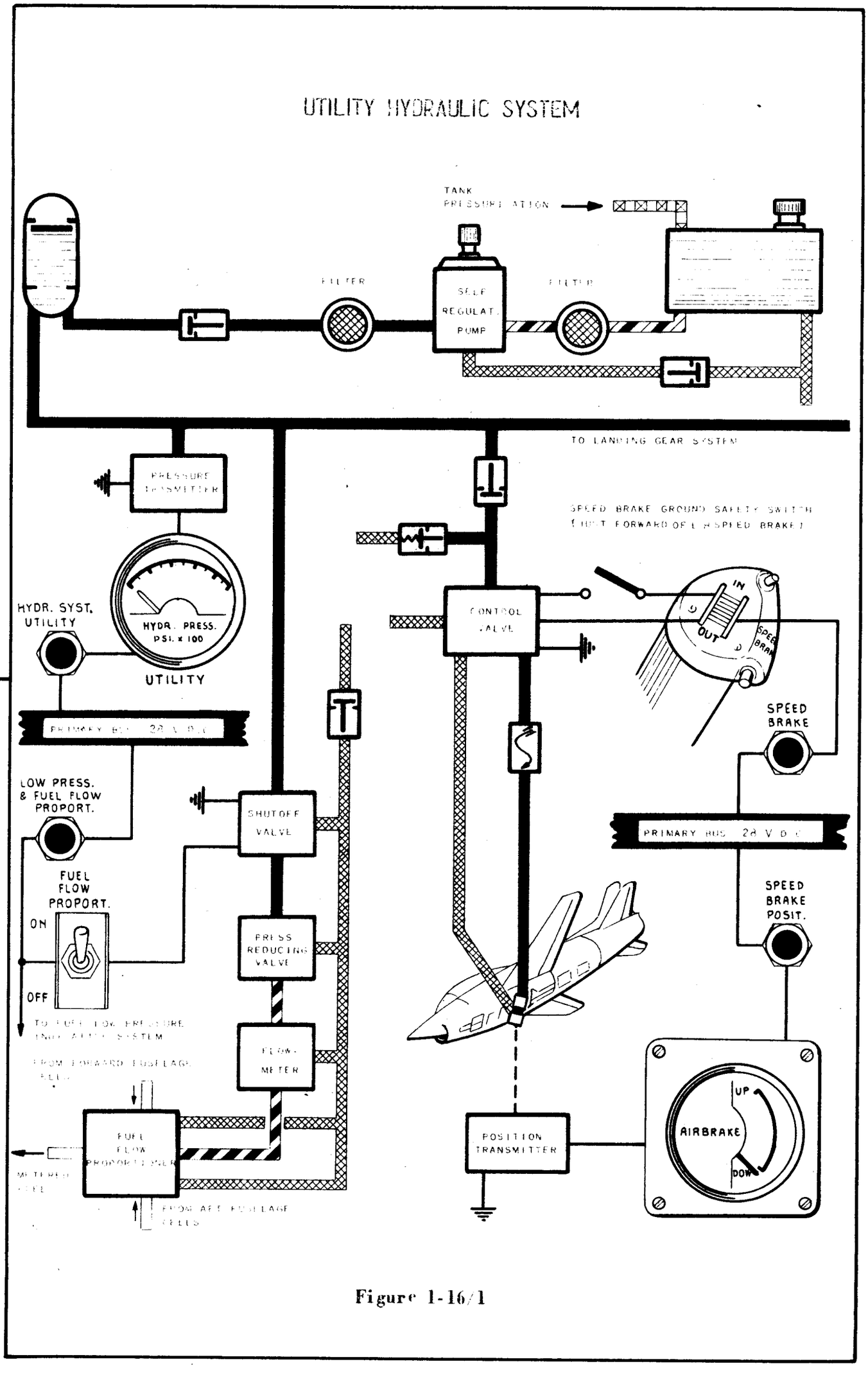

UTILITY HYDRAULIC SYSTEM
TANK PRESSURIZATION
FILTER
SELF REGULAT. PUMP
FILTER
TO LANDING GEAR SYSTEM
PRESSURE TRANSMITTER
HYDR. SYST. UTILITY
HYDR. PRESS. PSI. x 100
UTILITY
PRIMARY BUS 28 V D.C.
LOW PRESS. & FUEL FLOW PROPORT.
FUEL FLOW PROPORT.
ON
OFF
SHUTOFF VALVE
PRESS REDUCING VALVE
FLOW-METER
FUEL FLOW PROPORTIONER
METERED FUEL
FROM AFT FUSELAGE FEEDS
SPEED BRAKE GROUND SAFETY SWITCH
CONTROL VALVE
IN
OUT
SPEED BRAKE
PRIMARY BUS 28 V D.C.
SPEED BRAKE POSIT.
POSITION TRANSMITTER
AIRBRAKE
UP
DOWN

Figure 1-16/1

UTILITY HYDRAULIC SYSTEM

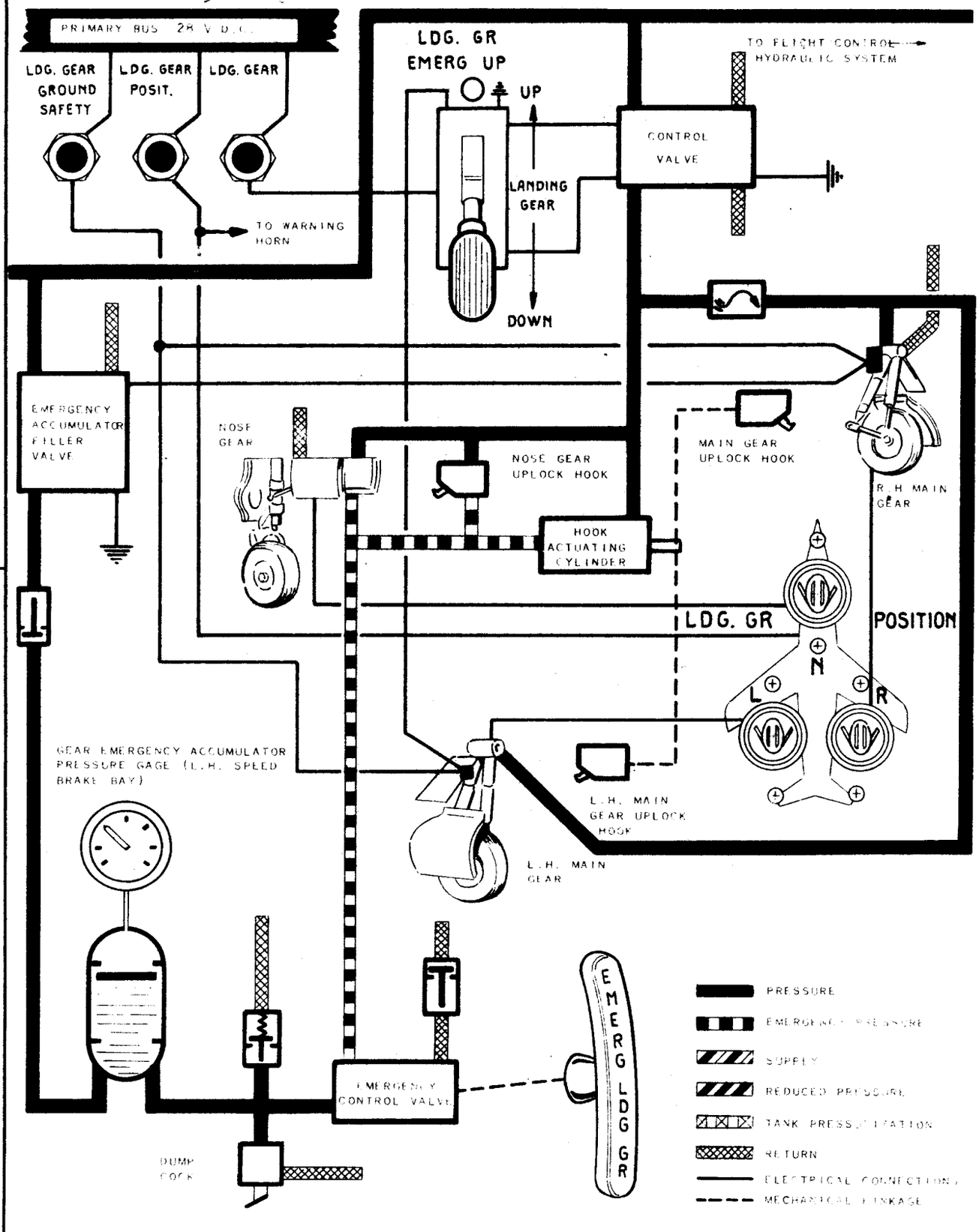


Figure 1-16/2

ARTIFICIAL FEEL SYSTEM

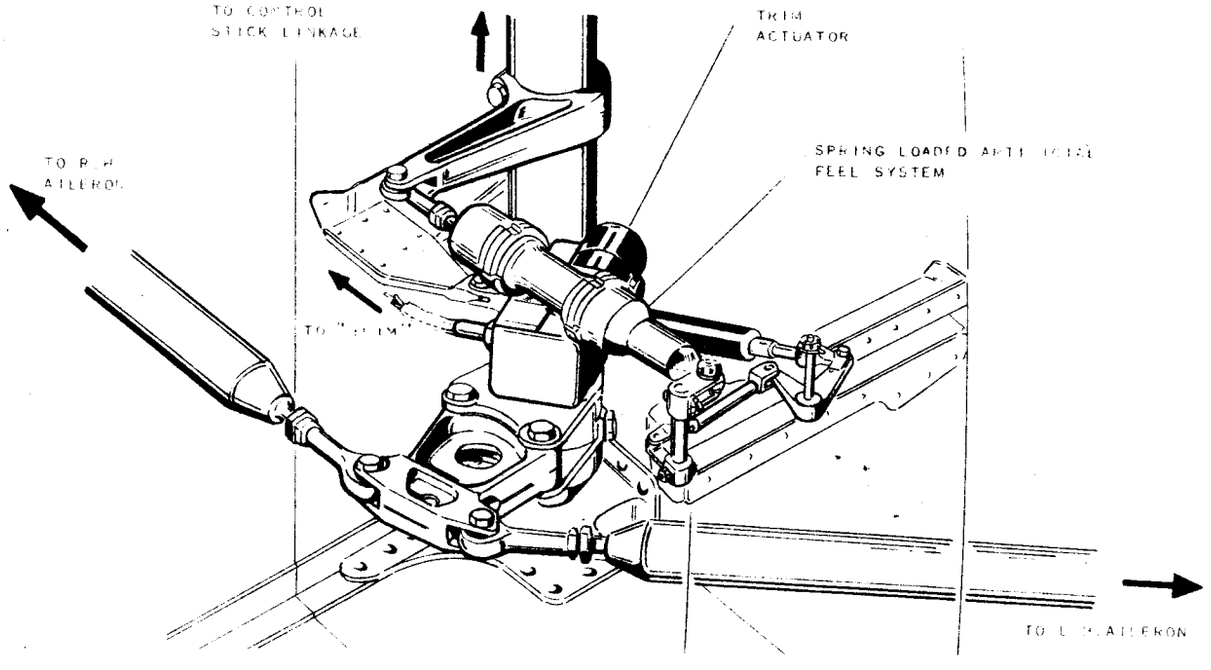


Figure 1-17

YAW DAMPER SYSTEM

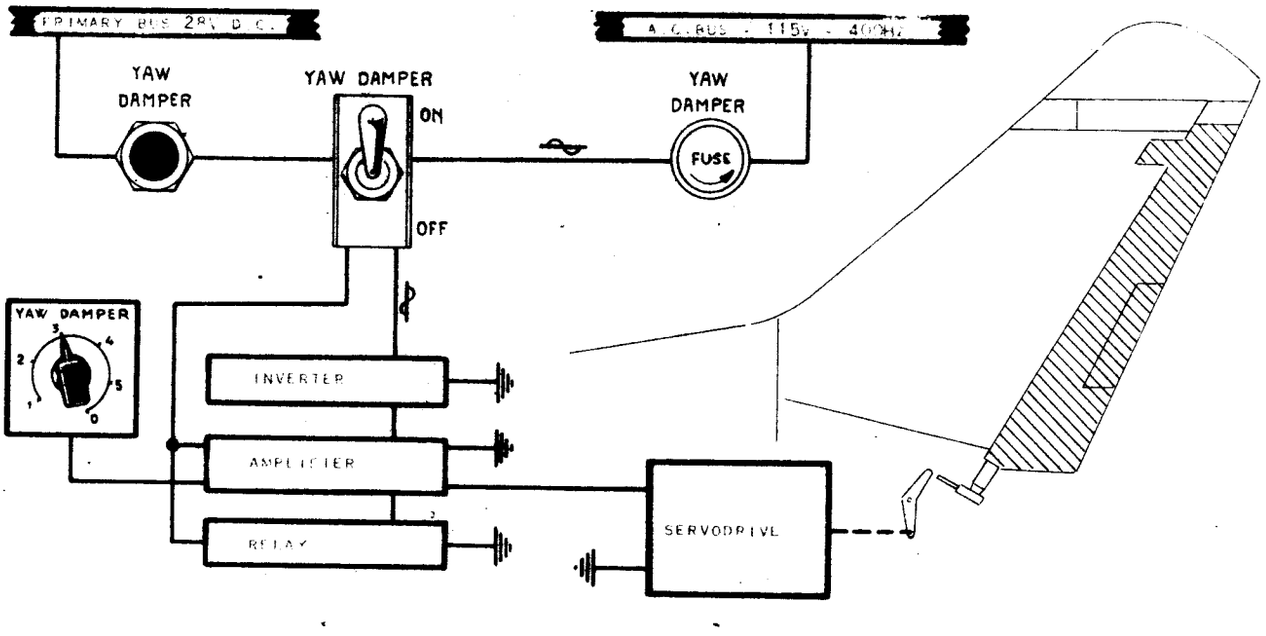


Figure 1-18

L-0001

CONTROL STICK GRIP

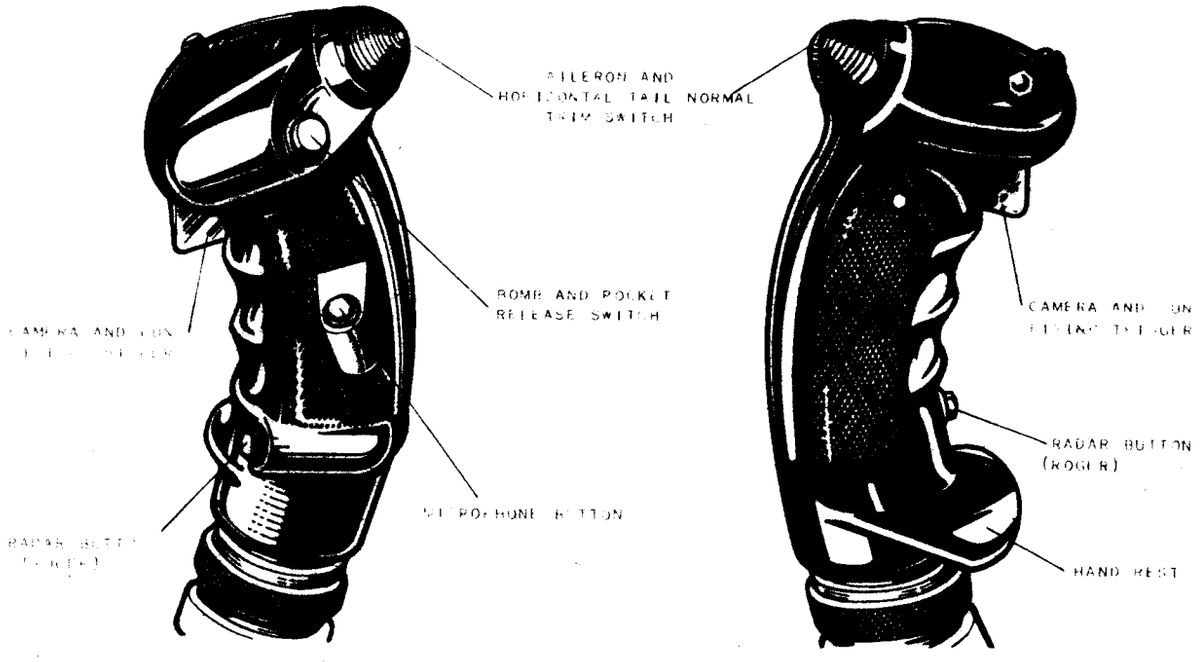


Figure 1-19

L-0002

RUDDER AND BRAKE PEDALS

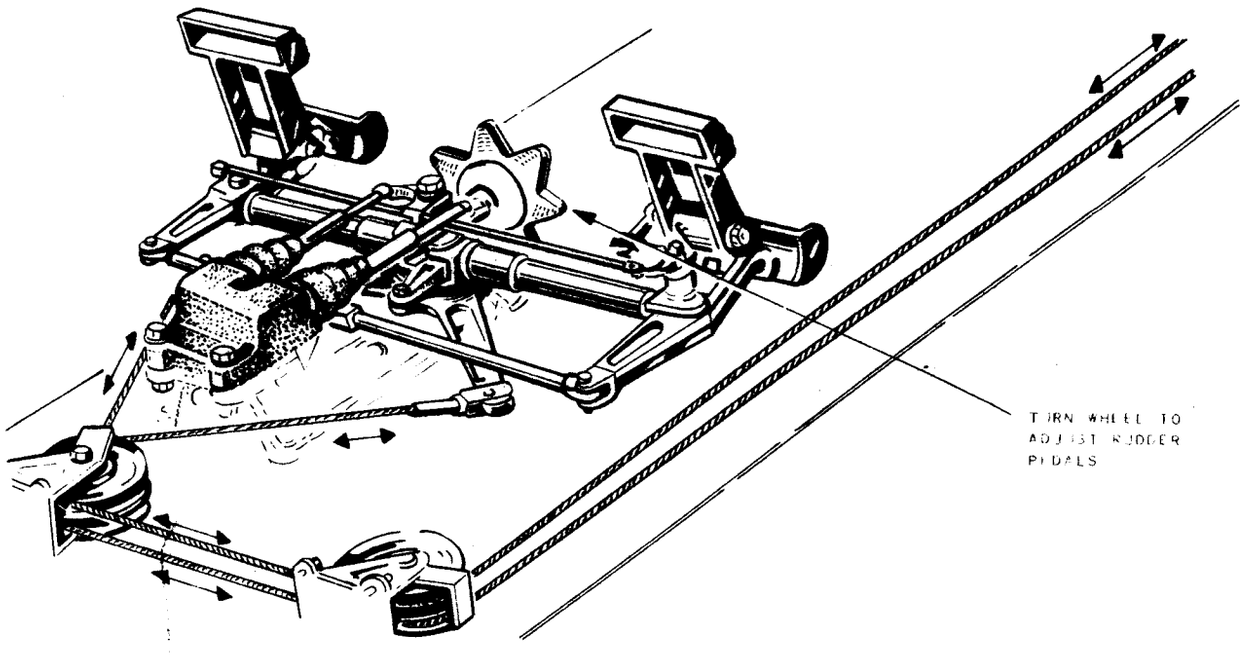


Figure 1-20

L-0003

FLIGHT CONTROL LOCK

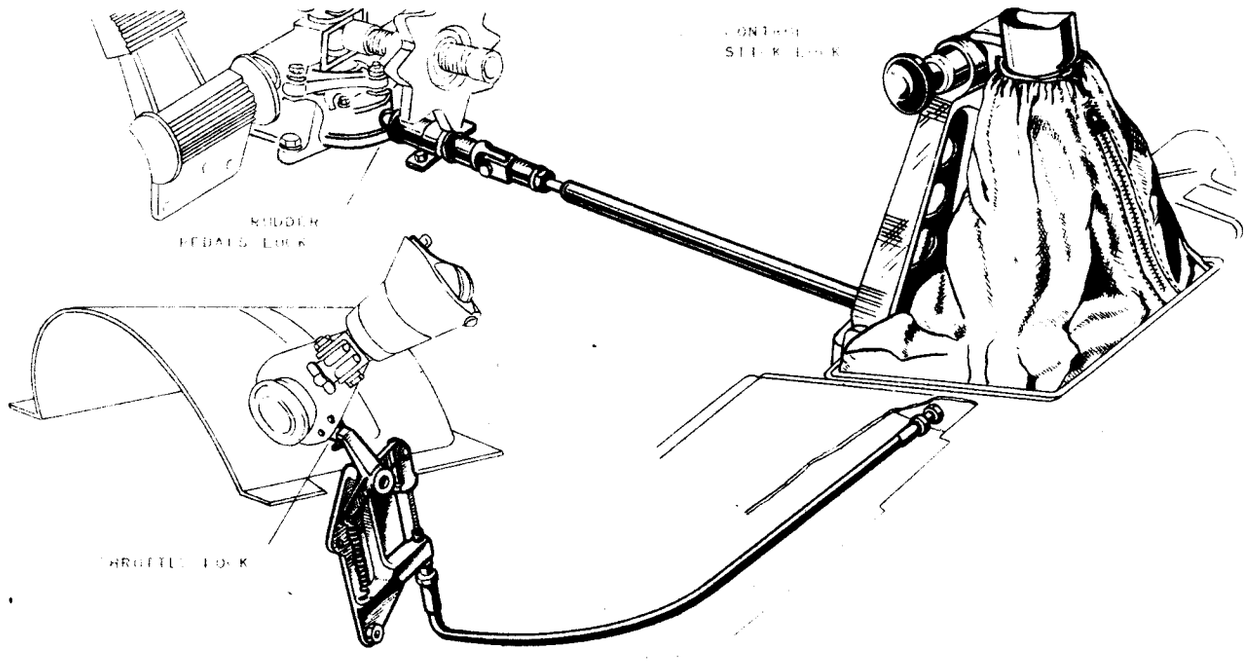


Figure 1-21

L-0004

FLIGHT CONTROL PANEL

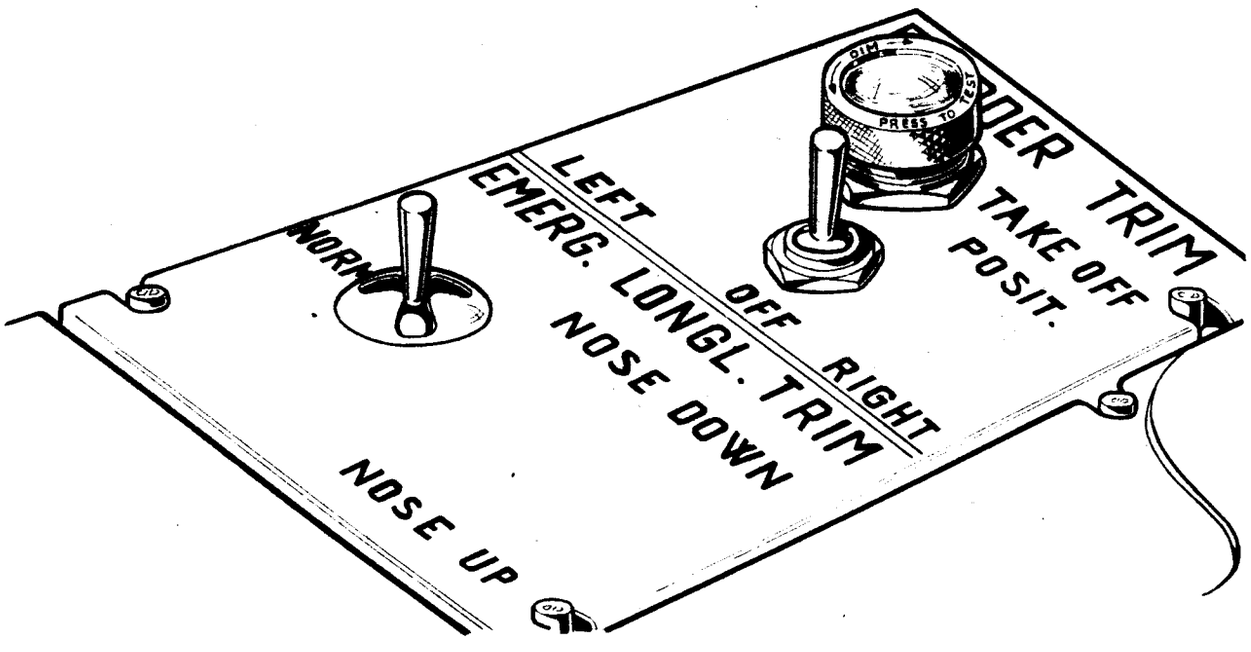


Figure 1-22

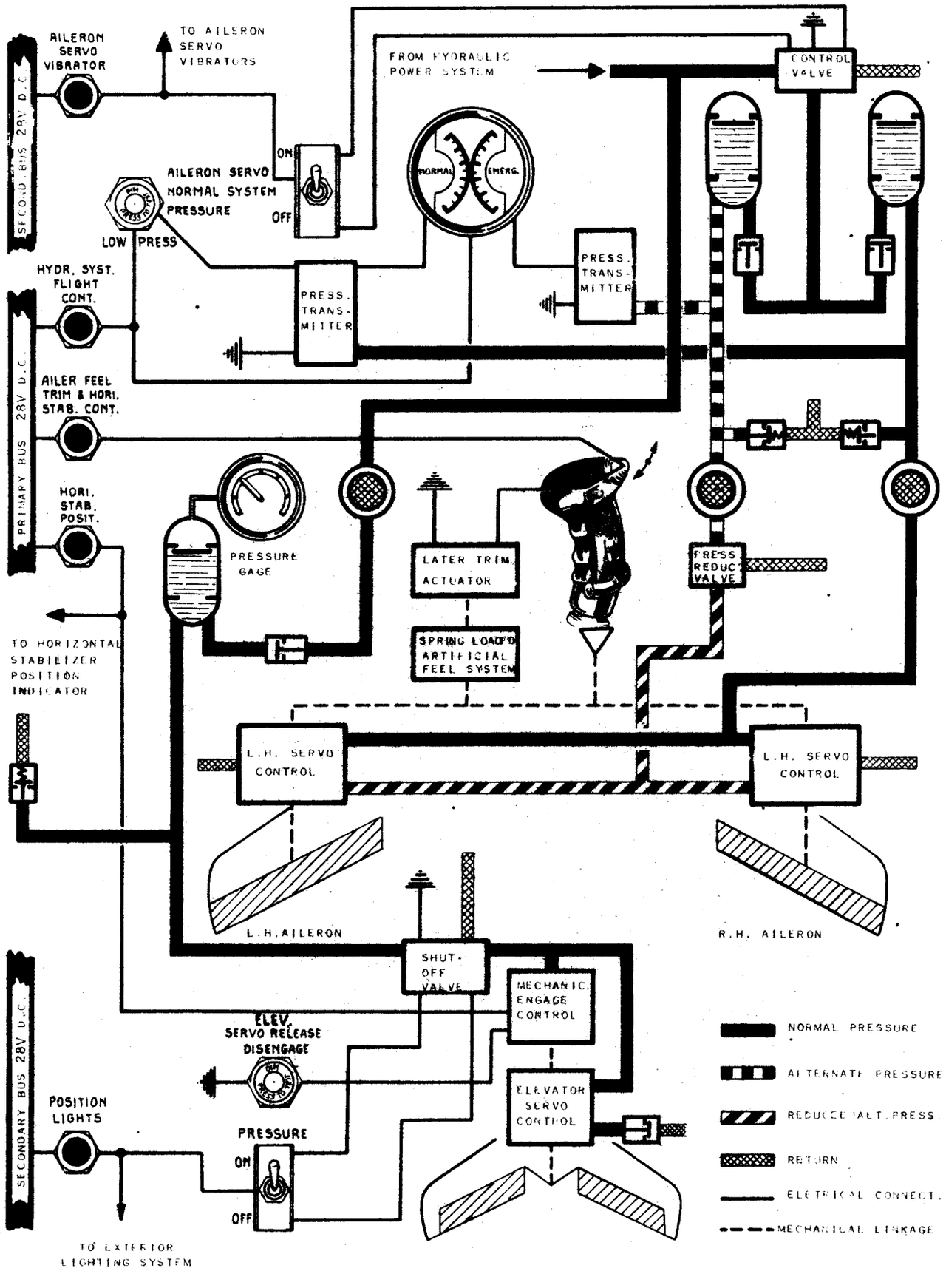

FLIGHT CONTROL HYDRAULIC SYSTEM
AILERON SERVO VIBRATOR
TO AILERON SERVO VIBRATORS
SECOND. BUS 28V D.C.
FROM HYDRAULIC POWER SYSTEM
CONTROL VALVE
ON
OFF
AILERON SERVO NORMAL SYSTEM PRESSURE
LOW PRESS
NORMAL
EMERG.
PRESS. TRANS-MITTER
HYDR. SYST. FLIGHT CONT.
PRESS. TRANS-MITTER
PRIMARY BUS 28V D.C.
AILER FEEL TRIM & HORI. STAB. CONT.
HORI. STAB. POSIT.
PRESSURE GAGE
LATER TRIM ACTUATOR
SPRING LOADED ARTIFICIAL FEEL SYSTEM
PRESS REDUCT VALVE
TO HORIZONTAL STABILIZER POSITION INDICATOR
L.H. SERVO CONTROL
L.H. SERVO CONTROL
L.H. AILERON
R.H. AILERON
SHUT-OFF VALVE
MECHANIC. ENGAGE CONTROL
ELEV. SERVO RELEASE DISENGAGE
ELEVATOR SERVO CONTROL
SECONDARY BUS 28V D.C.
POSITION LIGHTS
PRESSURE
ON
OFF
TO EXTERIOR LIGHTING SYSTEM
NORMAL PRESSURE
ALTERNATE PRESSURE
REDUCED ALT. PRESS
RETURN
ELECTRICAL CONNECT.
MECHANICAL LINKAGE

Figure 1-23

E-0000

NOSE GEAR GROUND SAFETY LOCK

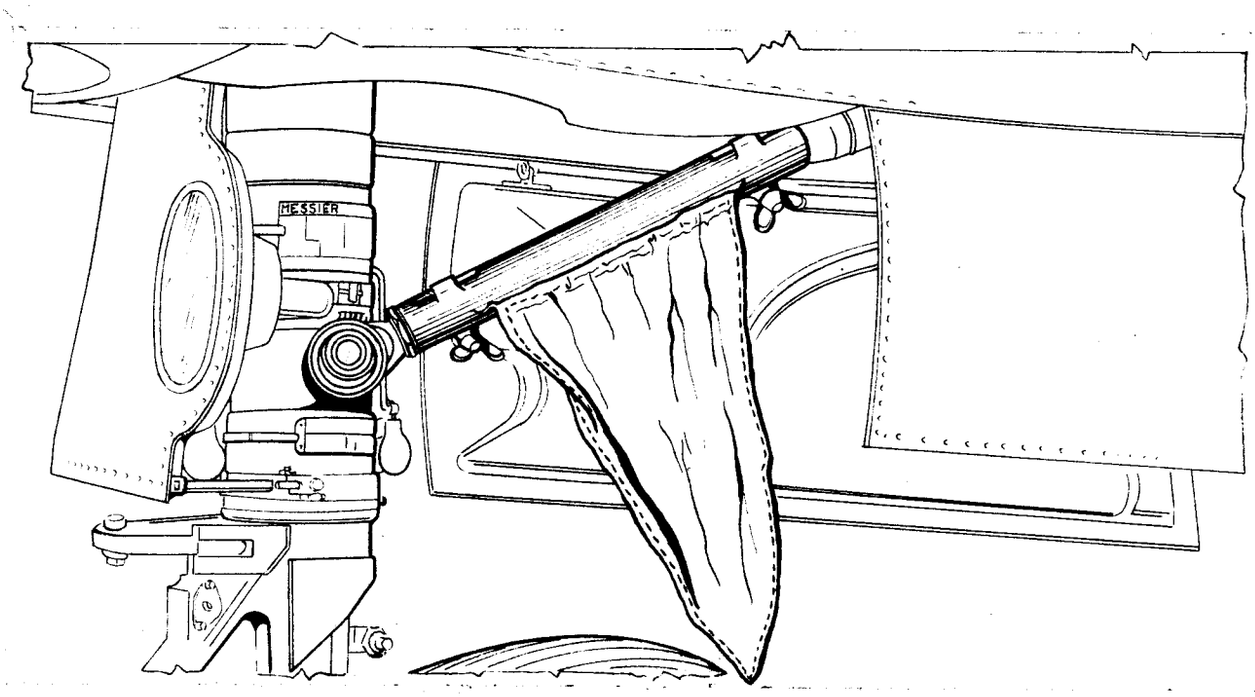


Figure 1-24

E-0001

LANDING GEAR SYSTEM INDICATORS

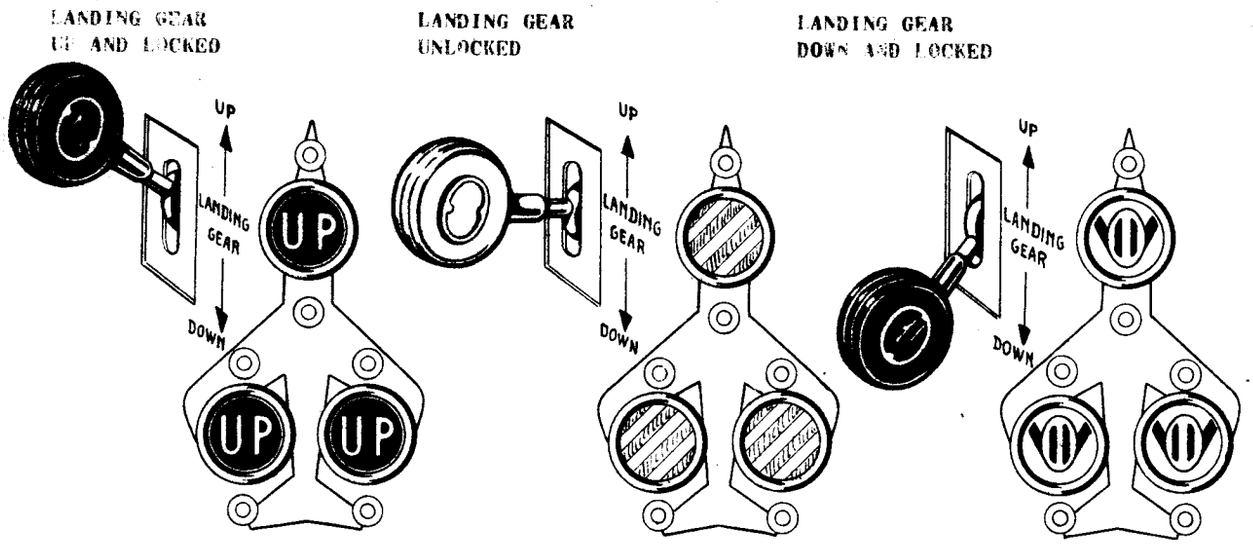


Figure 1-25

ANTISHIMMY UNIT

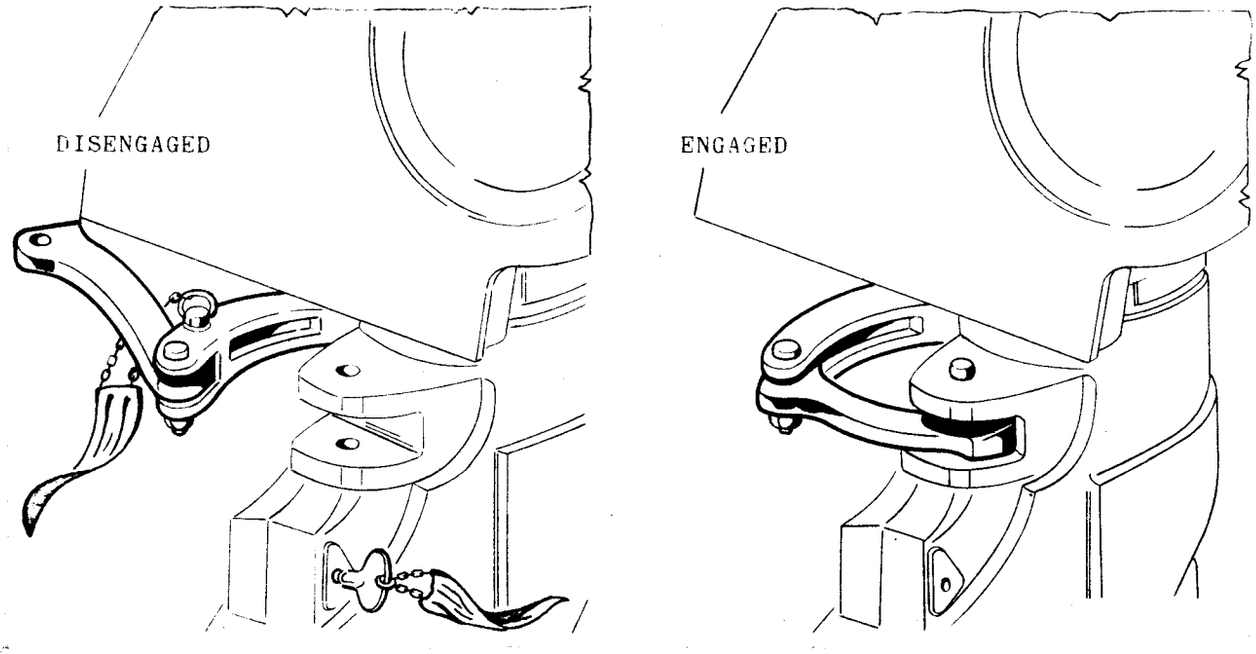


Figure 1-26

I-0001

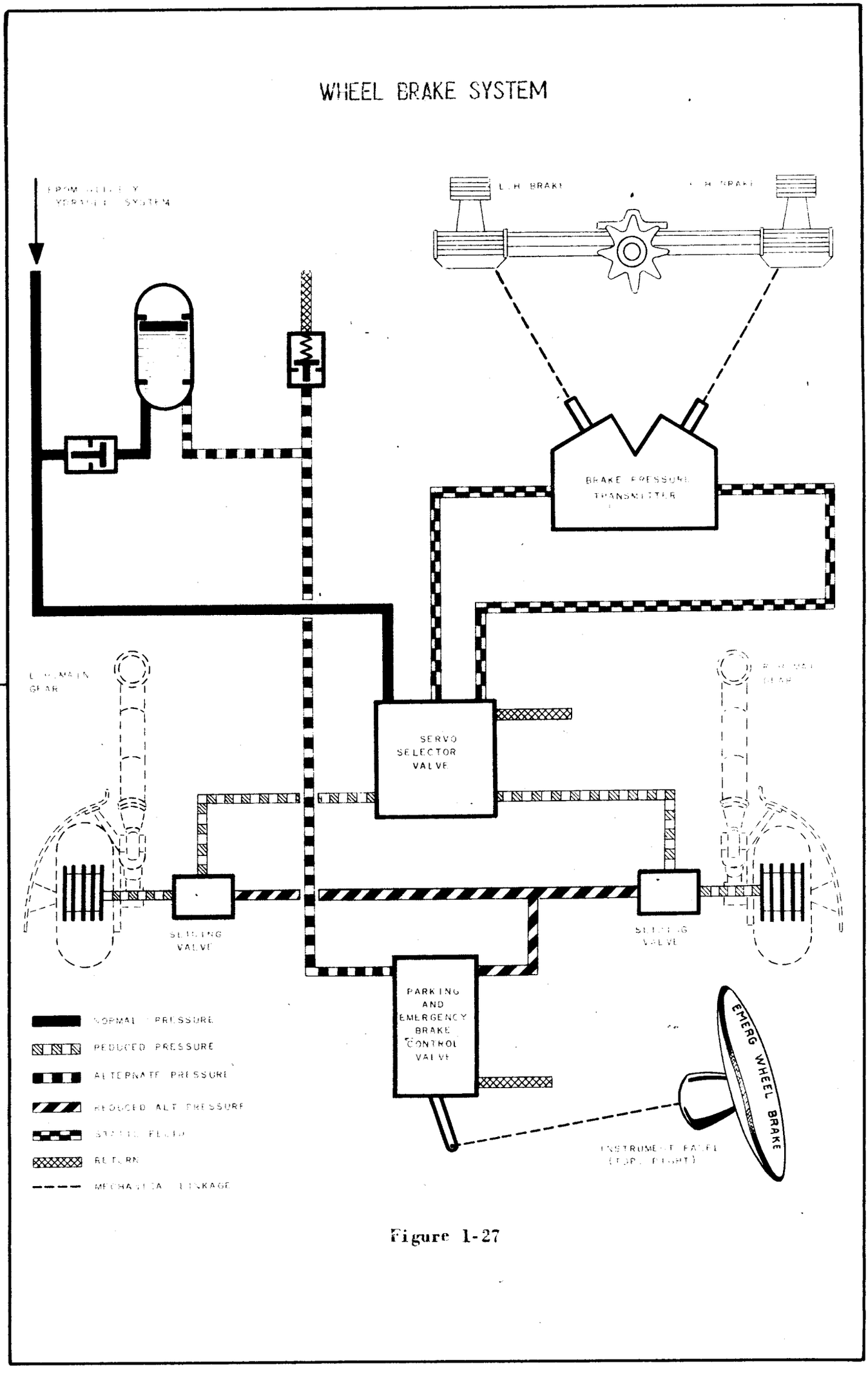


Figure 1-27

B-0000

DRAG CHUTE SYSTEM

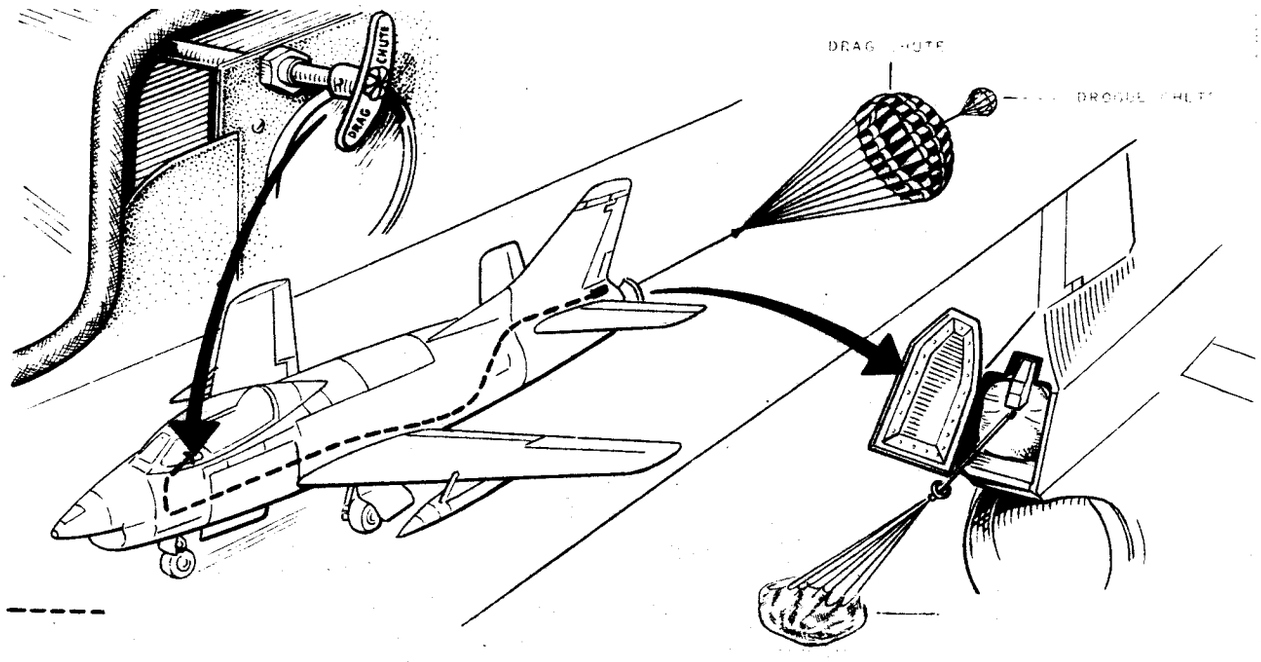


Figure 1-28

F-0004

FIRE WARNING SYSTEM

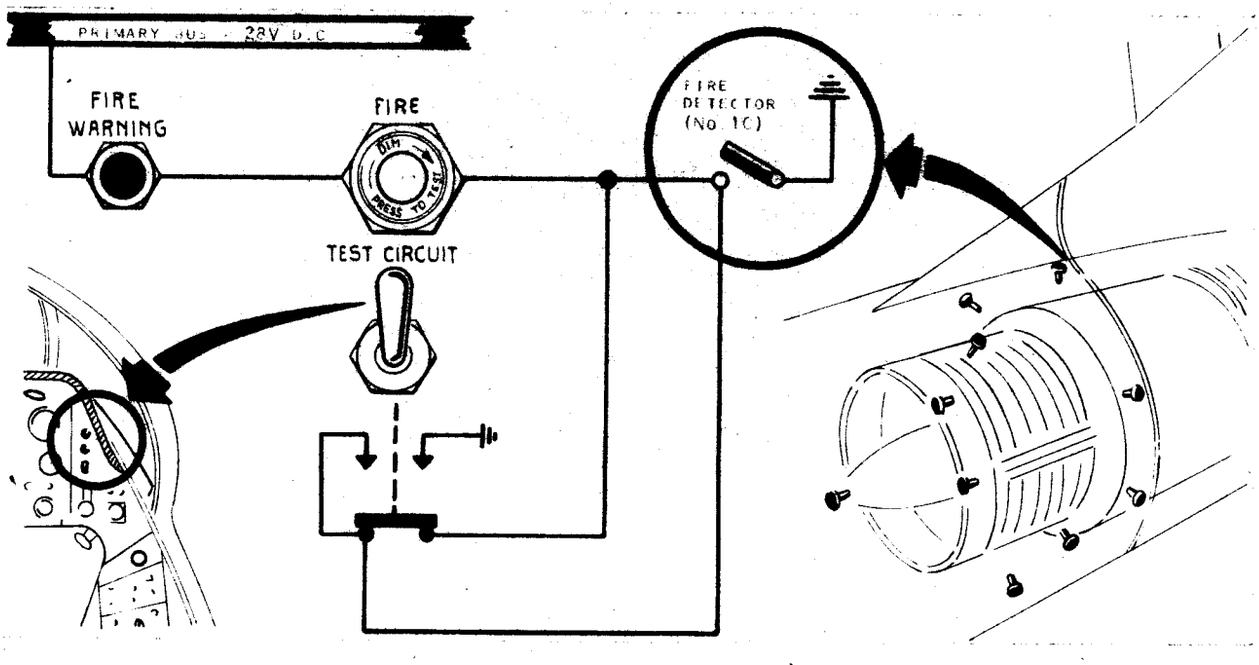


Figure 1-29

R-0001

CANOPY SYSTEM

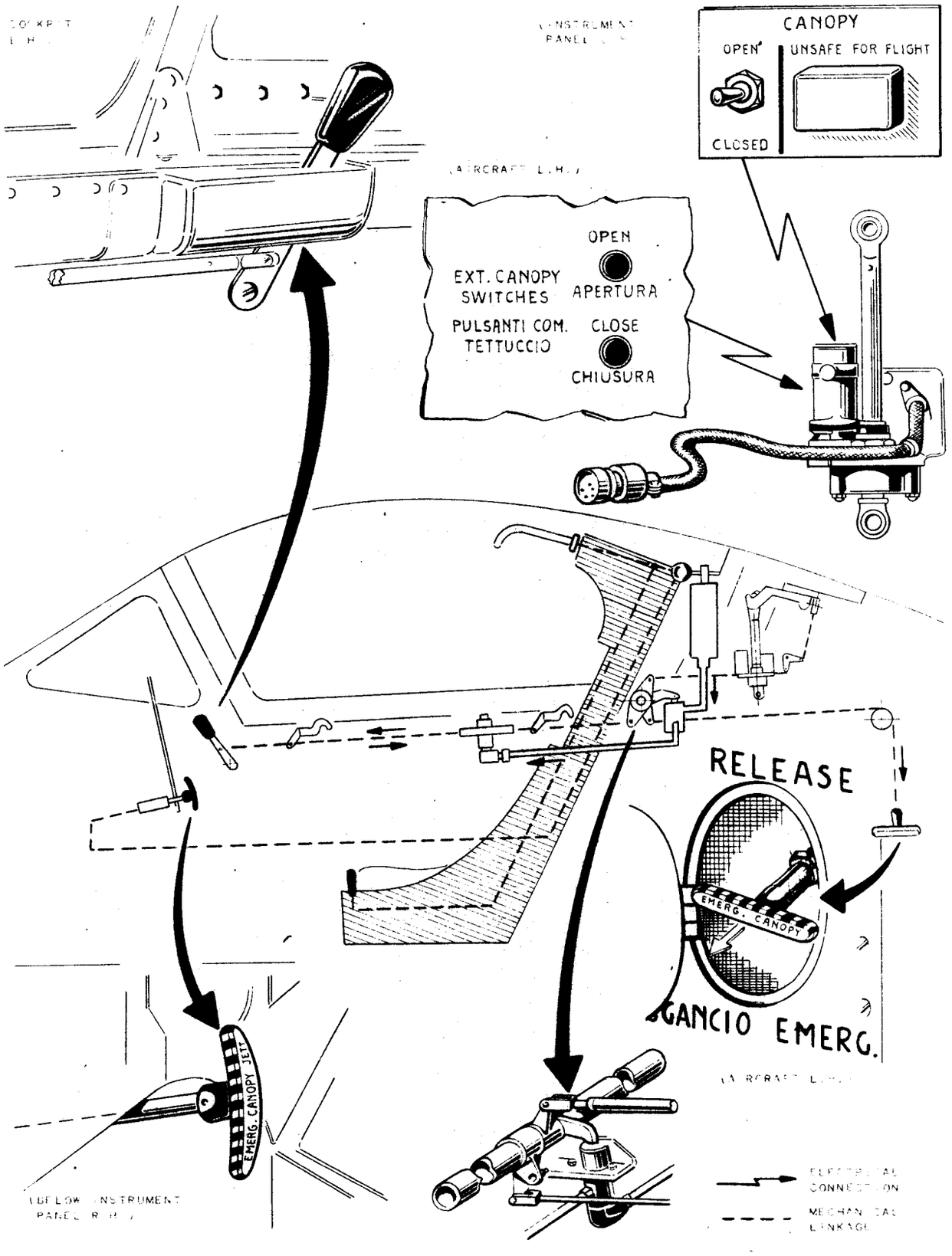


Figure 1-30

R-0002/1

MARTIN BAKER MK-W4 EJECTION SEAT

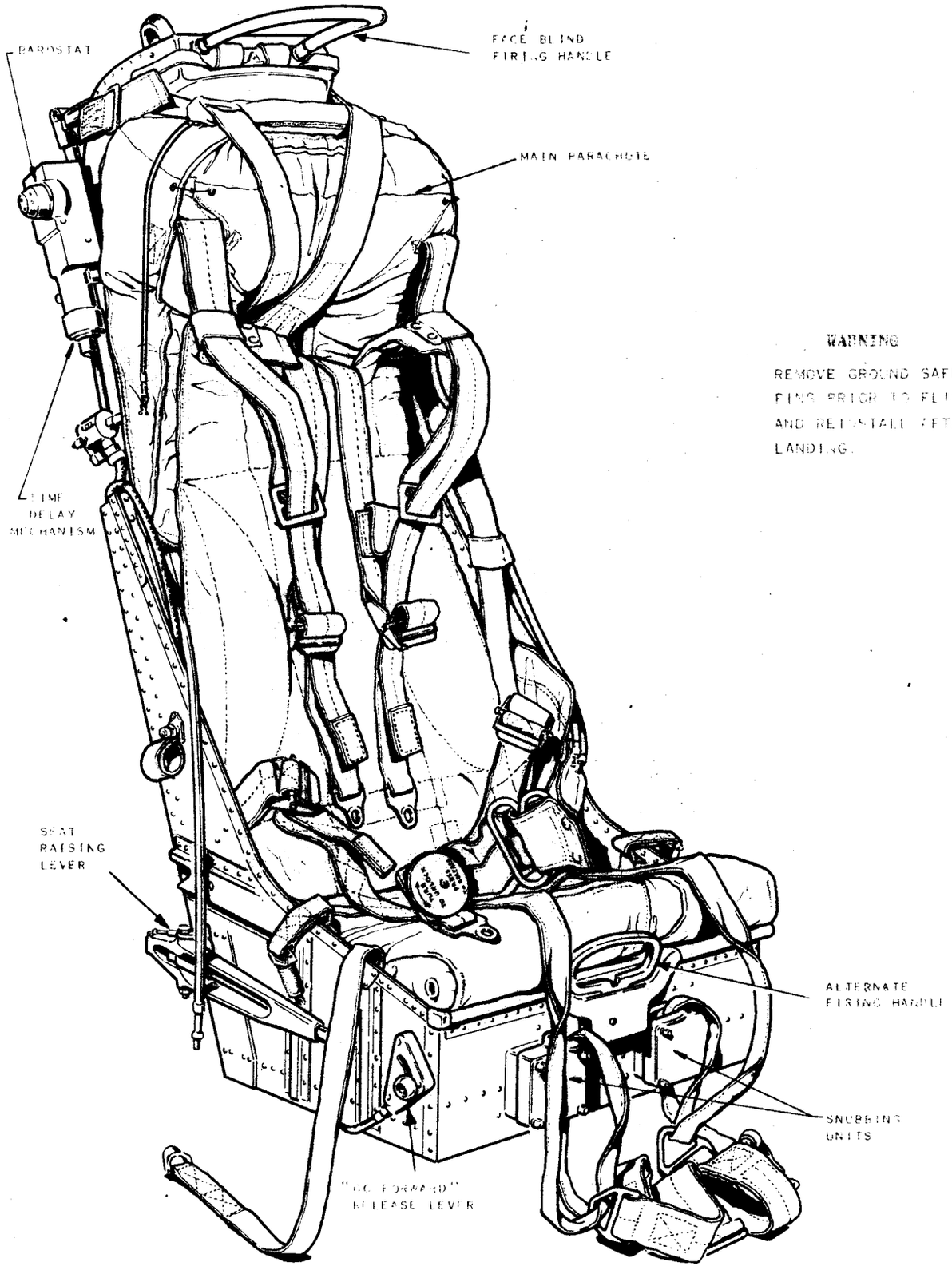
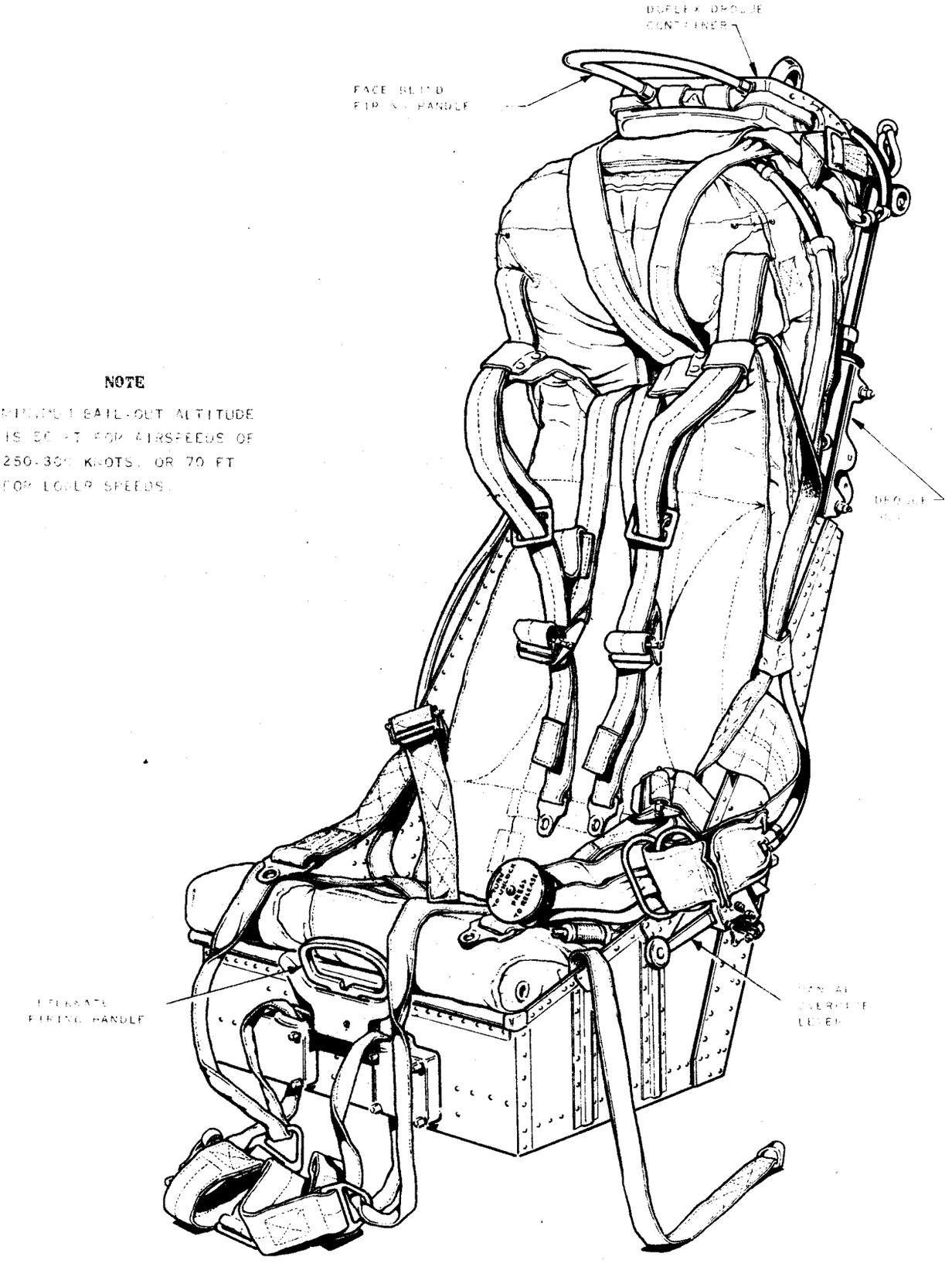


Figure 1-31/1

R-0002/2

MARTIN BAKER MK-W4 EJECTION SEAT



NOTE

MINIMUM BAIL-OUT ALTITUDE IS 50 FT FOR AIRSPEEDS OF 250-300 KNOTS, OR 70 FT FOR LOWER SPEEDS.

Figure 1-31/2

SECTION II

NORMAL PROCEDURES

CONTENTS

G.91-P

GENERAL

For a normal daily mission, the pilot will perform the following operations proceeding as specified for each item.

EXTERIOR INSPECTION

This will be a left-to-right (clockwise) check around the airplane, the starting point being the airplane left side just forward of the wing panel (fig. 2-1), on which the protective helmet, cards, etc., will have been placed.

First, the pilot should check the airplane log books, which will be shown to him by the crew-chief, to make sure about the airplane serviceability. Then, he should check that the airplane is in the proper loading, balance, and equipment conditions for the intended flight or mission.

The crew-chief shall assist the pilot during this inspection.

In case of a gunnery mission, also the armament specialist shall assist the pilot during the inspection.

G.91-P

WARNING

The check shall be performed with the airplane in the following conditions:

a) Main wheels chocked. If the ground slopes rearwards, the main wheels should be chocked also at the rear.

b) Speed brake ground safety key inserted and turned.

c) Nose gear ground safety lock installed.

d) Antishimmy engaged.

e) Canopy closed.

f) Air intake duct and tail pipe plugs in place.

g) Pitot cover in place.

h) Gun ports covered.

i) Flight controls locked with control surfaces in center position.

j) Wing flaps retracted.

k) Speed brakes open.

l) Ejection seat ground safety pins installed.

m) Engine bay inspection doors open.

n) Parking brakes on.

1) Forward fuselage - left side

a) Check windshield and canopy for condition and cracks.

b) Check heat exchanger air port clear.

c) Check left gun panel locked and secured.

d) Check gun ports covered.

WARNING

Check gun port plugs removed in case of gunnery mission.

e) Check three expended ammunition compartment doors closed.

WARNING

If a gunnery mission is to be carried out, check expended ammunition compartment emptied of links and cases.

2) Battery

a) Check battery stowed and connected.

b) Check door closed and secured.

CAUTION

If away from base, lower and check battery before proceeding to items a) and b).

3) Nose gear

a) Check for hydraulic leaks.

b) Check springs and locks for condition and operation.

c) Check doors and hinges for condition.

d) Check antishimmy engaged.

e) Remove nose gear ground safety lock and leave it to the crew-chief's care.

f) Check strut extension.

g) Check tire inflation.

h) Check tire for general condition and evidence of slippage.

4) Nose

a) Check left hand radio equipment door secured and ventilation ports clear.

b) Check gun camera door closed and nose tip glass not damaged.

c) Remove engine air intake dust plug and hand it to crew chief.

d) Check air intake duct for cleanliness, missing rivets, distortions, etc.

e) Check oxygen filler door closed.

f) Check right hand radio equipment bay ventilation ports clear.

5) Forward fuselage - right side

a) Check windshield and canopy for condition and evidence of cracks.

b) Check heat exchanger port clear.

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c) Check right gun panel secured.

d) Check gun ports properly covered.

WARNING

Check gun plugs removed for gunnery mission.

e) Check three expended ammunition compartment doors closed.

WARNING

If a gunnery mission is to be carried out, make sure the armament specialist has emptied expended ammunition compartment clear of links and cases.

f) Check condensation drain clear.

6) Speed brakes

Check for:

a) Twists or breaks.

b) Hydraulic leaks.

c) Fuel leaks.

d) Condition of position indicator and linkage.

e) Gear emergency system relief cock closed and lockwired.

7) Right main gear

a) Check for hydraulic and fuel leaks.

b) Check springs, latches and microswitches for condition and operation.

c) Check hinges and doors for condition, breaks and twist.

d) Check lines to wheel brakes for general condition.

e) Check strut extension.

f) Check gear grounded.

g) Check fairing for general condition.

h) Check tire inflation.

i) Check tire for condition and evidence of slippage.

j) Check wheel firmly chocked.

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8) Upper fuselage - right side

Climb wing and check:

a) Tank filler caps secured.

b) Doors and fairings (top and side) closed.

c) Position lights and glasses for condition.

9) Right wing

a) Check leading edge for condition.

b) Remove Pitot cover.

c) Check Pitot tube.

d) Check wing tip and position light.

e) Check aileron for condition, looseness, twists and hydraulic leaks.

f) Check flap for condition, looseness, and twist.

10) Aft fuselage - right side

a) Through right engine inspection door, check for hydraulic leaks, oil leaks, broken or burnt-out cables. Upon completion of check, close door.

b) Check fuel cell No.5 access door (right) closed, and no evidence of fuel leaks.

c) Check generator ventilation port clear.

d) Check drains clear.

e) Check empennage fairing closed and empennage sections secured.

f) Check tail pipe ventilation port clear.

11) Empennage and tail

a) Check fairings between horizontal stabilizer and fuselage for damage.

b) Check stabilizer leading edge and stabilizer for looseness.

c) Check stabilizer tips.

d) Check elevator for condition and looseness.

e) Check rudder for center position.

f) Check trim tab in center position.

g) Check taillights.

G.91-P

h) Check drag chute compartment door securely latched.

i) Chech ventilation outlet ports below drag chute compartment clear.

j) Remove plug from tail pipe and hand it to crew chief.

k) Check tail pipe for breaks, cracks and distortion.

l) Check turbine for missing buckets, burnt buckets, and distorted buckets.

12) Aft fuselage - left side

a) Check tail pipe ventilation inlet ports clear.

b) Check for fairing closed and fuselage sections secured.

c) Check hydraulic fluid filler cap access door closed.

WARNING

If away from base, check hydraulic fuel level and oil level.

d) Through right engine inspection door, check for hydraulic leaks, oil leaks, broken or burnt-out cables, oil tank cap secured. Upon completion of check, close door.

e) Check engine-driven pump, hydraulic pump and C.C.U. drain clear.

f) Check lower engine bay for hydraulic, fuel or oil leaks.

g) Check lower engine bay inspection door for condition.

h) Check drains clear.

i) Check fuel tank No.5 left access door secured and no fuel leaks.

13) Left wing

a) Check wing flap for condition, clearance and twist.

b) Check aileron for condition, clearance, twist, and hydraulic leaks.

c) Check wing tip and position light.

d) Check leading edge for condition.

14) Upper fuselage - left side

From left wing panel, check:

a) Doors and fairings (on side and top) securely closed.

15) Left main gear

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a) Hydraulic or fuel leaks.

b) Springs, latches and microswitches for condition and operation.

c) Doors for condition, breaks, twists; check hinges.

d) Line to wheel brakes for condition.

e) Strut extension.

f) Fairing condition.

g) Tire inflation.

h) Tire condition and evidence of slippage.

i) Wheel securely checked.

When, upon completion of this inspection, the pilot will be back at the starting point, he will make sure that the crew chief takes proper care of the following items, which he head handed him during the inspection:

- Air intake duct plug
- Nose gear ground safety lock
- Tail pipe plug.

Then the pilot will open the canopy by means of the external canopy switches and, using the pilot's ladder, will climb up to the cockpit (figure 2-2) and perform the "Check before entering the cockpit".

CHECK BEFORE ENTERING COCKPIT

1) Safety harness firmly secured and in good condition.
2) Oxygen emergency line connected to oxygen cylinders.
3) Visually check cockpit clear of objects.
4) Ejection seat face blind in place.
5) All seat and canopy ground safety pins installed.

COCKPIT INFERIOR CHECK

When in the cockpit, the pilot will don his helmet, secure himself in the seat and unlock the safety harness; will fasten the leg restraining straps; connect the anti-G line to the suit; the normal emergency oxygen lines to the mask; will adjust the seat up or down and back or forth. Then, he will make a left-to-right check around the cockpit (external d.c. power off) on the following items.

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1) Anti-G suit regulator valve set at "HI" or "LO" as desired.
2) Armament panel control switches off.
3) YAW DAMPER switch "OFF".
4) EMERG.LONGL.TRIM switch at "NORMAL".
5) UHF panel main switch "OFF".
6) FLAP control lever "UP".
7) Throttle at "STOP" (fully retracted).
8) FUEL L.P. COCK lever "OPEN".
9) Throttle friction adjusted as desired.
10) BOOSTER COILS switch at "NORMAL".
11) FUEL BOOSTER PUMP switch "ON".
12) FLOW PROPORT. switch "ON".
13) ELEV.PRESSURE switch "ON".
14) EMERG.LDG.GR. handle full in.
15) TAXI LIGHT switch "OFF".
16) LANDING GEAR lever "DOWN".
17) Landing gear position indicator for "barber pole" indication.
18) AILERON SERVO NORMAL SYSTEM PRESSURE switch "ON".
19) Altimeter barometric pressure adjusted as desired.

20) DRAG CHUTE handle full in.

21) EMERG.EXT.STORES REL. handle full in.

22) Accelerometer "RESET" button depressed.

23) GUN SIGHT LIGHT rheostat fully rotated counterclockwise.

24) EMERG.WHEEL BRAKE handle out and locked.

25) INVERTER switch "ON".

26) BATTERY switch "OFF" and then released.

WARNING

The "BATTERY OUT" warning light should be on; if not, it means that the battery is disconnected or discharged.

27) GENERATOR switch "OFF".

28) EMERG.CANOPY JETT. handle full in.

29) OXYGEN REGULATOR gage at 400 p.s.i.
red lever at "NORMAL"
black lever at "NORMAL OXYGEN"
"SUPPLY" green lever "OFF".
check corrugated tube and mask

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30) AN/APX-11A main switch "OFF".

31) IFF, AN/APX-6 main switch "OFF".

32) AD-722 radio compass main switch "OFF".

33) Light panel switches and rheostats off.

34) CANOPY DEFROST and DE-ICE lever "OFF".

35) COCKPIT VENTILATION lever "OFF".

36) COCKPIT AIR TEMPERATURE center switch "OFF".

37) PRESSUR. switch "ON".

38) PITOT HEAT switch "OFF".

39) Check circuit breakers in, except armament system and "IGNITION & CARTRIDGE STARTING".

40) Check all fuses in.

Upon completion of this check, the pilot will have the crew specialist connect the external power to the airplane and then will check:

1) Miniature wheel indication on landing gear position indicator instead of "barber pole" indication.

2) FLAP indicator "UP".

3) AIR-BRAKE indicator "DOWN".

4) Fuel quantity indicator for required amount of fuel.

5) Following warning lights on:
- CANOPY - UNSAFE FOR FLIGHT
- AILERON SERVO - LOW PRESS
- FUEL LOW PRESS
- OIL LOW PRESS
- GENERATOR OUT

6) That the FIRE warning light goes on when the "TEST CIRCUIT" button is depressed. Pilot is now ready for starting engine. To do this, push in the IGNITION AND CARTRIDGE STARTING button.

STARTING ENGINE

1) Turn "FUEL BOOSTER PUMP" switch "ON" and allow "FUEL LOW PRESS" warning light to go out.

2) Throttle at "START & FLIGHT IDLE".

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NOTE

To set throttle exactly in this position, advance it past the stop position and then pull it back against it.

3) Depress the "CARTRIDGE SELECTOR" starter button.

WARNING

Depressing the "STARTER" button will immediately energize the engine ignition circuit. The button is automatically held for 30 seconds by a solenoid controlled by a time switch. This switch prevents simultaneous selection of the two cartridges, which would damage the starter turbine.

CAUTION

If ignition does not occur, investigate cause before selecting the second cartridge.

4) Check exhaust temperature within limits.

CAUTION

Should the exhaust temperature exceed 715°C during the starting cycle, immediately shut down engine and investigate cause.

With engine cold, the normal starting exhaust temperature will be approximately 500°C. If the engine is warm, this temperature will be slightly greater.

5) Check that "OIL LOW PRESS" warning light is out. (This may take approximately 1 min. from pressing the starter button).

6) Turn "GENERATOR" switch "ON".

7) Turn "BATTERY" switch "ON" and then release.

8) Have external 28 Volt d.c. power source removed.

ENGINE GROUND TEST

1) Advance throttle to 7000 r.p.m. and check "GENERATOR OUT" warning light off. Check for 28 Volt d.c. on cockpit voltmeter.

2) Check aileron servo hydraulic system low pressure warning light out and "AILERON SERVO" gage for 3550 p.s.i. indication.

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3) Advance throttle to maximum continuous r.p.m. (9450 r.p.m.). Allow engine to stabilise and then check exhaust temperature within 640°C.

4) Advance throttle to intermediate r.p.m. (9700 r.p.m.). Allow engine to stabilize and then check exhaust temperature within 675°C.

5) Advance throttle to maximum r.p.m. and check for 9900 r.p.m. Temperature should not exceed maximum limit of 715°C.

6) Retard throttle to "START & FLIGHT IDLE" and check for 3500 (+100, -0) r.p.m. and temperature below 640°C.

WARNING

While the pilot is performing the above tests, the crew chief should check the engine bay, speed brake bay and gear wells for hydraulic oil, or fuel leaks. Upon completion of these checks, the crew chief will remove the key from the speed brake ground safety switch.

7) Retard throttle to idle.

CAUTION

Should the "FUEL LOW PRESS" or the "OIL LOW PRESS" warning lights come on during the starting cycle or during engine tests (the "OIL LOW PRESS" light above 4,000 rpm) shut down the engine immediately.

Once the engine tests have been accomplished, the pilot will perform the functional checks as outlined below.

FUNCTIONAL CHECKS

CANOPY

Close canopy by turning canopy switch to "CLOSED" until canopy closes fully. Lock by pushing lever forward and check "UNSAFE FOR FLIGHT" warning lights out. Then unlock and open.

CONTROL STICK

Unlock and handle control stick to check freedom of movement and correct linkage with relative control surfaces.

RUDDER AND BRAKE PEDALS

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Push pedals full down with both feet to check freedom of movement and correct linkage with the rudder.

HORIZONTAL STABILIZER

Push control stick grip "TRIM" switch full forward and then full back to complete travel and check instrument readings on instrument panel. Repeat this check using the left console "EMERG.LONG'L TRIM" switch, and then set stabilizer to "0" indication.

AILERONS AND ELEVATOR

Check that control stick returns to center position from any other position when released.

RUDDER TRIM TAB

Move "RUDDER TRIM" switch left and then right to complete travel. Check that "TAKE-OFF POSIT." light illuminates when passing through center position.

Then set trim tab in center position (light on). Releasing the switch will break the circuit and the light will go out.

WING FLAPS

Move "FLAP" lever to "DOWN" position; check flaps down and indicator pointer at "DOWN".

Then move it to "UP" and check again.

Then lower flaps 20 degrees and set lever at "HOLD".

SPEED BRAKES

Push "SPEED BRAKE" switch "IN" and check complete brake retraction on "AIR BRAKE" instrument.

OXYGEN SYSTEM

Move "SUPPLY" lever to "ON" and inhalate to check that white blinkers disappear from oxygen "FLOW" window during inhalation and re-appear when inhalation is stopped.

Press mask against face and move "EMERGENCY TEST" lever to "TEST"; check free oxygen flow and then return to "NORMAL".

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UHF COMMAND RADIO

Rotate UHF radio control to "BOTH" position, select desired channel, adjust volume, and call "QSA-QRK".

MARCONI RADIO COMPASS

Turn main switch to "ON", "CW-RT" switch to "RT", "ADF-REC" switch to "REC", select desired station with the "TUNING" knob, then move "ADF-REC" switch to "ADF" and check movement of indicator pointer in the direction of the station.

Then rotate switch "OFF".

So far, the pilot will have completely checked operation of engine, equipment and installations of the airplane; then he will have the ground crew remove seat and canopy safety pins. The airplane is now ready to be taxied to the take-off position, upon previous signal from the control tower.

TAXIING

1) Remove parking brake by unlocking and pushing "EMERG.WHEEL BRAKE" handle full in.
2) Hold brake pedals down.
3) Have wheel chocks removed.
4) Close canopy and lock.
5) Taxi to runway entrance maintaining directional control by use of rudder pedals. Check gyro instruments operation while taxiing. If signaled from the control tower, the pilot will enter the runway and will perform the preflight airplane check.

BEFORE TAKE-OFF

1) Trim switches in neutral position.
2) Speed brakes "UP".
3) Wing flaps 20 degrees.
4) Canopy locked.
5) Pressurization "ON".
6) Oxygen regulator "100% OXYGEN"
7) Armament circuit breakers out.
8) Safety belt tight.
9) Shoulder harness adjusted.

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TAKE-OFF

1) Hold brake pedals down firmly.
2) Progressively advance throttle up to 9900 r.p.m. and allow r.p.m. and exhaust temperature to stabilize.
3) Release brakes.
4) At 95 knots IAS retract nose wheel. VERY SPORTING !!
5) At 125 knots IAS take-off.

AFTER TAKE-OFF

1) "LANDING GEAR" lever UP at speed lower than 185 knots.
2) "FLAP" UP at speed lower than 185 knots.
3) Retard throttle to 9700 r.p.m.
4) Black oxygen lever at "NORMAL OXYGEN".
5) Check exhaust temperature (max 675°C).
6) FLAP at "HOLD".

See figure 2-4.

CLIMB

During initial climb keep engine speed at 9700 r.p.m. at 400 knots IAS up to 0.7 Mach. Then maintain 0.7 Mach during climb to altitude.

G.91-P

FLIGHT CHARACTERISTICS

Refer to section VI.

SYSTEMS OPERATIONS

Refer to Section VII.

DESCENT

1) Speed brakes down.
2) Throttle at idle (3500 to 4000 r.p.m.).
3) 300 knots IAS.
4) Check exhaust temperature.

PRE-TRAFFIC-PATTERN CHECK

During approach, make the following checks:

1) Hydraulic system pressure normal.
2) Safety belt and shoulder harness tight.
3) Armament circuit breakers out.
4) Oxygen regulator black lever "100% OXYGEN".

NORMAL LANDING

Refer to figure 2-5.

GO-AROUND

Refer to figure 2-6.

AFTER LANDING

During the landing run, check:

1) FLAP lever "UP".
2) SPEED BRAKE switch "IN".
3) Marconi radio compass "OFF".

On leaving the runway, release the drag chute and taxi to parking.

STOPPING ENGINE

1) Parking brake on.
2) Radio and oxygen off.

3) Retard throttle to idle and allow exhaust temperature to stabilize.

4) SPEED BRAKE switch "OUT" until brakes are lowered completely.

5) Unlock canopy and open.

6) Retard throttle to "STOP" and check engine stopping time.
(Minimum run down time is 20 to 40 seconds).

BEFORE LEAVING AIRPLANE

1) "FUEL BOOSTER PUMP" switch "OFF".

2) "GENERATOR" switch "OFF".

3) "BATTERY" switch "OFF", then released."BATTERY OUT" warning light "ON".

4) All circuit breakers out.

5) Seat and canopy ground safety pins and "EMER.EXT.STORES REL." handle and "EMER.CANOPY JETT." handle locks installed.

6) Complete engineering form on airplane log book.

7) Speed brake ground safety key installed.

8) Plugs installed on air intake duct and tail pipe as soon as possible.

SEQUENCE OF EXTERIOR INSPECTION

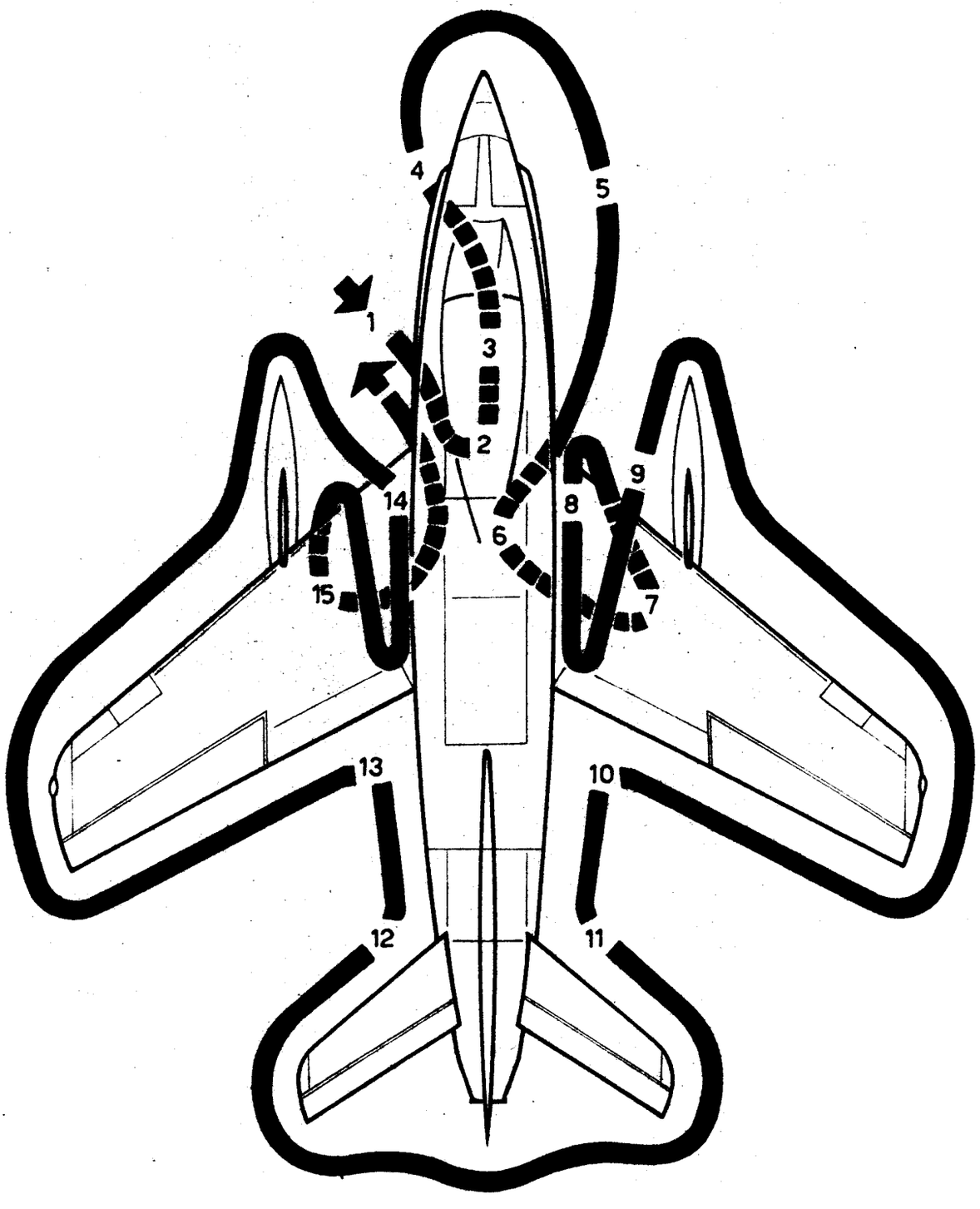


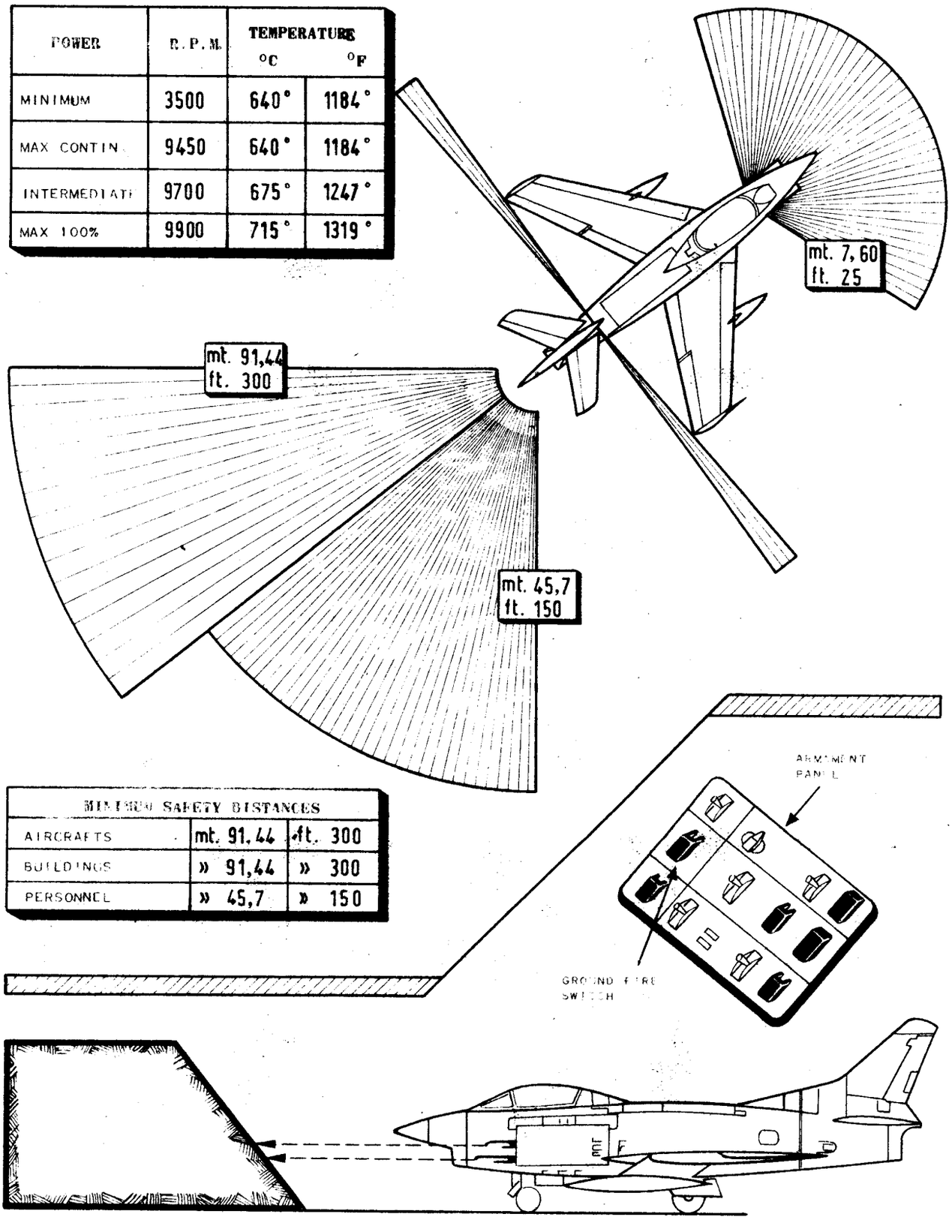
Figure 2-1

ENTERING COCKPIT

Figure 2-2

DANGER AREAS

POWER	R.P.M.	TEMPERATURES °C	°F
MINIMUM	3500	640°	1184°
MAX CONTIN.	9450	640°	1184°
INTERMEDIATE	9700	675°	1247°
MAX 100%	9900	715°	1319°



MINIMUM SAFETY DISTANCES		
AIRCRAFTS	mt. 91,44	ft. 300
BUILDINGS	» 91,44	» 300
PERSONNEL	» 45,7	» 150

A-0006

Figure 2-3

TAKE-OFF

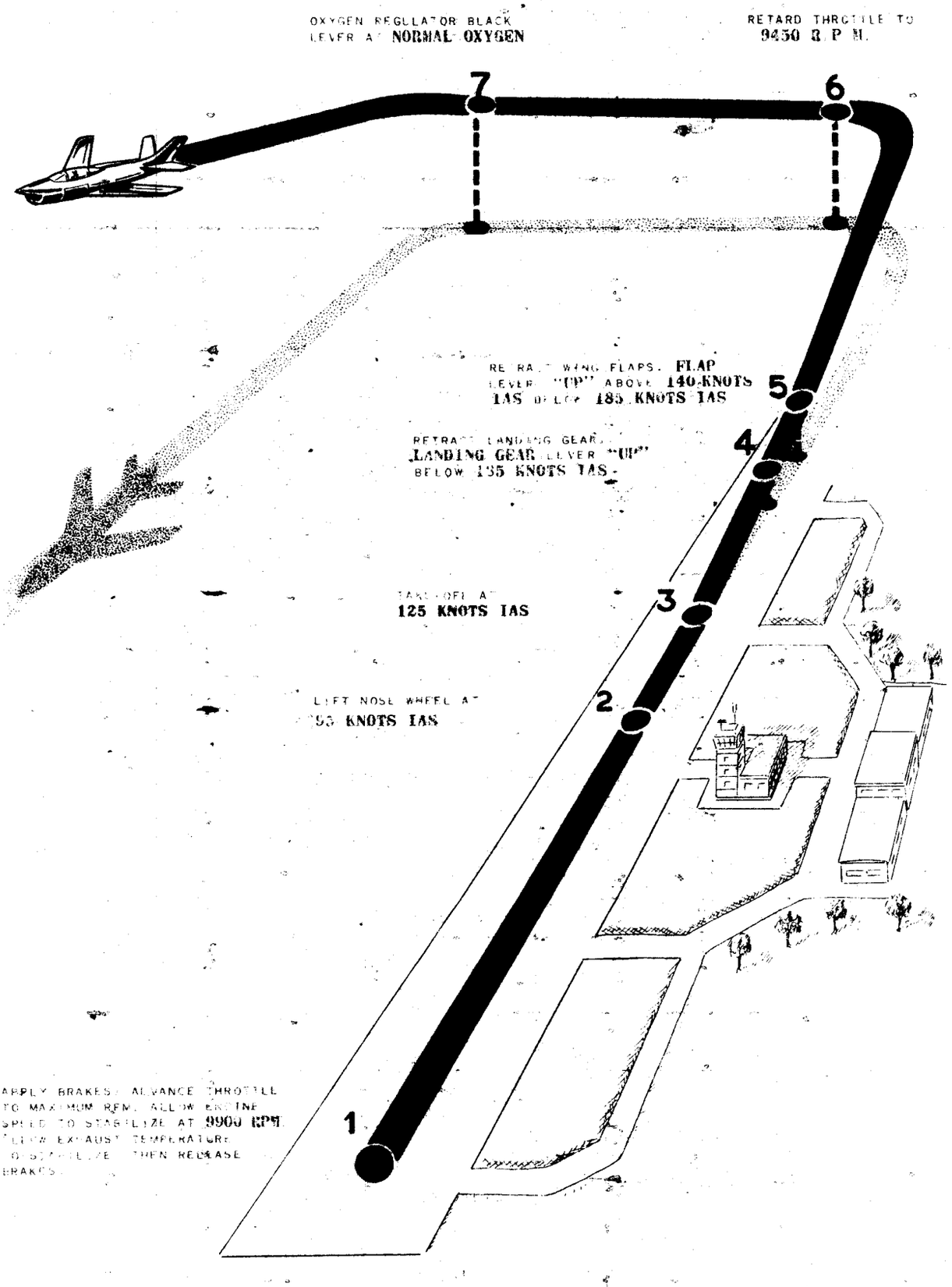


Figure 2-4

NORMAL LANDING

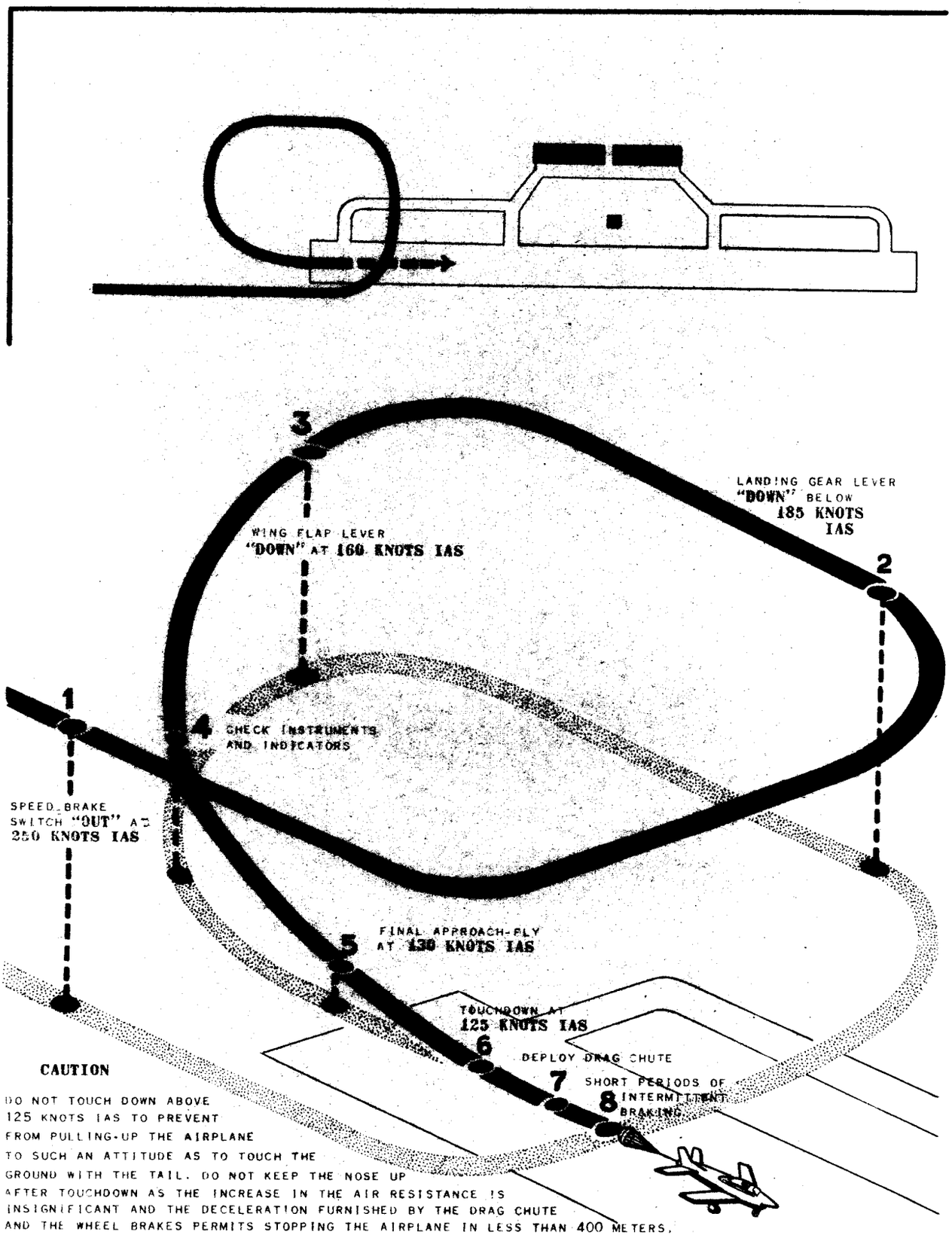


Figure 2-5

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GO-AROUND

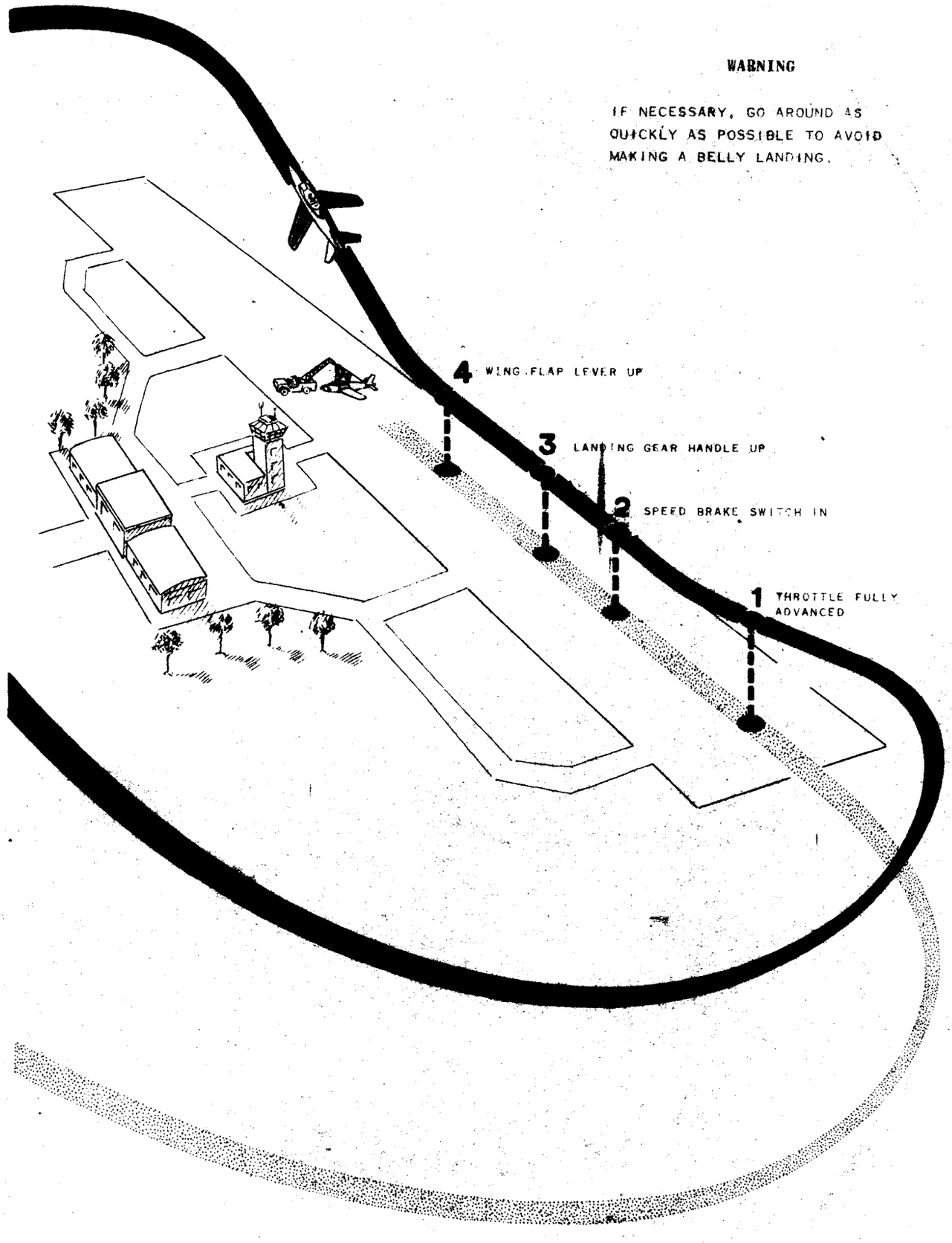

Figure 2-6

S E C T I O N III

E M E R G E N C Y P R O C E D U R E S

CONTENTS

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ENGINE FAILURE

In case of flame-out, an air start can be attempted. However, air starts should never be attempted if engine failure can be attributed to some mechanical failure.

ENGINE AIR START

Engine starts during flight are readily obtainable between 28,000 feet of altitude and sea-level. If flame-out occurs above this limiting altitude, descend below 28,000 feet before attempting restart.

An air start can still be attempted at altitudes below 10,000 feet. However, if this is the case, prepare for a forced landing or for ejection with the ejection seat.

The engine air start procedure is as follows:

1) Throttle at "STOP".
2) FUEL L.P. COCK lever "OPEN".
3) Climb airplane to drain tail pipe.
4) Maintain airplane at indicated airspeed given by the diagram in function of the altitude.

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5) BATTERY switch "ON" and BATTERY OUT warning light out.
6) BOOSTER PUMP switch "ON" and BOOSTER COILS switch "NORM".
7) Depress throttle grip IGNIT button for 2 to 3 seconds to clear igniter plugs.
8) Once igniter plugs are cleared, still depressing IGNIT button, slowly advance throttle to START & FLIGHT IDLE position and allow engine RPM to stabilize.
9) If engine is started, release IGNIT button at 3500 RPM.

WARNING

Engine starts during flight are more readily obtained as altitude and speed are decreased. Best altitude for restarting is below 15,000 feet at 200 knots IAS.

CAUTION

If exhaust temperature rises above 715°C or if engine fails to restart within 15 seconds, close throttle fully and drain tail pipe before attempting restart.

ENGINE FAILURE DURING TAKE-OFF BEFORE LEAVING GROUND

If engine failure occurs before leaving ground, proceed as follows:

1) Retard throttle to "STOP".

2) Apply brakes and, if possible, deploy drag chute.

If landing gear must be retracted because of insufficient remaining runway, proceed as follows:

3) Pull EMERG.CANOPY JETT. handle to jettison canopy.

4) Press LDG.GR.EMERG.UP button.

5) Landing gear handle "UP".

6) Turn GENERATOR switch "OFF".

7) Turn BATTERY switch "OFF" and release.

ENGINE FAILURE DURING TAKE-OFF AFTER LEAVING GROUND

If engine failure occurs after airplane is airborne, proceed as follows:

G.91-P

1) Retard throttle to "STOP".

2) Pull EMERG.CANOPY JETT. handle to jettison canopy.

3) Landing gear lever "UP".

4) FLAP lever "DOWN".

5) Turn GENERATOR switch "OFF".

6) Turn BATTERY switch "OFF" and release.

7) Land straight ahead, changing course only enough to miss obstacles.

8) Deploy drag chute immediately after airplane contacts ground.

ENGINE FAILURE DURING FLIGHT

If engine failure occurs during flight, attempt an air start, if possible. If engine does not restart, or if restarting is not convenient because of a mechanical failure, glide at best aerodynamic efficiency (figure 3-2), proceeding as follows:

1) Landing gear "UP".

2) Wing flaps "UP".

3) Speed brakes closed.

4) Glide at 190 knots IAS.

During glide, prepare for a forced landing (figure 3-3) or ejection with ejection seat (figure 3-6).

NOTE

The MARTIN-BAKER MK-W4 ejection seat permits successful ejections at altitudes as low as 50 feet above terrain at 250 to 300 knots IAS.

FORCED LANDING

Descend with airplane at best conditions (figure 3-2), and proceed as shown in figure 3-3, referring to paragraph "Engine failure during take-off after leaving ground".

FIRE

G.91-P

The fire-warning system consists of a detector circuit (10 detectors set radially around the compressor). If one of these detectors senses overheat, the circuit closes and the "FIRE" (red) warning light in the right upper corner of the instrument panel illuminates.

NOTE

This airplane is not equipped with a fire-extinguishing system.

ENGINE FIRE DURING STARTING

If there is indication of fire (fig. 3-4):

1) Throttle at "STOP".
2) BOOSTER PUMP switch "OFF".
3) FUEL L.P. COCK lever "CLOSED".
4) Turn BATTERY switch "OFF" and release.
5) Turn GENERATOR switch "OFF".
6) Leave airplane as quickly as possibile.

ENGINE FIRE DURING TAKE-OFF

If light illuminates during ground roll or sufficient runway or overrun area is available to abort the take-off, proceed as follows:

1) Retard throttle to "STOP".
2) BOOSTER PUMP switch "OFF".
3) FUEL L.P. COCK lever "CLOSED".
4) Turn BATTERY switch "OFF" and release.
5) Turn GENERATOR switch "OFF".
6) Deploy drag chute and apply brakes.
7) If overrun area is entered, depress LDG.GR.EMERG.UP button immediately.
8) Jettison canopy.
9) Leave airplane immediately after stopping.

If the take-off cannot be aborted, maintain power and immediately climb to a minimum safe ejection altitude (70 feet at 250 knots IAS); then eject.

G.91-P

ENGINE FIRE DURING FLIGHT

If the FIRE warning light illuminated, proceed as follows:

1) Immediately retard throttle to "STOP".
2) BOOSTER PUMP switch "OFF".
3) FUEL L.P. COCK lever "CLOSED".
4) Turn BATTERY switch "OFF" and release.
5) Turn GENERATOR switch "OFF".
6) If light is extinguished, make a forced landing or abandon airplane. If light remains on, abandon airplane.

ENGINE FIRE DURING SHUTDOWN

If there is indication of fire during shutdown, proceed as follows (refer to figure 3-4):

1) Retard throttle to "STOP".
2) BOOSTER PUMP switch "OFF".

3) FUEL L.P. COCK lever "OFF".

4) Turn BATTERY switch "OFF" and release.

5) Turn GENERATOR switch "OFF".

6) Leave cockpit as quickly as possible.

ELECTRICAL FIRE

Circuit breakers and fuses protect all of the electrical circuits to minimize the probability of electrical fires. However, if an eletrical fire does occur during flight, turn generator switch "OFF", and land as soon as possible. If battery power is to be saved, open all circuit breakers of all nonessential equipment, and disconnect the battery bus from the primary bus by turning the BATTERY switch "OFF" and releasing it. Then check that the BATTERY OUT warning light illuminates.

LANDING EMERGENCIES

G.91-P

BELLY LANDING

If a belly landing is unavoidable, proceed as follows:

1) Expend excess fuel.

2) Make approach with speed brakes open and flaps down.

3) Jettison canopy prior to landing.

4) Just before touchdown, retard throttle to "STOP", turn BOOSTER PUMP, GENERATOR and BATTERY switches "OFF" and FUEL L.P. COCK lever to "CLOSED".

5) Touch down in normal landing attitude.

6) Deploy drag chute immediately after touchdown.

7) Abandon airplane immediately after it stops.

ANYONE MAIN GEAR STRUT UP OR UNLOCKED

If landing is to be made on other than smooth ground or runway, retract all gear and make a belly landing.

If landing is to be made on smooth ground or runway, proceed as follows:

1) Expend excess fuel.

2) Make normal approach with wing flaps down and speed brakes open.

3) Jettison canopy prior to landing.

4) Plan approach to touch down as near end of runway as possible.

5) Just before touchdown, close throttle and turn booster pump, generator and battery switches off and fuel low pressure cock lever to "CLOSED".

6) Deploy drag chute immediately after touchdown.

7) Keep unlocked wheel up as long as possible.

8) Do not use brakes if you can stop without them.

9) Abandon airplane immediately after it stops.

NOSE GEAR UP OR UNLOCKED

If landing is to be made on other than smooth ground or runway, retract all gear and make a belly landing.

If landing is to be made on smooth ground or runway, proceed as follows:

G.91-P

1) Expend excess fuel.

2) Make normal approach with wing flaps down and speed brakes open.

3) Jettison canopy immediately prior to landing.

4) Plan approach to touch down as near end of runway as possible.

5) Just before touchdown, close throttle and turn booster pump, generator and battery switches off, and fuel low pressure cock lever to "CLOSED".

6) Deploy drag chute immediately after touchdown.

7) Keep airplane nose up as long as possible.

8) As the airplane will show tendence to lower its nose, press LDG.GR. EMERG.UP button and move landing gear lever "UP".

9) Abandon airplane immediately after it stops.

LOSS OF CANOPY

If the canopy should come off during the take-off roll and there is insufficient runway remaining to abort the take-off, it is recommended that the take-off be completed. It should be remembered that if a landing is made immediately after take-off, the airplane weight will

be higher than normal and, consequently, the approach and touchdown speeds will be 15 to 20 knots higher.

Due to the tremendous turbulance of air in the cockpit, it is advisable to fly at reduced speed if the airplane must be kept in flight.

EMERGENCY ENTRANCE

See figure 3-5.

DITCHING

Owing to the low altitude ejection (50 feet) made possible with the Martin-Baker ejection seat, ditch only as a last resort.

However, if ditching is unavoidable, proceed as follows:

G.91-P

1) Follow radio distress procedure.
2) Disconnect anti-G suit and radio leads.
3) Set oxygen regulator black lever at "100% OXYGEN".
4) Check landing gear up.
5) Check speed brakes closed.
6) Wing flap lever "DOWN".
7) Jettison canopy immediately before ditching.
8) Retard throttle to "STOP".
9) Turn booster pump, generator, and battery switches "OFF".
10) Close fuel low pressure cock.
11) Unless wind is high or sea is rough, try to touch down along wave crest. If wind is high or sea is rough, the best procedure is to approach into the wind.
12) Make normal approach and flare out to normal approach altitude, being careful to keep the nose as high as possible.
13) Abandon airplane as soon as possible by rotating and striking the knob of the harness release box. This will separate pilot with dinghy from seat and parachute.

WARNING

In the event of being unable to escape from underwater, eject with seat. Experiments of underwater ejection have been carried out successively.

14) Inflate life saving waistcoat immediately if this has not previously been done.

15) Extract dinghy from container and inflate.

EJECTION

In all cases of ejection, escape must be accomplished by means of seat ejection (figure 3-6). This is the only safe way of escaping, both at low and high speed, as it prevents the pilot from getting caught on the tail surfaces.

If the airplane must be abandoned, proceed as follows:

1) Reach blind firing handle (on top of seat headrest) with both hands and hold firmly.

G.91-P

2) Pull this handle full down violently to extract face blind completely. Hold face blind tight against face and keep elbows as tight to the body as possible. Sit erect, head hard back against headrest.

This action determines ignition of the canopy ejection cartridge and the seat ejection cartridges after one-second interval.

From now on, operation is automatic (figure 3-7) and occurs in the following sequence:

a) Opening of emergency oxygen bottle.

b) Retraction of pilot's legs against seat.

c) Jettisoning of pilot drogue of main stabiliser drogues.

d) Pilot's release from seat at altitude preset by barostatic control.

e) Opening of pilot's personal chute.

WARNING

Should the canopy ejection mechanism fail, seat ejection is still possible through the canopy. Therefore, seat adjustment is necessary before any normal flight. Be sure the pilot's helmet does not project from top of seat headrest.

This is to prevent from hitting helmet instead of seat against canopy in case of ejection through canopy.

If the airplane must be abandoned and the ejection mechanism fails, proceed as follows:

1) Jettison canopy. If canopy fails to jettison, unlock and open. Keep head down and forward to prevent it from being hit by the canopy while it is broken away by the airstream.

2) Pull up lever on exterior left side of seat to release safety harness, shoulder harness, leg restraining straps and to disconnect chute pack from seat.

3) Pull "D" ring No.1 (external) to disconnect chute pack from lead that connects it to seat stabilizer drogue.

4) Abandon airplane.

5) As soon as airplane is abandoned, pull "D" ring No.2 located just below "D" ring No.1. This will open the chute pack and deploy the personal chute.

WARNING

Steps 2), 3) and 5) are to be accomplished also in the event that the time-delay release and chute deployment mechanism fails after ejection.

G.91-P

FUEL BOOSTER PUMP FAILURE

In case of booster pump failure, the FUEL LOW PRESS warning light will illuminate.

The engine-driven pump will be capable of sucking fuel from tank No.5 and supplying necessary power to the engine up to 100% RPM.

WARNING

It is advisable, in this case, to reduce throttle manipulation to minimum essential.

ELECTRICAL SYSTEM EMERGENCY OPERATION

GENERATOR FAILURE

If the GENERATOR OUT warning light comes on, indicating that the generator has failed or has been disconnected because of overvoltage, equipment powered by the secondary bus and gyro instrument bus will be automatically shut off; the primary bus will still be powered by the battery bus for about 20 minutes maximum. Attempt to bring the generator back into the circuit by cutting out, through the circuit breakers, all nonessential equipment and by turning the GENERATOR switch to "RESET" position. If the warning light goes out, it means that the generator has been brought back into the circuit and that it had been disconnected because of overvoltage.

Then turn switch "ON".

If the light remains on, it indicates generator failure and landing must be made within 15 to 20 minutes.

Turn switch "OFF".

If it is necessary to continue the flight after the generator has failed, turn off nonessential equipment powered by the primary bus to prolong battery life.

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WARNING

Radio equipment absorbs more electrical power than any other equipment. Therefore, use of radio equipment should be reduced to minimum essential.

INVERTER FAILURE

When failure of the inverter occurs, such failure is indicated by non-operation of all gyro instrument. (The "OFF" flag will appear on the attitude gyro).

Turn INVERTER switch "OFF" and remeber that the a.c. bus will not be powered.

WARNING

Automatic cockpit temperature control will be inoperative; to increase or decrease cockpit temperature, manually set control switch to "INC" or "DEC".

LANDING GEAR EMERGENCY OPERATION

LANDING GEAR EMERGENCY RETRACTION

If it is necessary to retract gear during take-off or after landing, depress LDG.GR.EMERG.UP button and move landing gear lever "UP".

LANDING GEAR RETRACTION EMERGENCY

Reduce airspeed to below 185 knots IAS, extend gear and repeat retraction sequence. If gear does not retract fully, repeat cycle at lower speed. If gear still does not retract, extend gear and land at IAS lower than 175 knots.

LANDING GEAR EMERGENCY LOWERING

In case of hydraulic system failure, proceed as follows to extend gear (figure 3-9):

1) Reduce airspeed to less than 175 knots IAS.

G.91-P

2) Landing gear lever "DOWN".

3) Pull EMERG.LDG.GR. handle, located below and to the left of the instrument panel, and hold it fully extended until nose gear is seen locked and main gear unlocked.

4) Yaw airplane until main gear is locked.

FLIGHT CONTROL HYDRAULIC SYSTEM FAILURE

Operation of this system is entirely automatic and no particular action is required from the pilot, but aileron and elevator servo system engagement. When aileron normal hydraulic system pressure drops below 2630 ± 107 p.s.i., the LOW PRESS warning light illuminates and the flight control alternate system is automatically engaged. When hydraulic pressure from the alternate system accumulator fails automatic transfer to mechanical operation will occur. If this is the case, the airplane must be flown at reduced airspeed and pedal action is required to aid in aileron control.

In an analogous manner a flight control hydraulic system failure will render the elevator servo system inoperative and automatic transfer to mechanical operation will occur. In this case, the amber warning light marked SERVO RELEASE DISENGAGE will illuminate.

HORIZONTAL STABILIZER NORMAL TRIM FAILURE

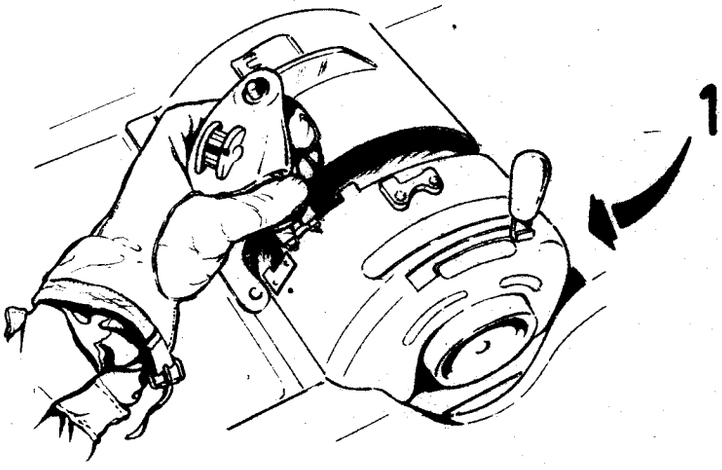
In event of a failure of the normal longitudinal trim control, the stabilizer can be trimmed through use of the alternate trim switch on the left console.

WARNING

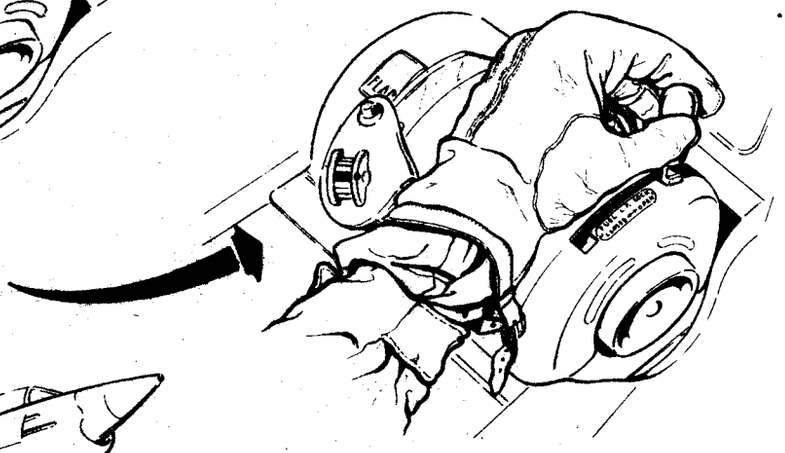
If failure of both normal and alternate trim occurs and the horizontal stabilizer remains locked in a diving attitude, lowering the dive brakes can compensate for the adverse moment; if the stabilizer remains locked in a climbing attitude, compensate moment by lowering gear.

S-0005/1

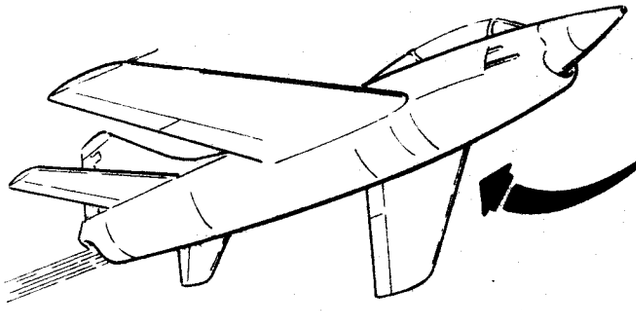
ENGINE AIR START PROCEDURE



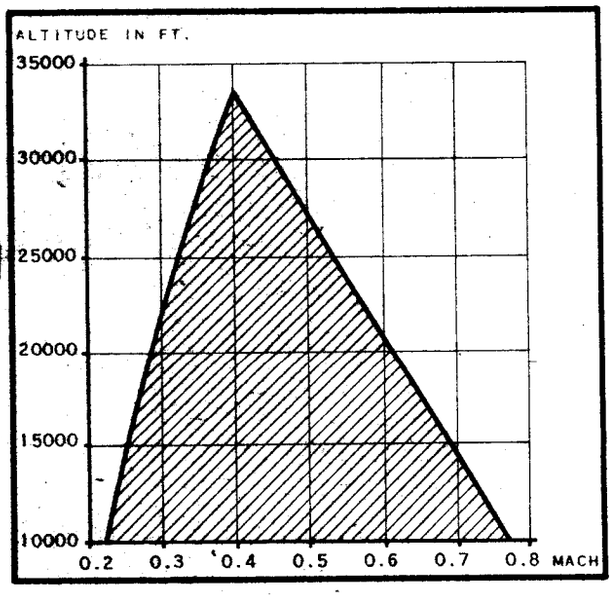
1 RETARD THROTTLE TO **"STOP"**



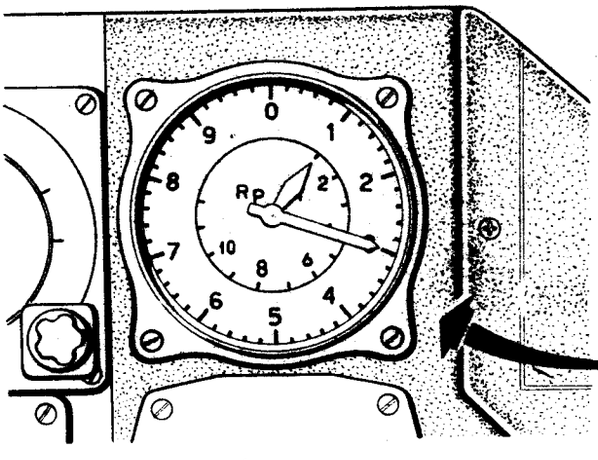
2 FUEL L. P. COCK OPEN



3 DRAIN TAIL PIPE



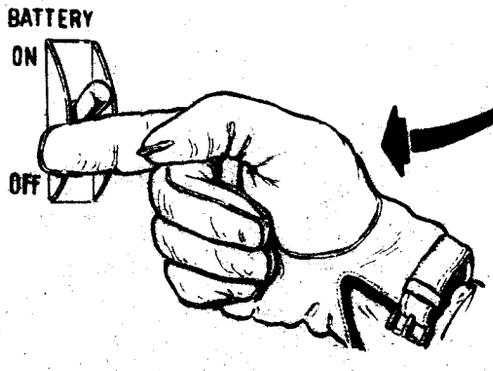
4 MAINTAIN SPEED INDICATED ON TABLE IN FUNCTION OF ALTITUDE



5 CHECK WINDMILLING RPM BETWEEN 1300 AND 1600.

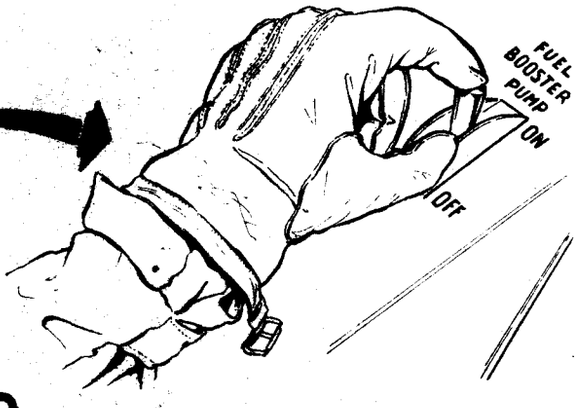
Figure 3-1/1

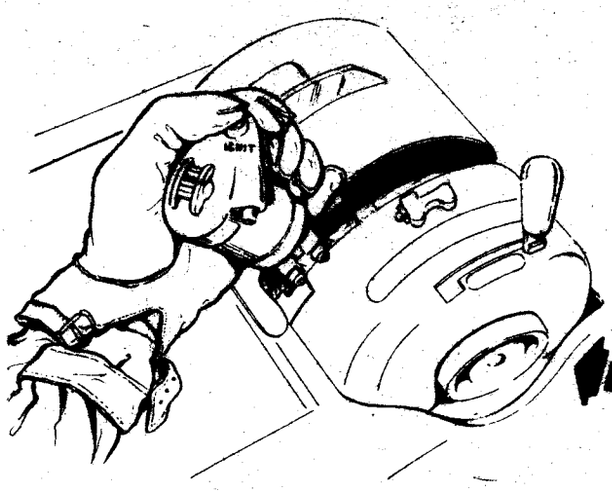
ENGINE AIR START PROCEDURE



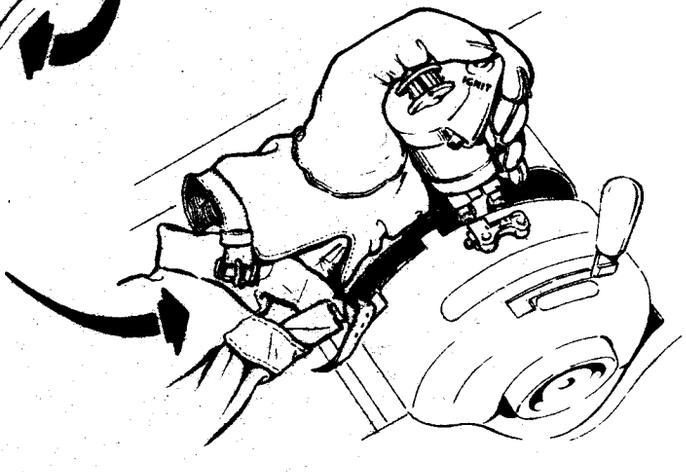
6 **BATTERY** SWITCH **"ON"**

7 **BOOSTER PUMP** SWITCH **"ON"**

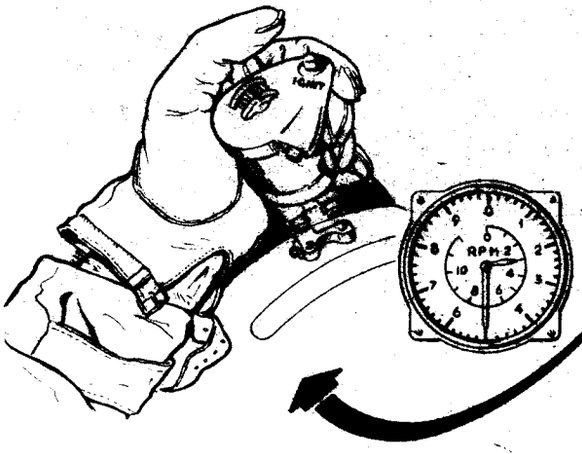




8 DEPRESS **IGNIT** BUTTON WITH THROTTLE AT **"STOP"** TO CLEAR IGNITER PLUGS



9 SLOWLY ADVANCE THROTTLE TO **"START & FLIGHT IDLE"** HOLDING **IGNIT** BUTTON DEPRESSED



10 AT 3500 RPM RELEASE **IGNIT** BUTTON.

Figure 3-1/2

S-A005/2

GLIDE DISTANCES WITH DEAD ENGINE

NO EXTERNAL LOAD

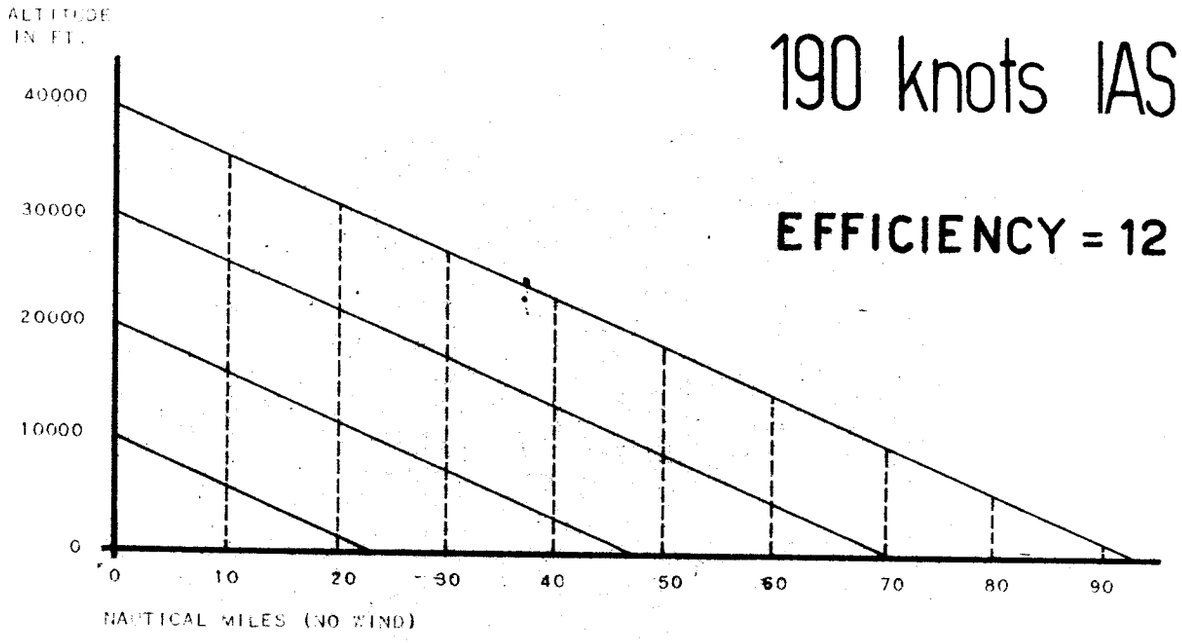
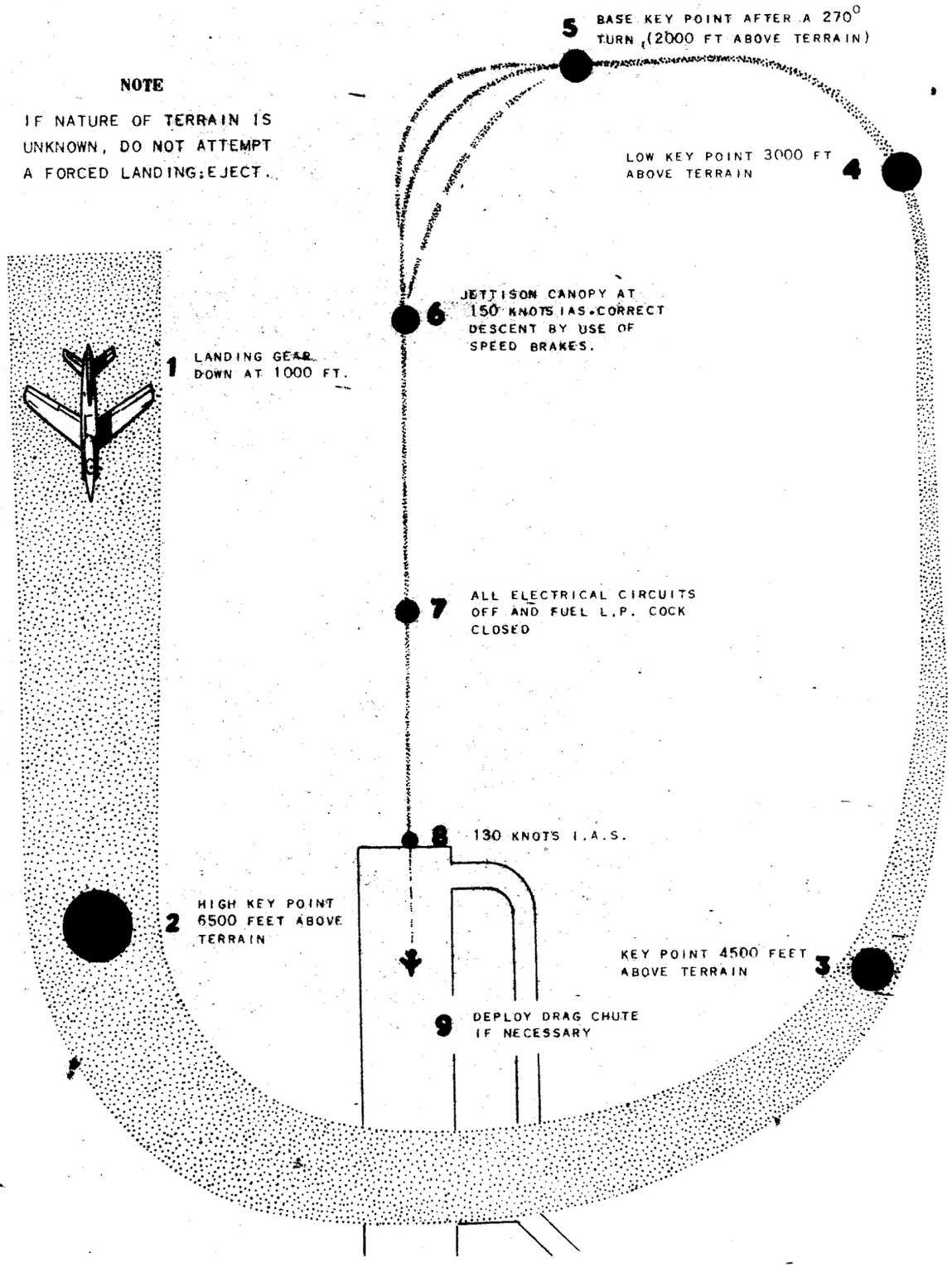


Figure 3-2

FORCED LANDING

DEAD ENGINE



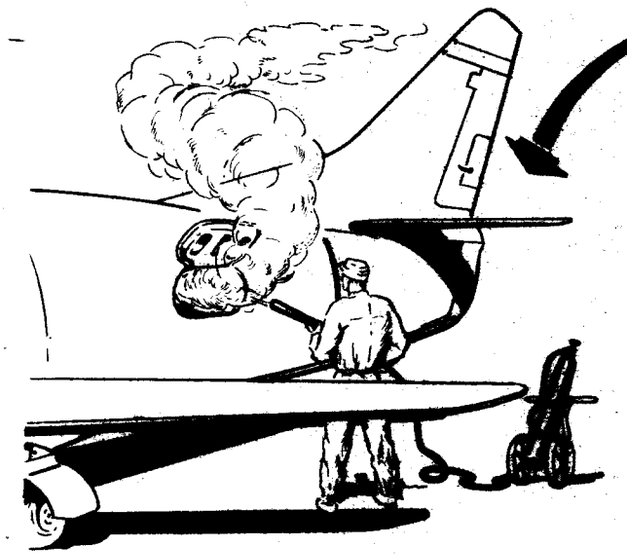
S-0007

Figure 3-3

EXTINGUISHING GROUND FIRE

WARNING : NO FIRE EXTINGUISHING EQUIPMENT IS INSTALLED IN THE AIRPLANE.

CAUTION : IN CASE OF FIRE, IMMEDIATELY RETARD THROTTLE TO "**STOP**", **FUEL L.P.COCK** LEVER TO "**CLOSED**", AND TURN BOOSTER PUMP AND BATTERY SWITCHES OFF. ABANDON COCKPIT AND ACT AS FOLLOWS.

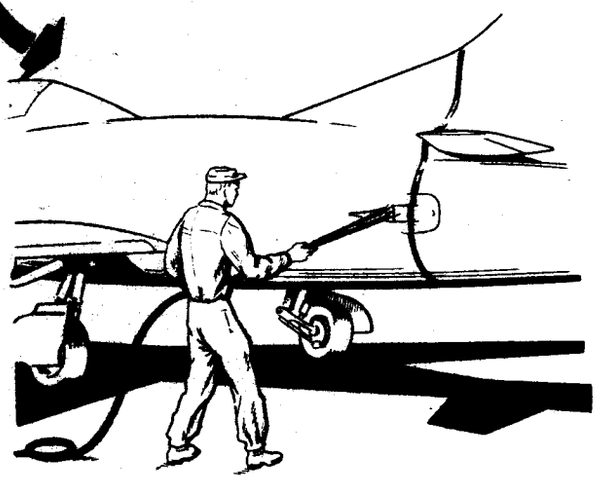


COMPRESSOR COMPARTMENT FIRE

OPEN ENGINE (RIGHT-HAND OR LEFT-HAND ACCESS DOORS) AND INTRODUCE EXTINGUISHING AGENT.

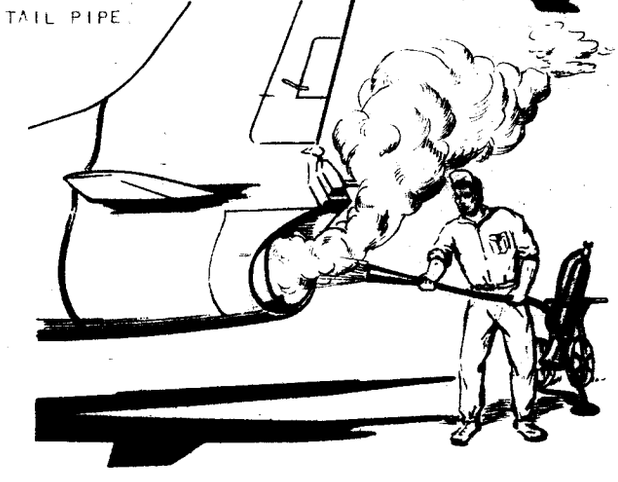
AFT FUSELAGE FIRE

INTRODUCE EXTINGHISHING AGENT INTO TAIL PIPE VENTILATION PORT. IF THIS IS NOT SUFFICIENT TO BLOW OUT THE FIRE, INTRODUCE AGENT BETWEEN THE TAIL PIPE AND THE AIRPLANE SKIN.



TAIL PIPE FIRE

TURN **BOOSTER COILS** SWITCH TO "**ISOL**" AND **BATTERY** SWITCH "**ON**". DEPRESS **STARTER** BUTTON AND TURN **BATTERY** SWITCH "**OFF**" AS SOON AS THE ENGINE IS STARTED. IF THE AIR BLOW IS NOT ENOUGH TO EXTINGUISH THE FIRE INTRODUCE EXTINGHUISHING AGENT INTO THE TAIL PIPE.



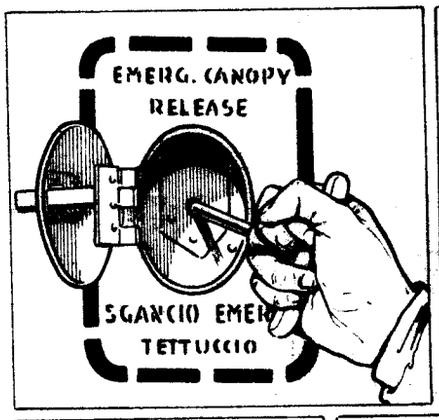
POSTFIRE PROCEDURE

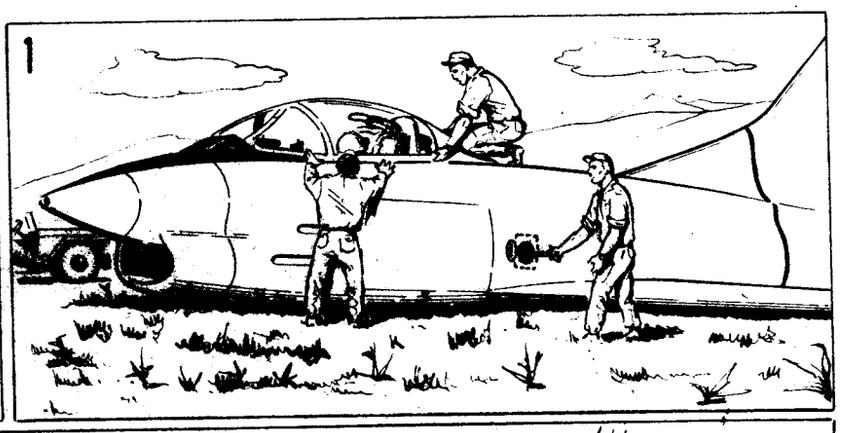
1. BLOW OFF EXTINGUISHING AGENT WITH COMPRESSED AIR.
2. WASH ALL AFFECTED STRUCTURE WITH A FINE SPRAY OF WATER
3. RINSE THE AFFECTED STRUCTURE WITH A 5 PERCENT CHROMIC ACID SOLUTION; THEN RINSE WITH CLEAR WATER
4. IF EXTINGUISHING AGENT HAS PENETRATED INTO ENGINE, THE ENGINE WILL REQUIRE A THROUGH OVERHAUL.

A-0007

Figure 3-4

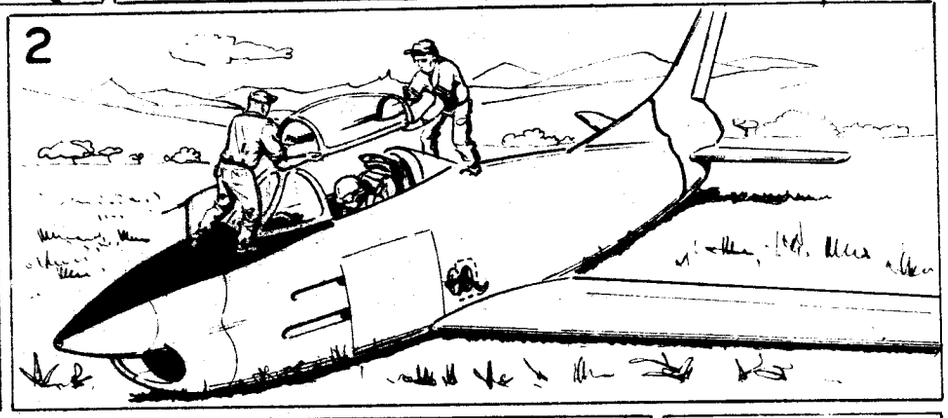
COCKPIT EMERGENCY ENTRANCE

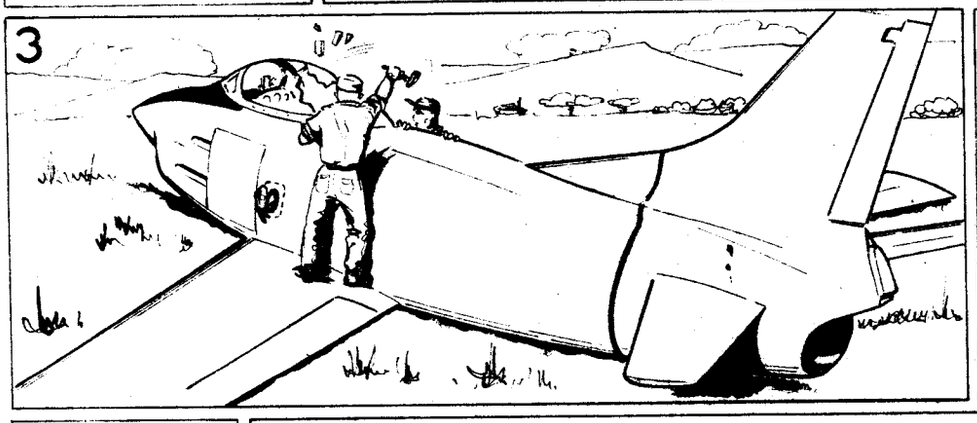




PROCEDURE

1. PULL EMERG. CANOPY RELEASE HANDLE
2. LIFT CANOPY
3. IF CANOPY CANNOT BE LIFTED, BREAK CANOPY GLASS AFT OF PILOT'S HEAD
4. EXTRACT PILOT



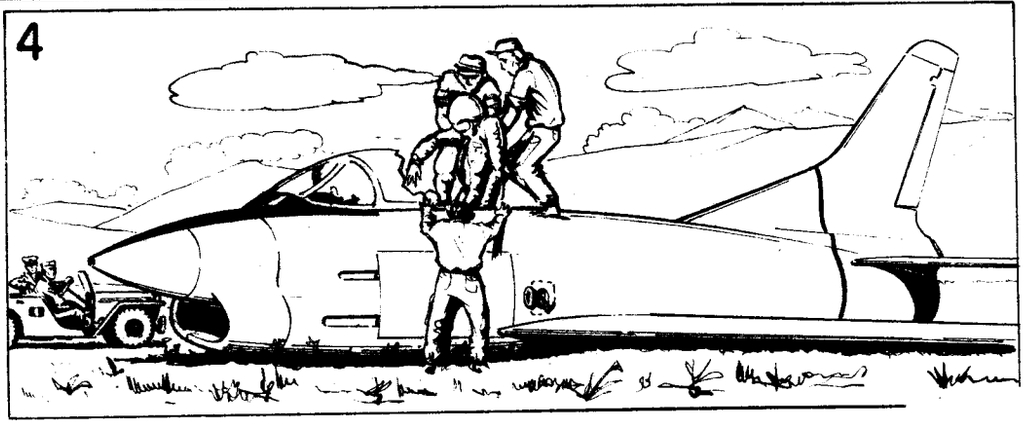


CAUTION

THE CANOPY ACTUATOR GROUND SAFETY PIN IS NOT INSTALLED. STAY CLEAR OF LINE OF CANOPY EJECTION

CAUTION

IF POSSIBLE, INSTALL ALL SEAT AND CANOPY GROUND SAFETY PINS BEFORE EXTRACTING PILOT



S-0008

Figure 3-5

SEAT EJECTION

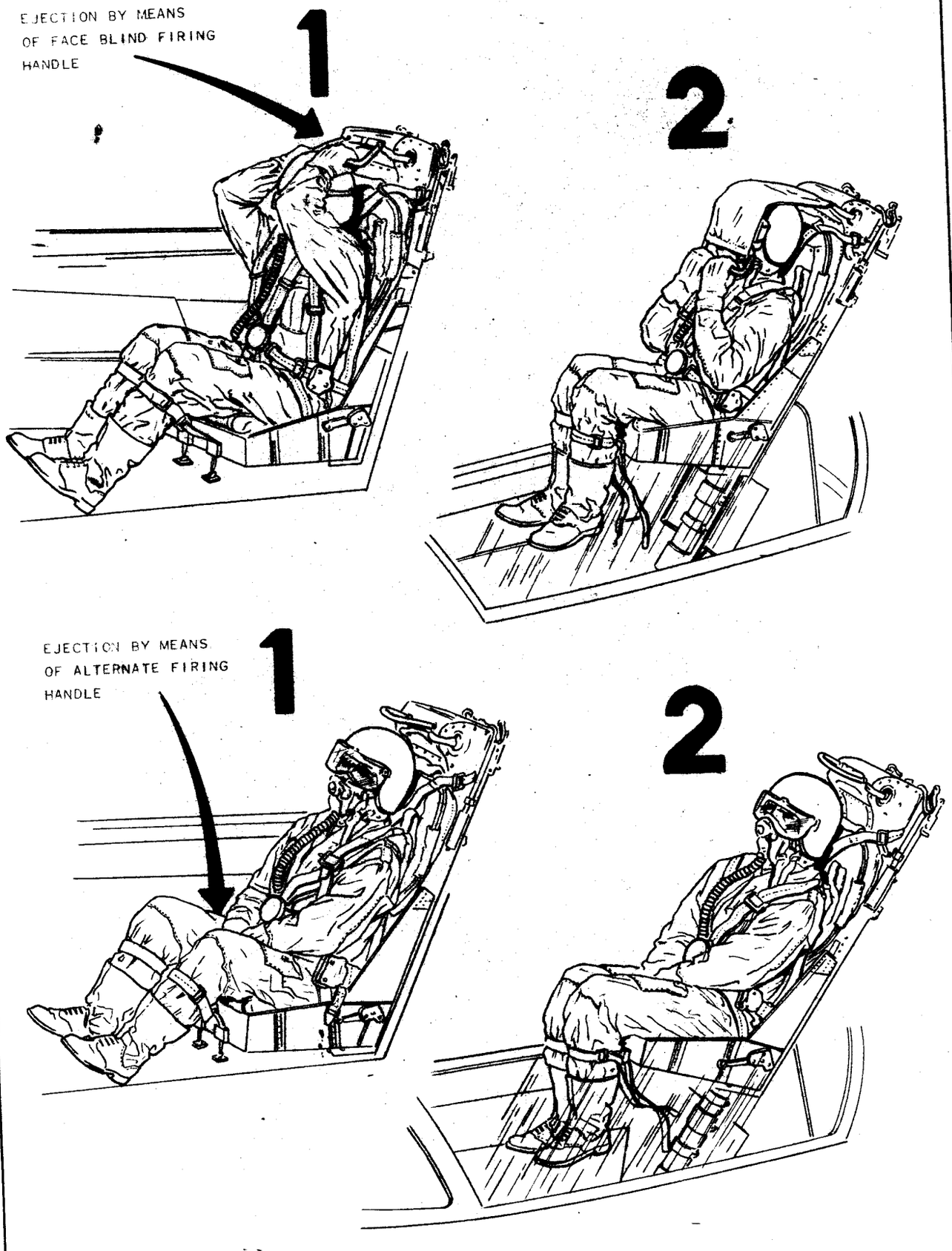


Figure 3-6

R-0003

EJECTION SEQUENCE

WARNING

MINIMUM SAFE BAIL-OUT ALTITUDE IS 50 FEET FOR SPEEDS OF 250 TO 300 KNOTS IAS. FOR LOWER SPEEDS, MINIMUM SAFE ALTITUDE IS 70 FEET.

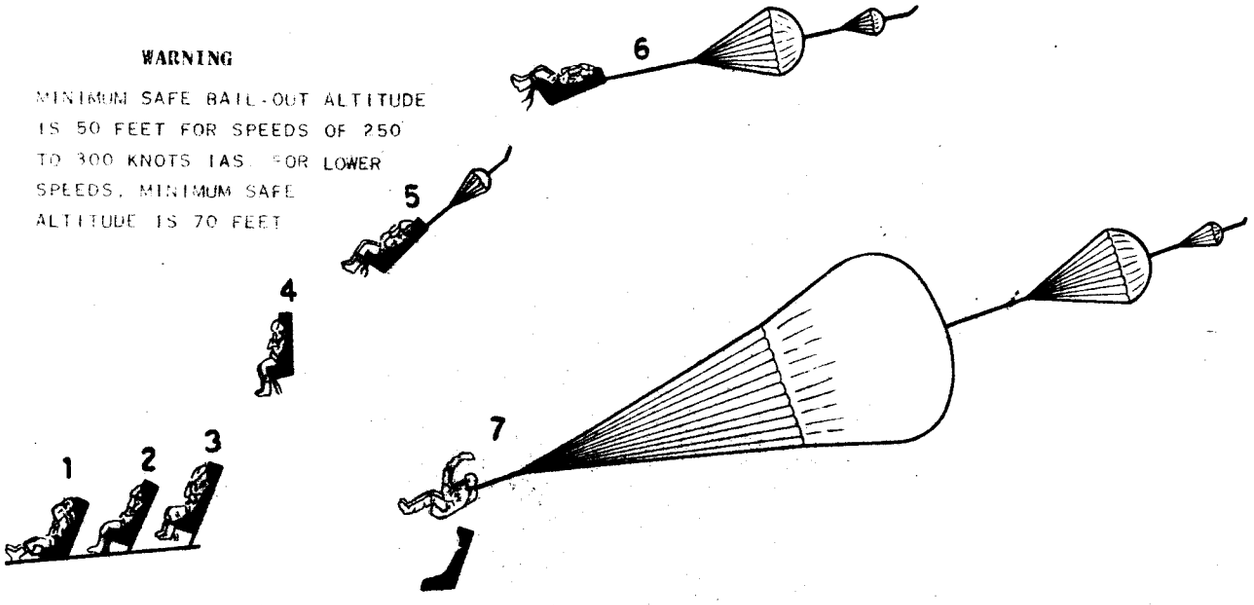


Figure 3-7

CANOPY EJECTION

WARNING

TO JETTISON CANOPY INDEPENDENTLY OF SEAT EJECTION, PULL "**EMERG. CANOPY JETT.**" HANDLE (BELOW INSTRUMENT PANEL, RIGHT).

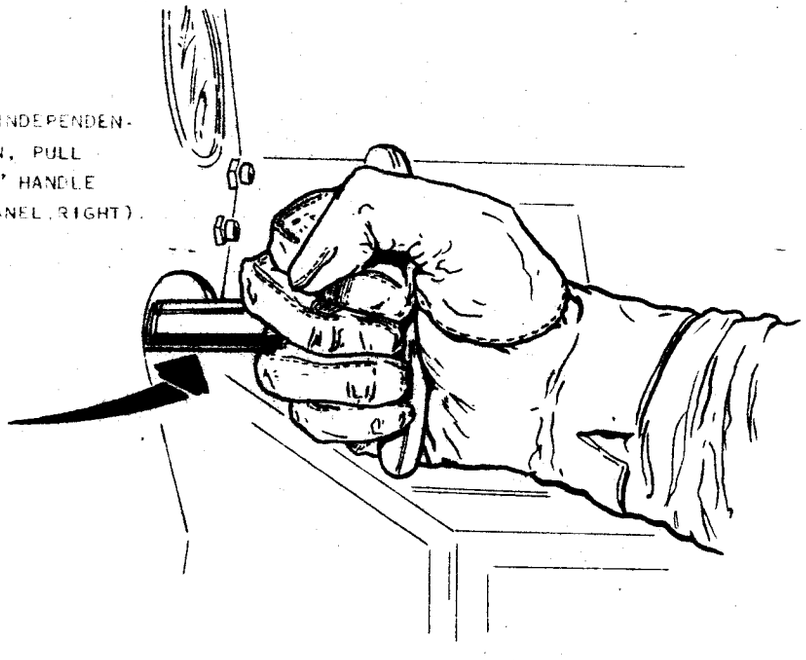
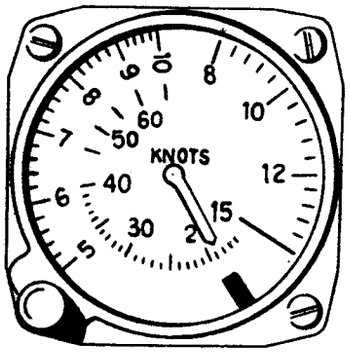


Figure 3-8

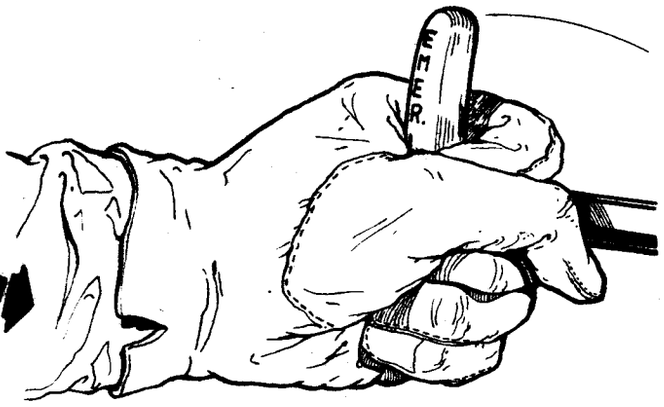
LANDING GEAR EMERGENCY LOWERING

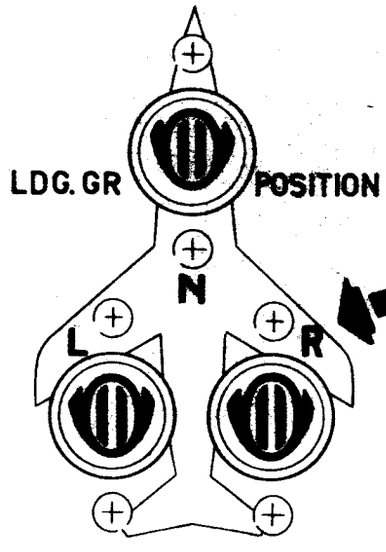
1 REDUCE AIRSPEED TO LESS THAN **185 KNOTS IAS.**



2 **"LANDING GEAR"** HANDLE **"DOWN"**

3 **"EMERG. LDG. GR."** RELEASE HANDLE (LOWER LEFT SIDE OF INSTRUMENT PANEL) FULLY EXTENDED AND HOLD.





4 CHECK GEAR POSITION INDICATOR FOR NOSE GEAR DOWN-AND-LOCKED, AND MAIN GEAR UNLOCKED INDICATION. IF NECESSARY, YAW AIRPLANE TO LOCK MAIN GEAR. THEN RELEASE EMERGENCY RELEASE HANDLE.

S-0009

Figure 3-9

SECTION IV

DESCRIPTION AND OPERATION OF AUXILIARY EQUIPMENT

CONTENTS

G.91-P

COCKPIT AIR CONDITIONING, PRESSURIZATION AND VENTILATION SYSTEM

This system is designed to supply air for pressurization and conditioning of the cockpit. Air is taken from the engine compressor last section.

Part of this air is cooled by the conditioning unit and then mixed with the warm air which flows directly to the mixer. This mixed air is then diverted to the air outlets in the cockpit, behind the instrument panel, (figure 4-1).

An air pressure regulator is provided to control pressurization in the cockpit.

The cockpit air conditioning, pressurization and ventilation system control panel is installed on the left console.

WARNING

The cabin altimeter, located on the right console, permits checking operation of the pressurization system by comparing cabin altimeter reading with altimeter reading.

G.91-P

COCKPIT AIR CONDITIONING AND PRESSURIZATION SYSTEM CONTROLS

"COCKPIT VENTILATION" lever

The "COCKPIT VENTILATION LEVER" is provided to open or close the dump valve.

Pressurization switch

This switch has two positions, "ON" and "OFF". It provides a means for controlling the cockpit pressurization.

"COCKPIT AIR TEMPERATURE" rheostat

This rheostat has a center position; it can be moved left toward "DECREASE" or right toward "INCREASE" to select air cockpit temperature through the automatic control electronic unit.

"AUTOMATIC" switch

This switch has four positions: "AUTOMATIC", "OFF", "INC" and "DEC".

When it is set in the "AUTOMATIC" position, air is supplied at the temperature that was selected through the "COCKPIT AIR TEMP" switch.

In case the temperature electronic regulator fails, cockpit air temperature can still be selected by means of the "AUTOMATIC" switch by moving it to "DEC" to decrease cockpit temperature and to "INC" to increase cockpit temperature.

ANTI-ICING AND DEFROSTING SYSTEM

This system is designed to supply hot air from the engine compressor on either side of the windshield and on the inner side of the canopy glass (figure 4-4).

Hot air is released from anti-icing duct apertures along the outer windshield base in such a way that the inner surface of the windshield is warmed and defrosted or formation of ice is prevented.

For interior defrosting, hot air is released from the defrost duct against the inner side of the windshield and canopy glass.

C.91-P

The anti-icing and defrosting system control panel is on the left console.

"CANOPY DE-ICE DEFROST" CONTROL LEVER

The "CANOPY DE-ICE DEFROST" lever can be rotated counterclockwise from its "OFF" position (figure 4-3).

Moving it to "INCREASE", in the direction indicated by the arrow, will permit to progressively open the inlets to the anti-icing and defrosting ducts and hot air to flow in.

RADIO AND RADAR EQUIPMENT

UHF COMMAND RADIO - AN/ARC-34

The AN/ARC-34 command radio equipment provides two-way radio-telephone communication on 1750 different channels in the radio frequency range of 225.0 through 399.9 megacycles, on frequencies spaced 0.1 megacycles apart. It incorporates provisions for presetting 20 channels on the receiver unit at any one time, and any of the preset channels may be selected as desired. The guard channel receiver (a separate integral component) is capable of covering the frequency

range of 238.0 through 248.0 megacycles. The normal guard channel frequency is 243.0 megacycles. The controls for the unit (fig. 4-5) are: the main control switch, which has four positions, "OFF" (turns set off), "MAIN" (allows transmission and reception on main selected channels only), "BOTH" (allows transmission and reception on main selected channels and reception only on the guard frequency), and "ADF" (which has no function at the present time); the channel selector (a rotary selector switch for selection of the preset channels); the "MANUAL-PRESET-GUARD" selector control ("MANUAL" position for manual selection of a desired frequency from 225.0 to 328.9 and 335.1 to 399.9 megacycles by use of the four frequency selector knobs located at the top of the control panel, "PRESET" position for use with the channel selector and the 20 preset frequencies, and "GUARD" position for monitoring the emergency guard frequency); a volume control for manual adjustment of volume; and a tone button for sending a continuous tone to aid in obtaining a direction-finding bearing. A frequency card at the top of this radio command panel, is used to list the frequencies selected for the 20 preset channels. Power for the AN/ARC-34 is furnished from the primary bus. The control panel is on the left console.

Operation of command radio (AN/ARC-34)

0.91-P

1) Rotate main control switch to "BOTH" position and allow approximately one minute for warm-up of main and guard receiver units.

2) Place "MANUAL-PRESET-GUARD" switch in the "PRESET" position.

3) Place channel selector control to desired channel.

4) Adjust volume control to desired audio level.

5) Manual selection of a frequency not preset is made by moving the "MANUAL-PRESET-GUARD" control to "MANUAL" position. Rotate the four frequency selection knobs for selection of the desired frequency. The main control switch must be in either "MAIN" or "BOTH" position for manual operation.

6) Reception on the guard frequency is made by moving the "MANUAL-PRESET-GUARD" selector to "GUARD". This tunes the receiver and tranamitter to the guard frequency and cuts out the main units.

7) To turn set off, rotate main control switch to "OFF".

RADAR EQUIPMENT (AN/APW-11A AND AN/APA-90)

The radar system is used either to plot the position of the airplane from the ground by means of proper equipment, or to send indications to the airplane from the ground.

Basically, for tracking purposes, the equipment is provided for replying to the signals it receives from a ground transmitter. A pulse is sent from the ground stations which determines, when received from the radar equipment, the emission of two pulses of a coded frequency. The reply challanges are displayed by the ground equipment and the position of the airplane can be plotted on radar indicators.

The pilot receives the indications from the ground on the instrument panel indicator.

The system utilizes two antennas: a transmitting antenna and a receiving antenna.

The control panel (figure 4-7) is mounted on the right console.

The indicator has 20 windows which can be illuminated by 20 lights: 19 lights illuminate the control markings; the 20th light, called "radar contact light", warns the pilot that the ground equipment is to send a message. The window of the radar contact light is that in the center position on the top (figure 4-8).

Operation of radar equipment (AN/APW-11A and AN/APA-90)

G.91-P

1) Check operation of indicator lights by placing the switch, located in the control panel, in the "LIGHT CHECK" position. All the lights should go on.

2) Adjust luminosity by means of the "DIM" knob which is on the indicator.

3) Place the switch in the "ON" position; the system is ready to receive control indications which will be visible on the indicator and checkable by means of a signal in the headset. Once a light has illuminated and the message has been received, preset the equipment for reception of other indications by depressing the button on the bottom left side of the control stick grip or the "ROGER" button on the control panel: all visible and audio signals should disappear.

4) Turn set off by placing switch at "OFF".

To operate the airplane equipment that provides the ground set with a means of tracking the airplane turn the control switch to the "BEACON ONLY" position.

The radar contact light will illuminate at any interrogation from the ground radar set. Besides the visible indication, an audio indication can assure the pilot of the tracking by disconnecting the "jack" pin from the headeset and installing it in the "MONITOR" jack receptable located on the control panel.

IDENTIFICATION RADAR - AN/APX-6

The AN/APX-6 identification radar set is used to automatically

identify the airplane as friendly whenever it is properly challenged by suitably equipped air or surface forces. The set also has provisions for identifying itself as a specific "firendly" within a group of other airplanes, and means for transmitting a special distress code. Functionally, the AN/APX-6 set receives challenges and transmits replies to the source of the challenges where the replies are displayed, together with the associated radar targets, on radar indicators.

When a radar target is accompanied by a proper reply from the "IFF" set, the target is considered friendly. The master switch on the "IFF" radio control panel (figure 4-9), mounted on the right console, receives power from the secondary bus if a.c. power is available.

Operation of identification radar (AN/APX-6)

1) Rotate "MASTER" switch on "IFF" radio control panel to "NORM" position (full sensitivity and maximum performance) or to "STDBY" or "LOW", as required.

2) Set the switch on"IFF" radio control panel to required position. Normally, this will be "OFF".

3) Set the "MODE 3" switch on "IFF" radio control panel to the required position. Normally, this will be "OUT".

G.91-P

4) Set "I/P MIC" switch as required.

5) For emergency operation, press the dial stop and rotate master switch to "EMERGENCY" position. When switch is in this position and power from the a.c. bus is available, the equipment will automatically transmit a distress signal, indicating that the airplane requires immediate assistance.

6) To turn off equipment, rotate "IFF" master switch to "OFF" position.

CAUTION

Before take-off, make sure that AN/APX-6 "IFF" frequency counter has been set to the proper frequency channel. (IFF units are accessible through access door on fuselage underside).

RADIO COMPASS - MARCONI AD 722

The Marconi AD 722 radio compass is a visual and navigational aid used in conjunction with the radio compass indicator on the instrument panel (upper right corner).

The equipment is powered from the primary bus and has a frequency range of 200 through 1700 kilo-cycles covered by three wave bands.

Controls permit selection of automatic or manual direction finding. The control panel is on the right console (figure 4-10).

Master switch

It has two positions, "ON" and "OFF", and it is used to supply or cut out power to the radio compass set.

Control switch

The radio compass control switch has two positions: "ADF" for automatic operation, employing both sense aerial and loop aerial; and "REC" for operation as normal receiver.

Frequency band selector

It is used to select one out of the three frequency bands.

"TUNING" knob

The tuning knob determines rotation of the tuning mechanism inside of the receiver so as to make tuning possible on any frequency of the preset band.

Rotation of tuning knob determines rotation of the dial so as to have a visual indication of the desired frequency.

G.91-P

"GAIN" volume control

Rotating it full clockwise, the maximum audio output is reached; rotating it full counterclockwise, the minimum audio output is reached.

"CW-RT" switch

Normally, this switch is kept in the "RT" position. However, when a station cannot be heard clearly, either because it is weak or too far away, this switch is turned to "CW" to energize an oscillator within the circuit. Then the non-audio is searched with the maximum indication on the tuning indicator.

Dial illumination button

The dial illumination button is indicated by the words "DIM PUSH". Depressing it will illuminate the tuning dial with dim light.

LIGHTING SYSTEM

EXTERIOR LIGHTING

Exterior lighting consists of wing tip lights, taillights, fuselage

lights and taxi light.

All exterior lights receive power from the secondary bus.

The position light control panel is on the right console (figure 4-11.

The taxi light switch is on the left lower side of the instrument panel.

Exterior lighting flasher switch

It has three positions: "FLASH", "OFF", and "STEADY".

From the "OFF" position, the switch can be moved to "STEADY", which will cause all position lights to burn steadily, or it can be moved to "FLASH" effecting a repeated regular-interval flashing.

"POSITION LIGHTS" dimmer switch

This switch regulates the brilliance of the position lights, its two positions are "DIM" and "BRIGHT".

"TAXI LIGHT" switch

C.91-P

This switch is indicated by the marking "TAXI LIGHT" and it has two positions: "ON".

INTERIOR LIGHTING

The interior lighting is accomplished by means of two types of lights: the incandescent lights, powered from the secondary bus, for illumination of consoles, altitude gyro, oxygen, "UHF" and "IFF" control panels; the ultraviolet lights, powered from the primary bus, for illumination of the instrument panel.

The control rheostats for these lights are on the right console.

"CONSOLE LIGHTS" rheostat

This rheostat, marked "CONSOLE LIGHTS", can be rotated, from the "OFF" position, to "DIM" and then to "BRIGHT".

Attitude gyro, O_2, UHF & IFF panels light rheostat

This rheostat, marked "CONSOLE PANEL LIGHTS", can be rotated, from the "OFF" position to "DIM" and then to "BRIGHT".

"INSTR.PANEL LIGHTS" rheostat

To turn on the ultraviolet lights, the "INSTR.PANEL LIGHTS" rheostat is moved from the "OFF" position through "DIM" and to the

"START" position. It is left in this position until the lights go on; then it is turned to "DIM" to get the desired intensity.

OXYGEN SYSTEM

The airplane is equipped with a low-pressure oxygen system with two Type D-2 cylinders. A third emergency cylinder is installed on the right side of the ejection seat and is directly connected to the mask. For greater safety, specially during combat, the cylinder supply the demand-type regulator through independent distribution lines, with check valves (figure 4-13). This regulator automatically supplies a proper mixture of oxygen and air at all altitudes. A pressure gage, a flow indicator, and a light for illumination of the dials and system controls are incorporated in the regulator.

OXYGEN SYSTEM CONTROLS

G.91-P

Regulator "SUPPLY" lever

The regulator "SUPPLY" lever (green) has two positions: "ON" and "OFF".

Regulator diluter lever

It is a black lever with two positions: "100% OXYGEN" and "NORMAL OXYGEN". When the lever is in the "NORMAL OXYGEN" position, the regulator supplies the proper mixture of oxygen and air in relation to the altitude. The lever is placed at "100% OXYGEN" for maximum supply of oxygen.

Regulator emergency toggle lever

It has three position, "EMERGENCY", "NORMAL" and "TEST MASK".

Placing the lever in the "TEST MASK" position, will permit checking operation of the system by checking the free oxygen flox from the corrugated hose that leads to the mask.

OXYGEN SYSTEM NORMAL OPERATION

1) Be sure oxygen pressure gage reads at least 400 p.s.i. If pressure is below this minimum, have the oxygen cylinders charged to capacity.
2) Black lever "NORMAL".
3) Green lever "ON".

OXYGEN SYSTEM EMERGENCY OPERATION

With development of anoxia simptoms due to malfuncion of oxygen regulator, proceed as follows:

1) Oxygen regulator diluter lever (black) "100% OXYGEN".

2) Push oxygen regulator emergency toggle lever to "EMERGENCY".

NAVIGATION EQUIPMENT

STAND-BY COMPASS

Refer to "Instruments" in Section I.

MARCONI RADIO COMPASS

Refer to "Radio Equipment" in Section IV.

G.91-Y

SLAVED GYRO MAGNETIC COMPASS

The slaved gyro magnetic compass is basically a directional gyro that is automatically kept on a true magnetic north heading by a flux valve in the left wing. The flux valve "senses" the south-north flow of the earth's magnetic flux and indicates magnetic heading without northerly turning error, oscillation or swinging.

The magnetic heading is indicated by the needle on a slaved gyro magnetic compass indicator in the cockpit. Electrical power for the slaved gyro magnetic compass is provided only when d.c. power and 400-cycle, three-phase a.c. power is available. Should either the a.c. or d.c. power supply fail, the slaved gyro magnetic compass system is automatically disconnected from all electrical power. The gyro is energised when primary bus power is applied to the airplane, and is on a fast slaving cycle for the first 2 to 3 minutes of operation, during which it should align with the magnetic heading. The gyro then begins a slow slaving cycle. A switch is provided to energize the fast slaving circuit for faster recovery during flight.

NOTE

After the gyro reaches operation speed, the needle should be checked against the stand-by compass indication to make sure it does not show a 180-degree ambiguity. If such ambiguity exists, the slaved gyro magnetic compass is not operating properly.

A knob on the lower left of the slaved gyro magnetic compass indicator permits the compass card to be rotated to a preselected heading. Indicator readings will be incorrect if the airplane exceeds 85 degrees of climb or dive or if it banks left or right more than 85 degrees.

"COMPASS FAST SLAVE" switch

A fast slaving cycle of the slaved gyro magnetic compass can be selected by means of a push-button switch located on the instrument panel. Actuation of the switch interrupts d.c. power to the slaved gyro. This power interruption automatically de-energizes the slow slaving cycle and engages the fast slaving cycles, as during an initial start, permitting faster gyro recovery for the true heading.

CAUTION

Allow a minimum of 10 minutes between depressions of the fast slaving switch. Excessive use can damage the slaving torque motor.

ARMAMENT SYSTEM

A gun bay for installation of the quick-remove gun panels is located on each side of the fuselage, outboard of the cockpit.

Each panel carries two guns and two removable ammunition cans (one for each gun).

The guns are combination blow-back, gas-operated guns, designed to fire 0.5 (12,7 mm) ammunition at the rate of 1200 rounds per minute.

Each ammunition can has a capacity of 300 rounds of ammunition.

After the ammunition has been fired, the extracted rounds and links are routed to an expended ammunition compartment below the armament bay and are then recovered through three quick-closing doors.

The guns are charged externally before flight. A gun heater, controlled by the gun "HEATER" switch on the armament panel on the left console, is installed on each gun.

Plugs are installed in the forward end of each blast tube to protect the guns from dirt and moisture. These plugs must be removed before any armed mission.

Generally, the ammunition cans are not replaced on the gun panel but the entire gun panel is replaced. Likewise, harmonization on the guns on the gun panel is effected with the gun panel removed from the airplane.

A gun camera is installed in the nose of the airplane, to record the results of gun firing.

Guns are electrically fired by actuation of a trigger mounted on the control stick grip (figure 1-19).

Two pylons are installed under the wing panels. Each pylon carries a hook for suspension of the bombs. Bomb release is electrically controlled by the rear button on the control stick grip.

GUN CAMERA

A N-9 camera is located in the nose of the airplane. Operation of the gun camera is electrically controlled through the trigger on the control stick grip. When the trigger is actuated to the first detent, the camera begins to operate; actuating it to the second detent will operate both camera and guns.

Operation of the camera is cut out by placing the "CAMERA" switch, located on the armament panel on the left console (figure 4-14), in the "OFF" position. If the switch is not in this position, it means that the camera is engaged and the lens is adjusted.

G.91-P

"CAMERA" switch

The "CAMERA" switch has four positions: one is to cut out the gun camera and the others are to adjust the lens aperture relation to the light conditions. From left to right, these positions are: "OFF", "DULL", "HAZY" and "BRIGHT".

ARMAMENT CONTROLS

Bomb selector switch

The bomb selector switch has three positions: "ALL", "OFF" and "SINGLE". When the switch is in the "ALL" position and the bomb release button on the control stick grip is depressed, both bombs are dropped simultaneously.

When the switch is turned to "SINGLE" and the bomb release button is depressed, the left bomb will be dropped first; the right bomb will be dropped when the release button is depressed a second time. When the switch is in the "OFF" position, the bomb will not dropped even though the release button is depressed.

This switch is located in the "BOMBS" panel of the armament panel on the left console (figure 4-14).

Bomb armament switch

The bomb armament switch is installed in the "BOMBS" panel and it has three positions: "ARM NOSE & TAIL", "SAFE" and "TAIL ONLY". When the switch is placed in the "ARM NOSE & TAIL" position, the nose and tail fuses are energized by means of two cables which are held by their relative solenoids when the bomb release button is depressed. When the switch is at "TAIL ONLY" the tail fuse only is energized, while the nose fuse cable remains attached to the nose fuse, which, thus, remains safetied. When the switch is in the "SAFE" position, the bombs can be dropped, but they fall deenergized with the armament cables installed in their respective fuses, which remain safetied.

Bomb release button

The spring-loaded bomb release button is located at the top of the control stick grip left of the airplane normal trim switch (figure 1-19). When this button is depressed, the bomb electrical circuit is energized. This permits releasing the bombs relatively to the position of the bomb selector switch.

Emergency release switch

G.91-P

An emergency release switch, marked "BOMBS & ROCKETS SALVO", is provided for emergency operation in the left, rear portion of the armament panel. Moving this switch forward, after the cover is lifted, permits jettisoning of the bombs or rockets simultaneously (independently of selector switch position and release button depression).

Fuselage gun selector switch

The fuselage gun selector switch, marked "FUSELAGE", is located in the armament panel. It has three positions: "TWO", "OFF" and "ALL". When this switch is in the "TWO" position, the two upper fuselage guns are fired by pressing the trigger on the control stick grip, provided the airplane is off ground. In fact, when the airplane wheight is on the landing gear, a microswitch mounted on the left main gear strut interrupts the electrical circuit. Setting this switch at "ALL", all four guns are fired, provided the airplane is flying. Turning the switch to "OFF" cuts out the electrical power.

Wing gun selector switch

This switch is marked "WINGS" and is installed in the armament panel. At present this switch is not utilised.

Gun heater switch

The gun "HEATER" switch has two positions: "ON" and "OFF". This switch is used to turn on or off gun heating.

Ground-fire switch

The two position (FIRE and SAFE) "GROUND-FIRE" switch is located in the armament panel. Normally, this switch is kept in the "SAFE" position. It is turned to "FIRE" to test-fire the guns while the airplane is on the ground. The switch serves to reenergize the circuit which was interrupted by the microswitch mounted on the left main gear strut.

Trigger

The gun trigger is mounted on the front side of the control stick grip. The trigger has two subsequent positions and a rest position. Actuation of the trigger to the first detent energizes the gun camera only. Actuation of the trigger to the second detent energizes also the guns. Operation of the gun will depend, of course, on the position of their relative switches.

Rocket jettison presetting switch

This switch has two positions: "JETTISON READY" and "OFF". Placing the switch to "JETTISON READY" position will energize the entire rocket jettisoning electrical circuit. When the switch is at "OFF", the circuit is open and de-energized. At present, this switch is not utilized.

0.91-P

Rocket selector switch

The rocket selector switch has two positions; "SINGLE" and "AUTO". With the switch in the "SINGLE" position, pressing the control stick grip button (figure 1-19) will jettison one rocket and automatically preset the circuit for jettisoning of the other rocket, which will leave as the button is depressed again. Turning this switch to "AUTO" and holding the button in the depressed position, the rockets will be automatically jettisoned one after the other with a 1/10 second interval approximately. At present, this switch is not utilized.

Rocket counter-indicators

Two-counter-indicators, marked "RIGHT WING" and "LEFT WING", are provided to indicate the number of the jettisoned rockets for each wing group.

Indicator reset switch

The "SELECTOR RESET" switch is provided to reset the counter-indicator. At present, this switch is not utilized.

External stores mechanical release handle

The "EMERG. EXT. STORES REL." handle is installed above the instrument panel. It is used for emergency operation to manually release any external load hooked on the bomb pylons: bombs, rocket holder, containers, etc. This i independent of the position of the armament panel switches.

GUN SIGHT

An adjustable, reflection-type, SFOM 83 A gun sight is provided to the pilot for use during the different types of attack.

GUN SIGHT CONTROLS

Up and down adjustment handle

It is a calibrated handle with a reference index. It serves to raise or lower the gun sight mirror.

Recticle illumination rheostat

3.91-P This rheostat serves to regulate the light intensity of the recticle on the gun sight. It is marked "GUN SIGHT LIGHT" and it can be positioned at "DIM" or "BRIGHT".

ANTI-G SUIT SYSTEM

An air pressure outlet connection on the left console provides a means for attachment of the air pressure intake tube (from the regulator valve located on the left console) of the pilot's anti-G suit (figure 3-13).

The regulator valve can be set on two positions: "HI" and "LO". Acceleration above 1.75 G causes the valve to open, inflating the anti-G suit. For each additional one G acceleration force, a corresponding one p.s.i. ("LO" setting) or 1.5 p.s.i. ("HI" setting) air pressure is exerted in the anti-G suit.

With engine running, a button on top of the valve can be manually depressed to test operation of anti-G suit system.

COCKPIT AIR CONDITIONING, VENTILATION AND PRESSURIZATION SYSTEM

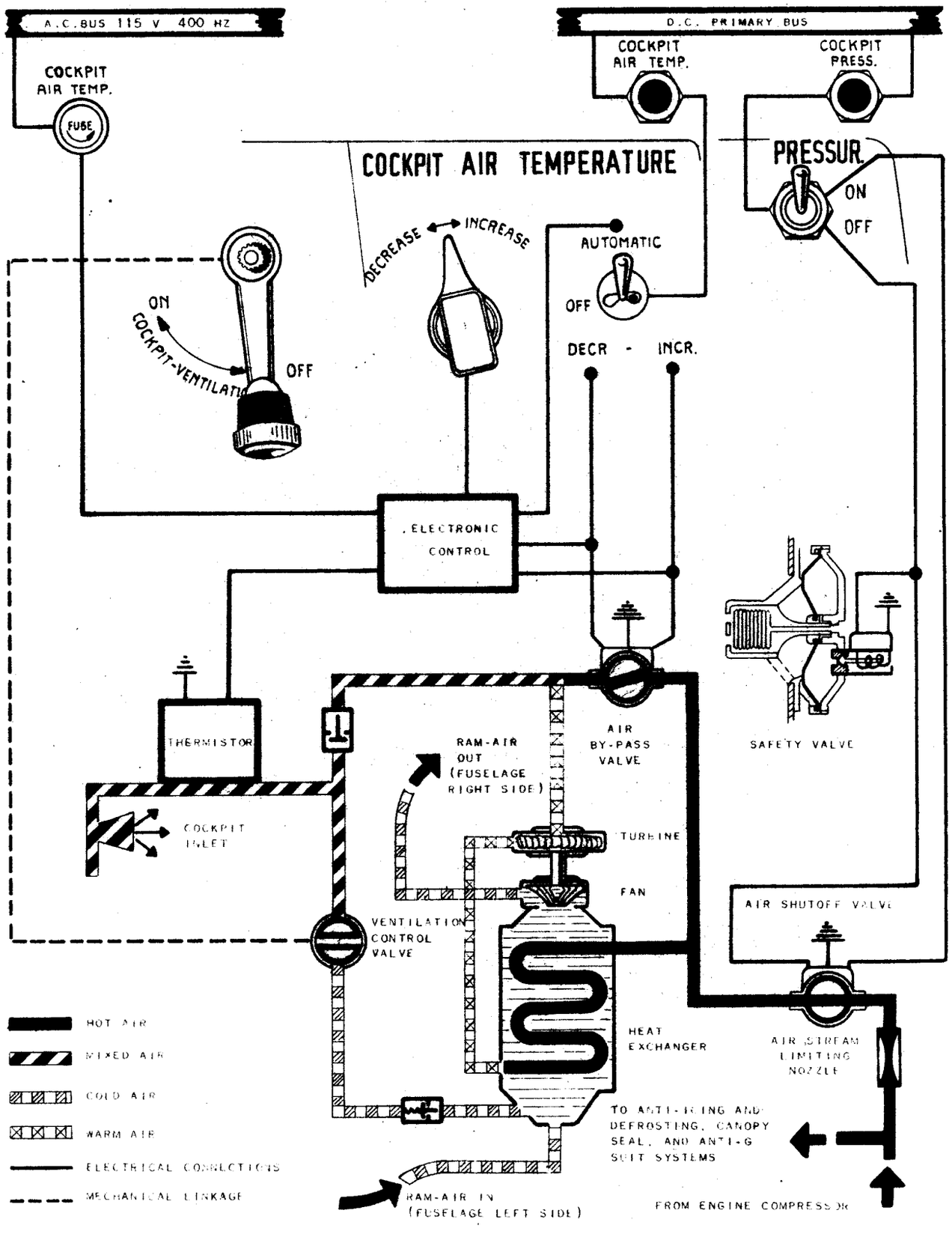


Figure 4-1

S - 0010

COCKPIT PRESSURE SCHEDULE

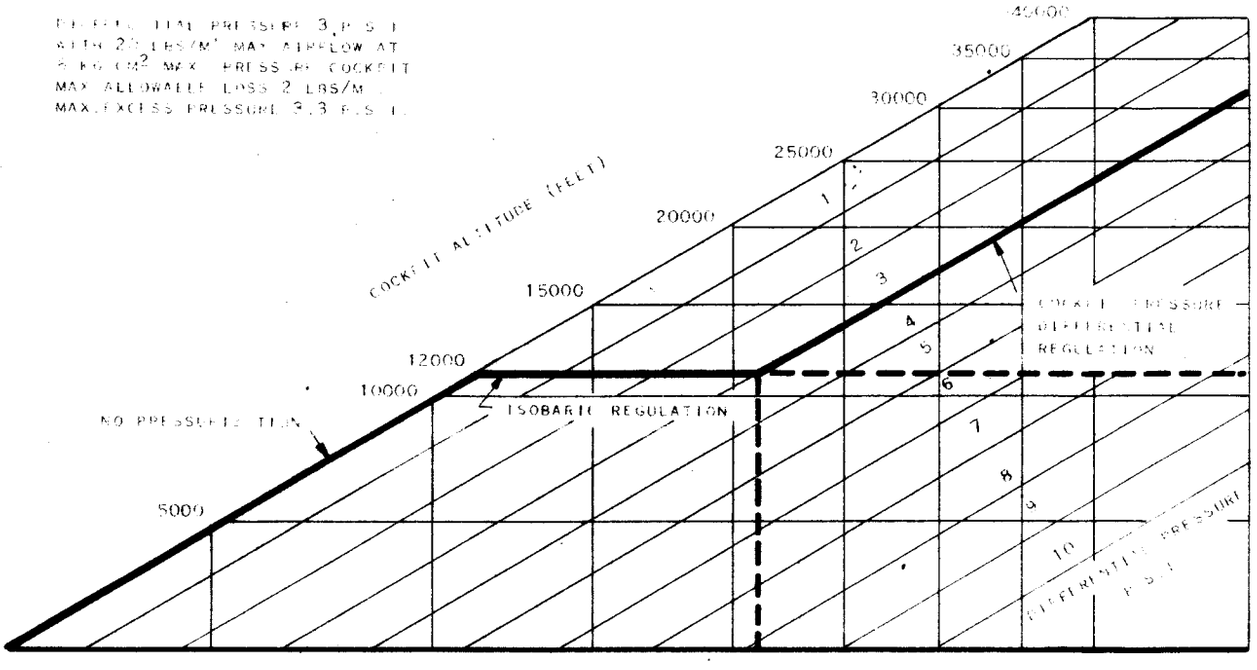


Figure 4-2

M - 0001

AIR CONDITIONING, VENTILATION AND PRESSURIZATION CONTROL PANEL

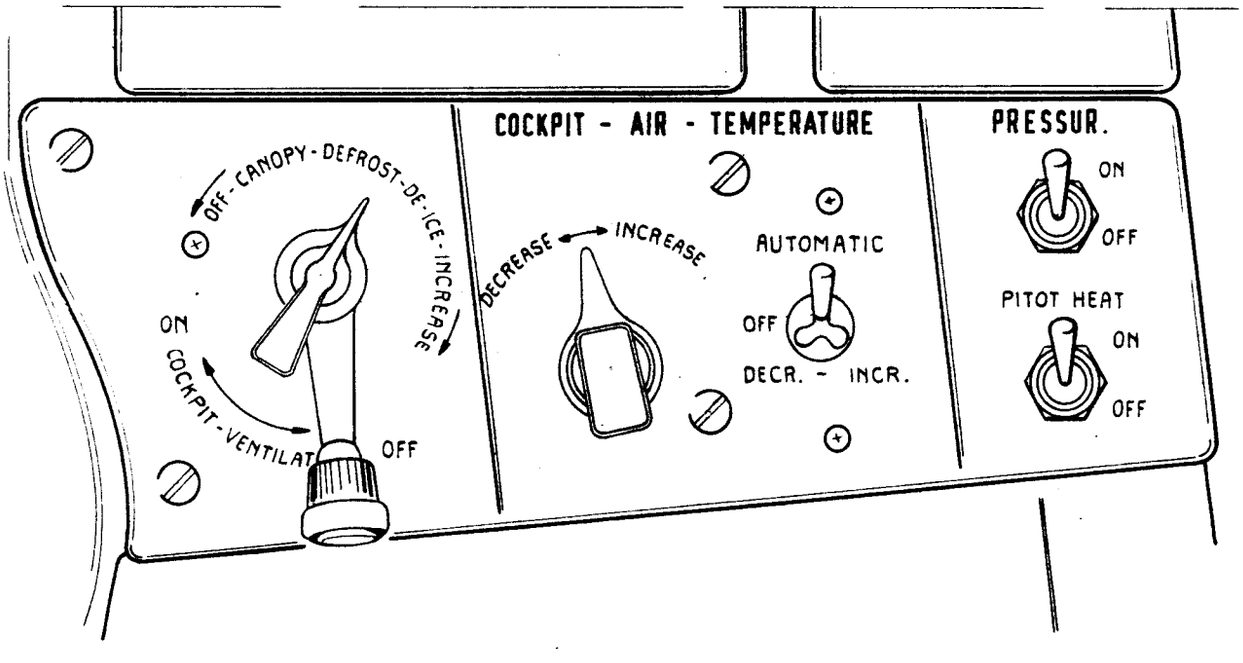


Figure 4-3

M-0002

ANTI-ICING & DEFROSTING SYSTEM

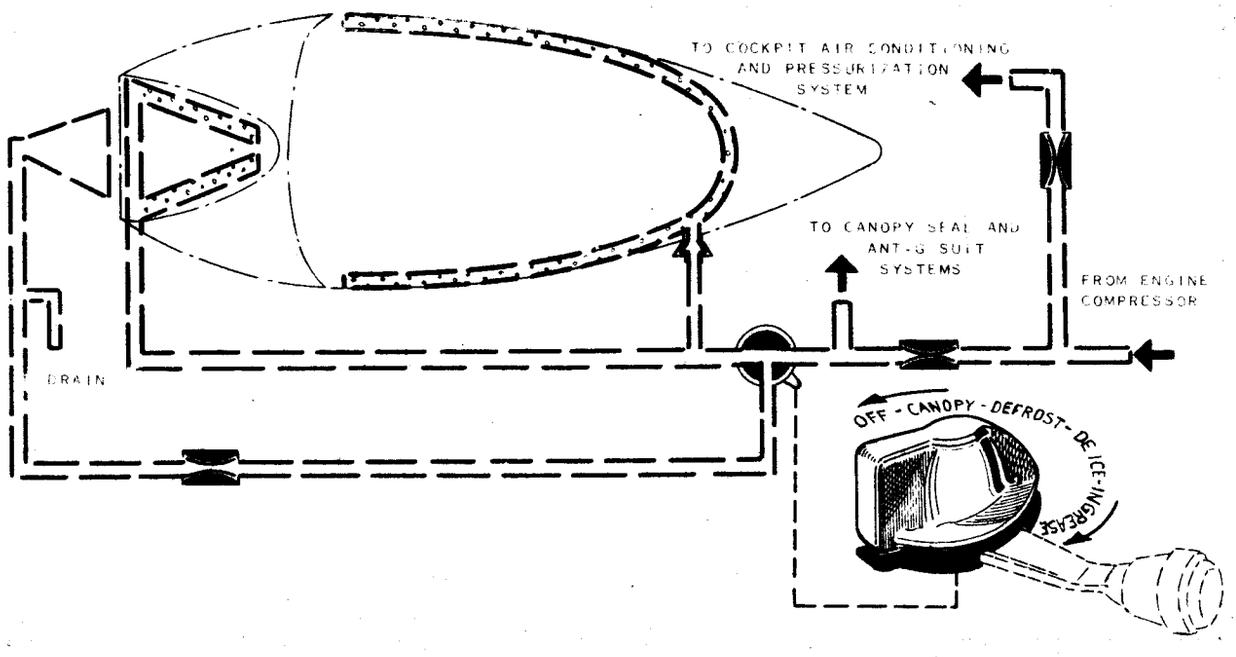


Figure 4-4

AN/ARC-34 RADIO CONTROL PANEL

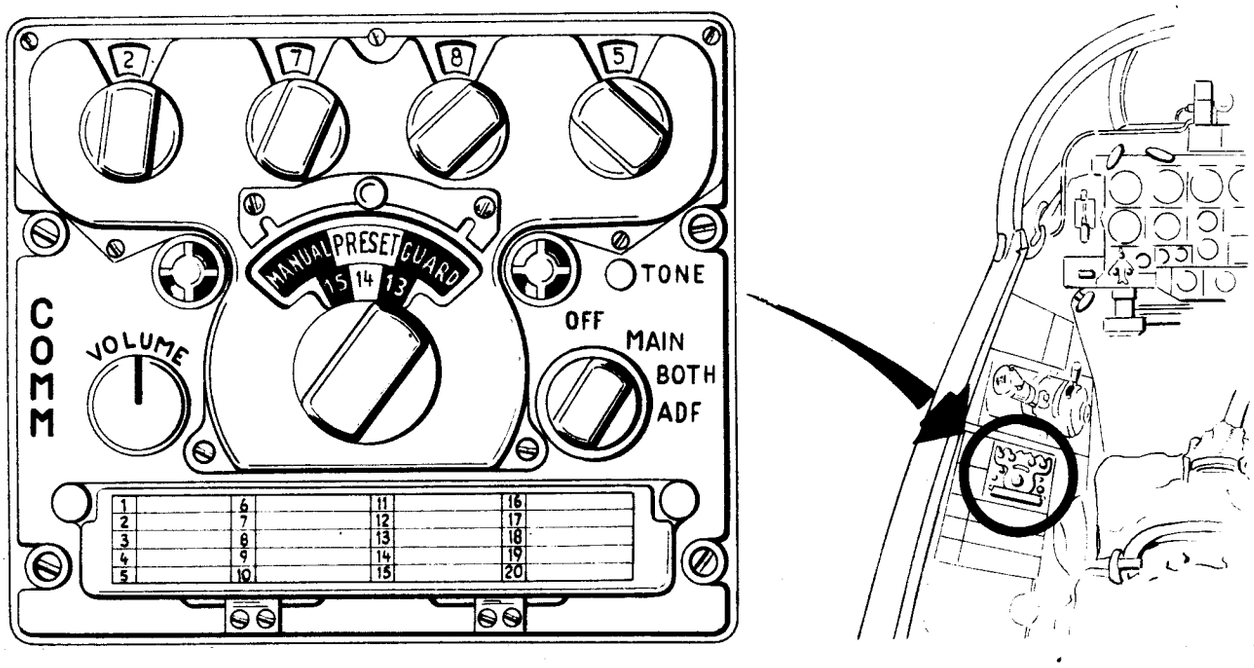


Figure 4-5

RADIO AND RADAR ANTENNA
LOCATION DIAGRAM

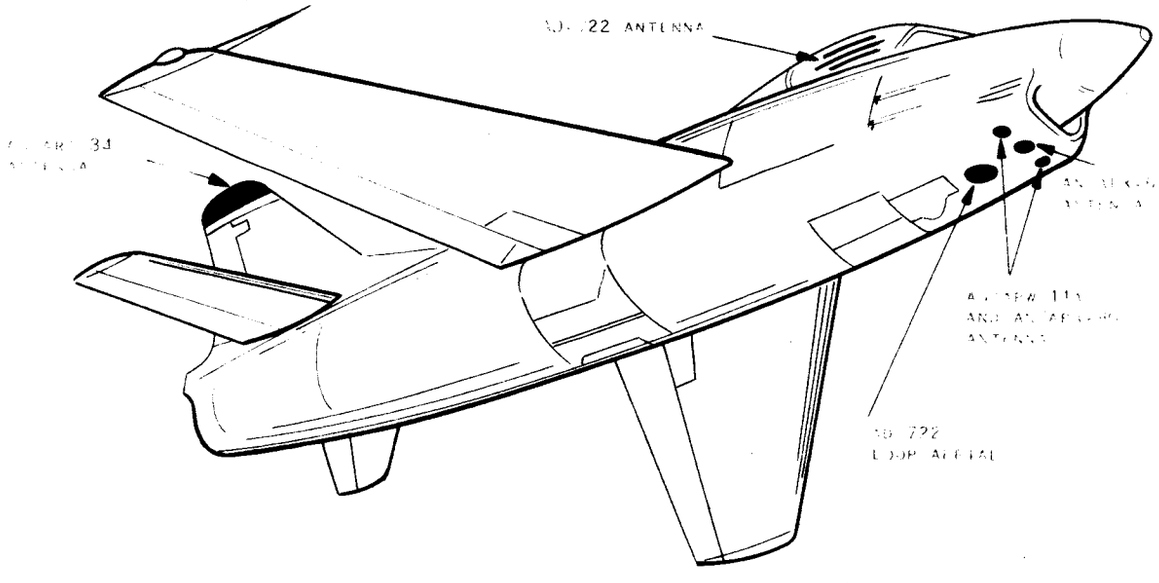


Figure 4-6

O-0002

AN/APW-11A & AN/APA-90 CONTROL PANEL

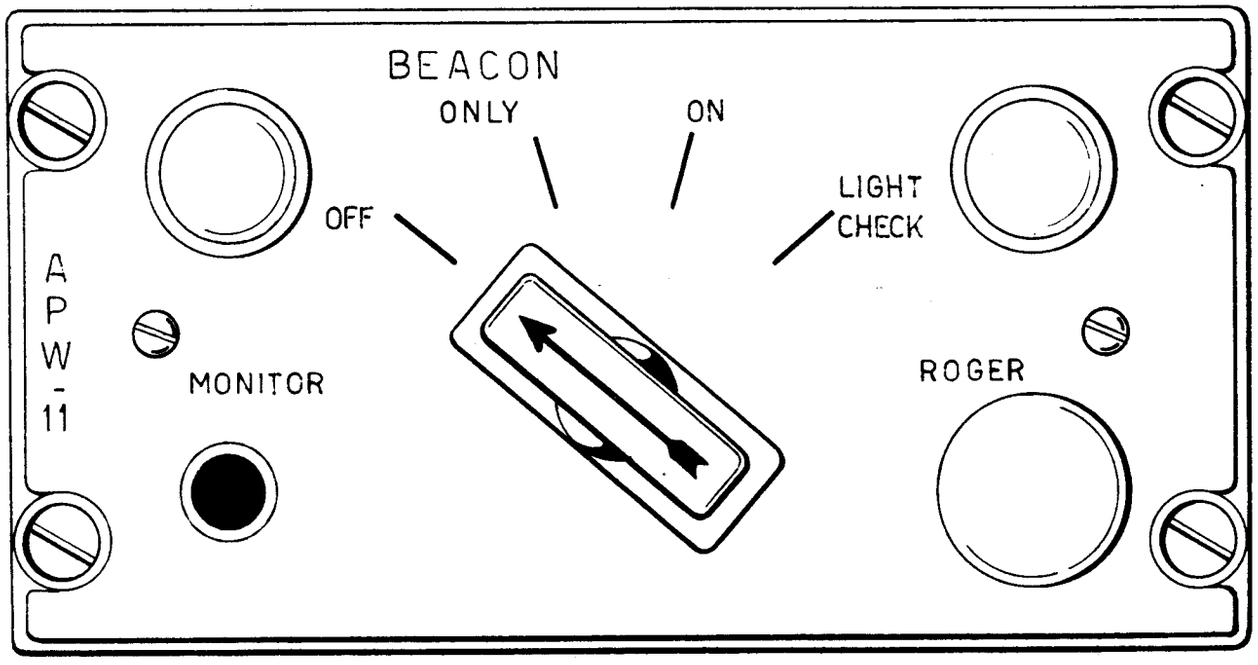


Figure 4-7

P-0001

AN/APW-11A & AN/APA-90 RADAR INDICATOR

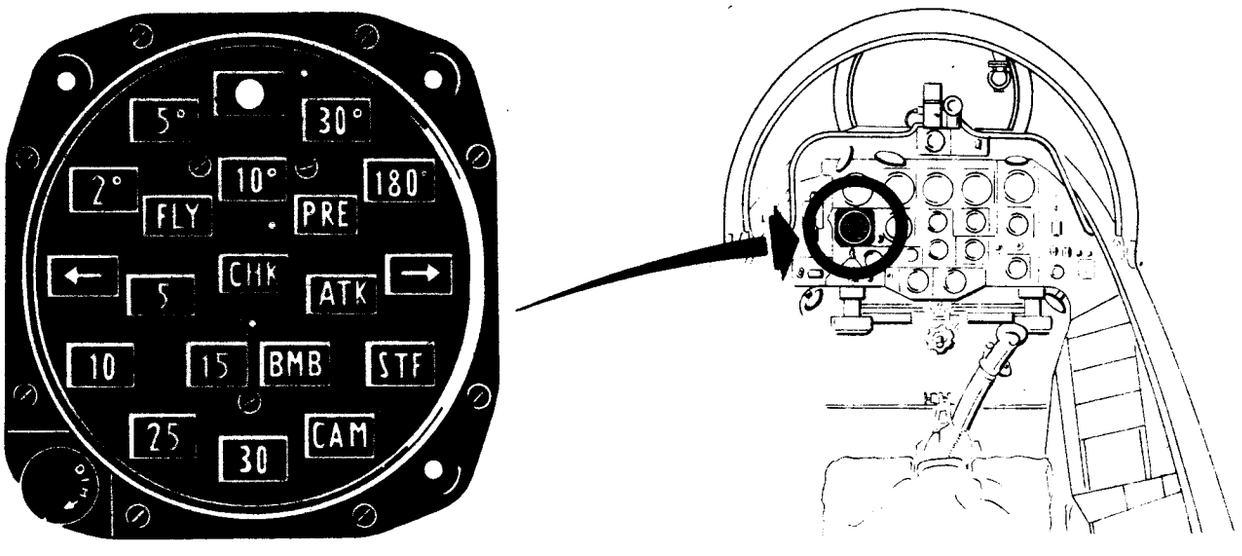


Figure 4-8

0-0003

AN/APX-6 RADAR CONTROL PANEL

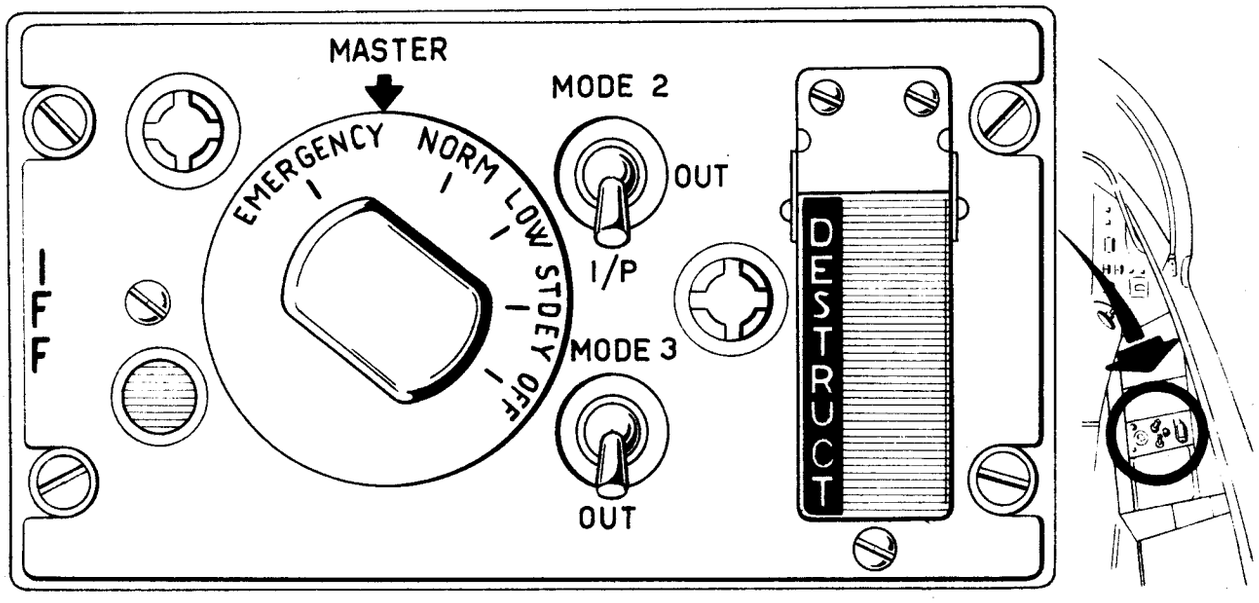


Figure 4-9

0-0004

AD-722 RADIO COMPASS CONTROL PANEL

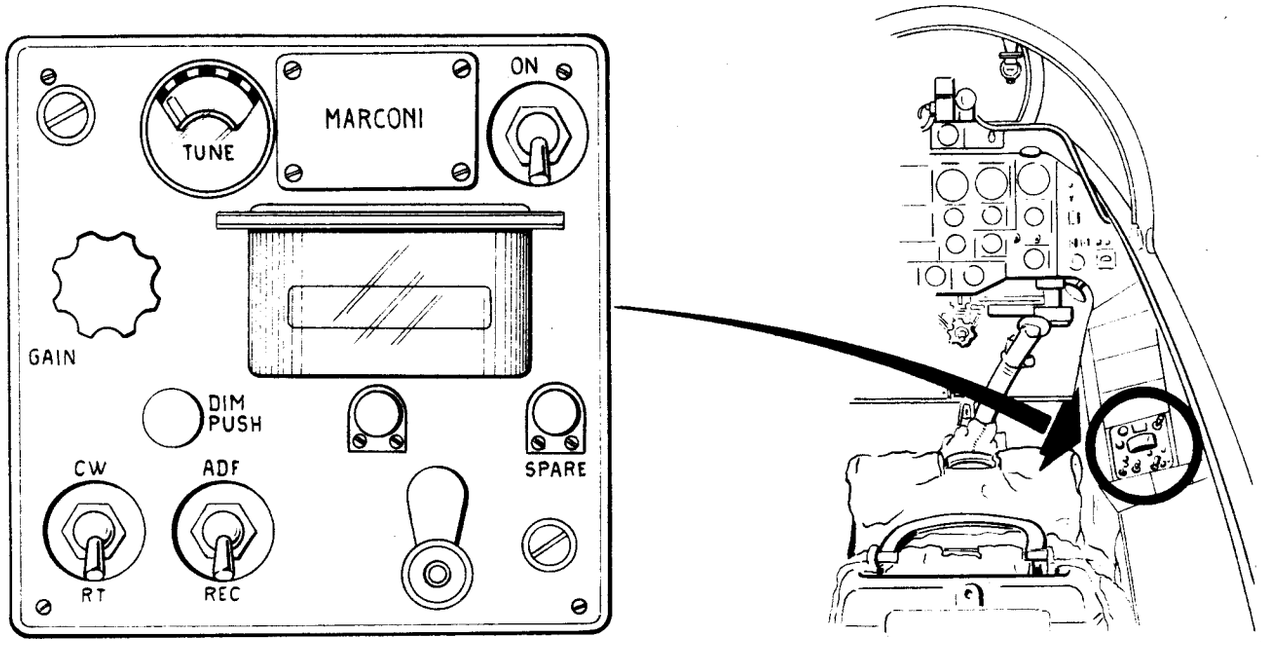


Figure 4-10

N-0003

LIGHTING CONTROL PANEL

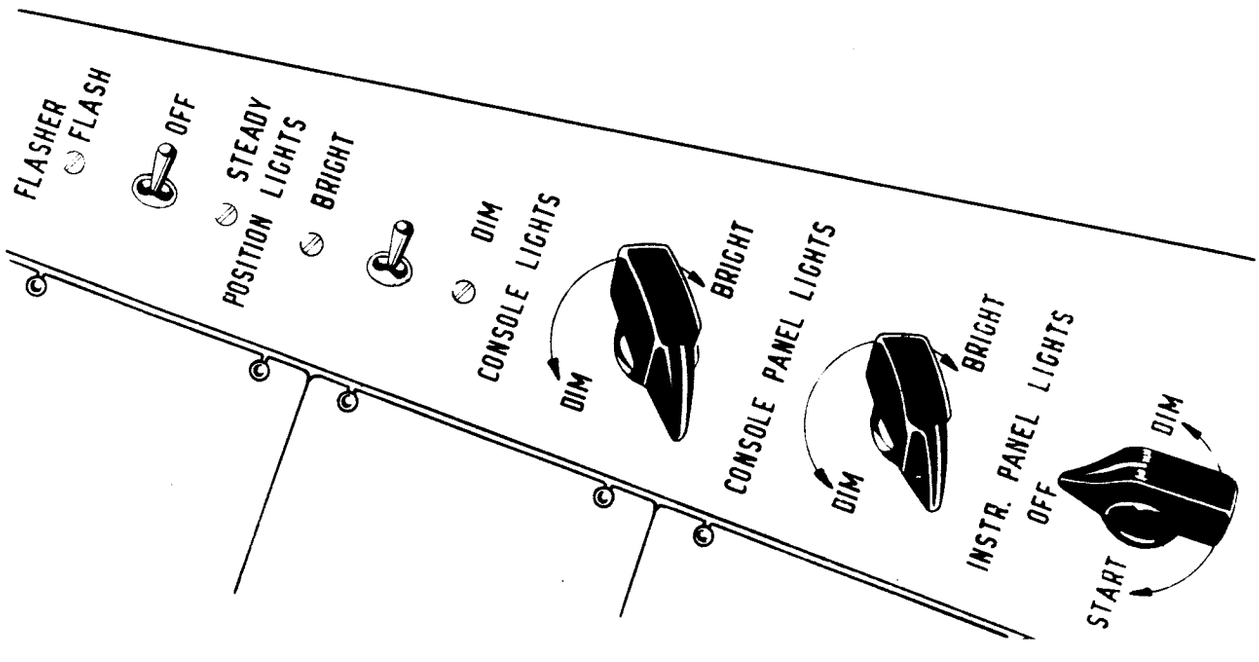


Figure 4-11

OXYGEN SYSTEM

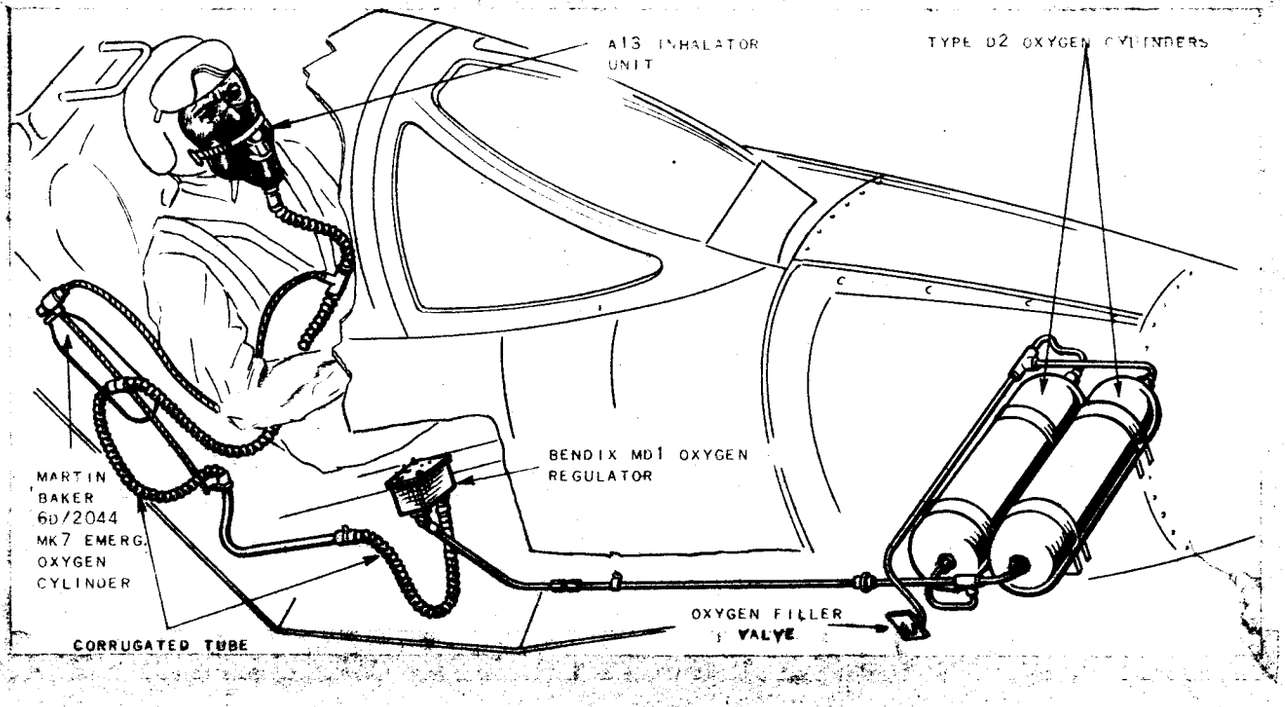


Figure 4-12

OXYGEN REGULATOR

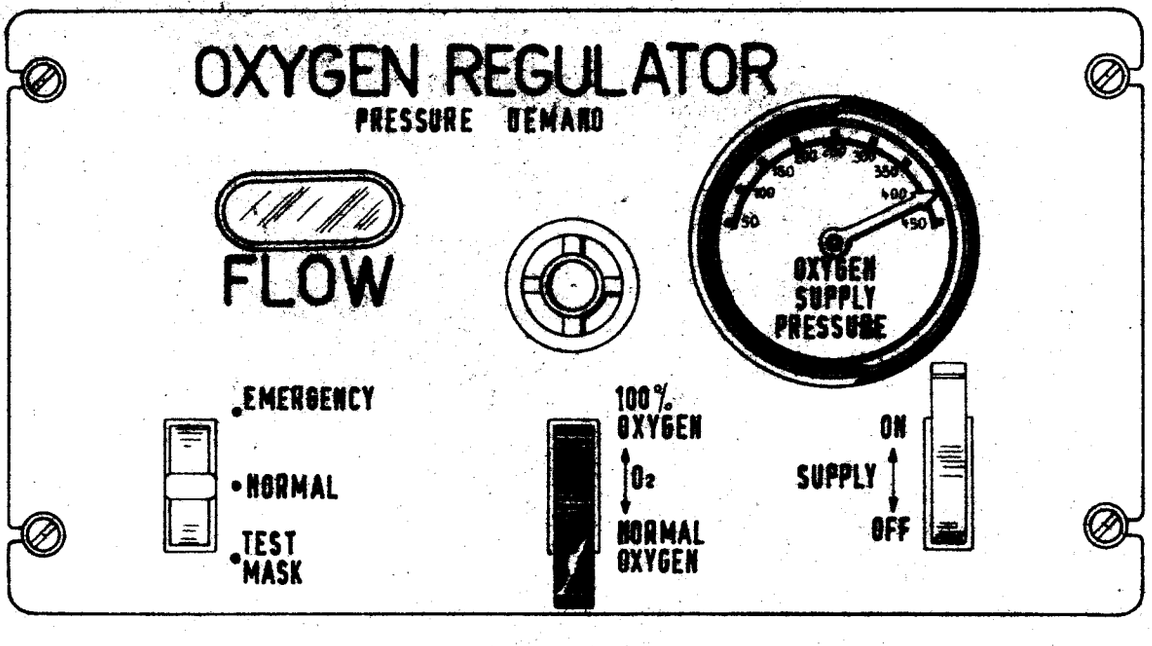
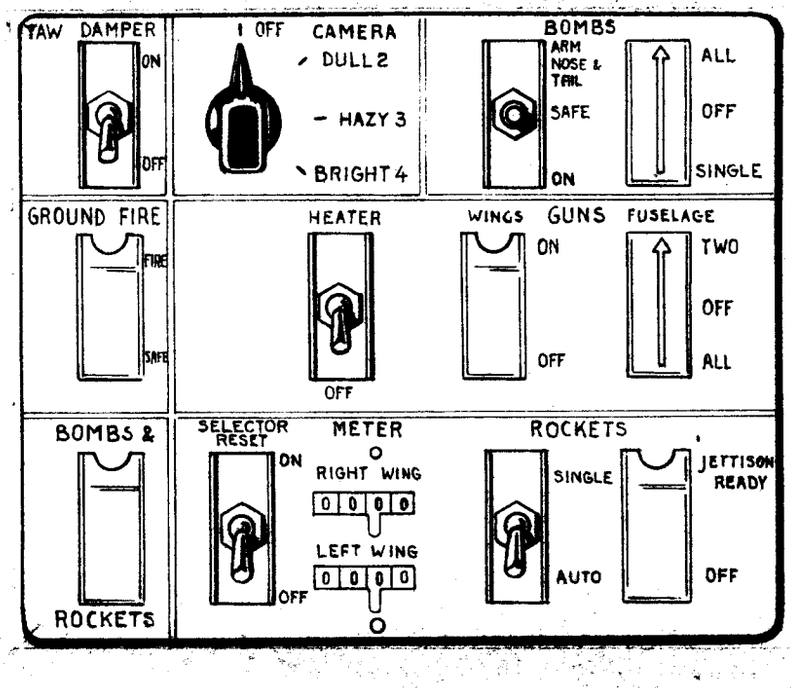


Figure 4-13

R-0006

ARMAMENT CONTROL PANEL



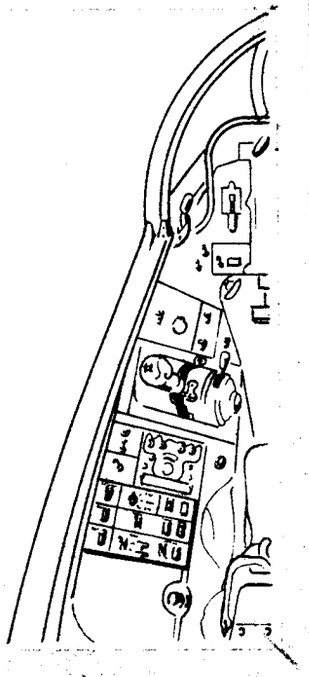


Figure 4-14

M-0005

ANTI-G SUIT SYSTEM

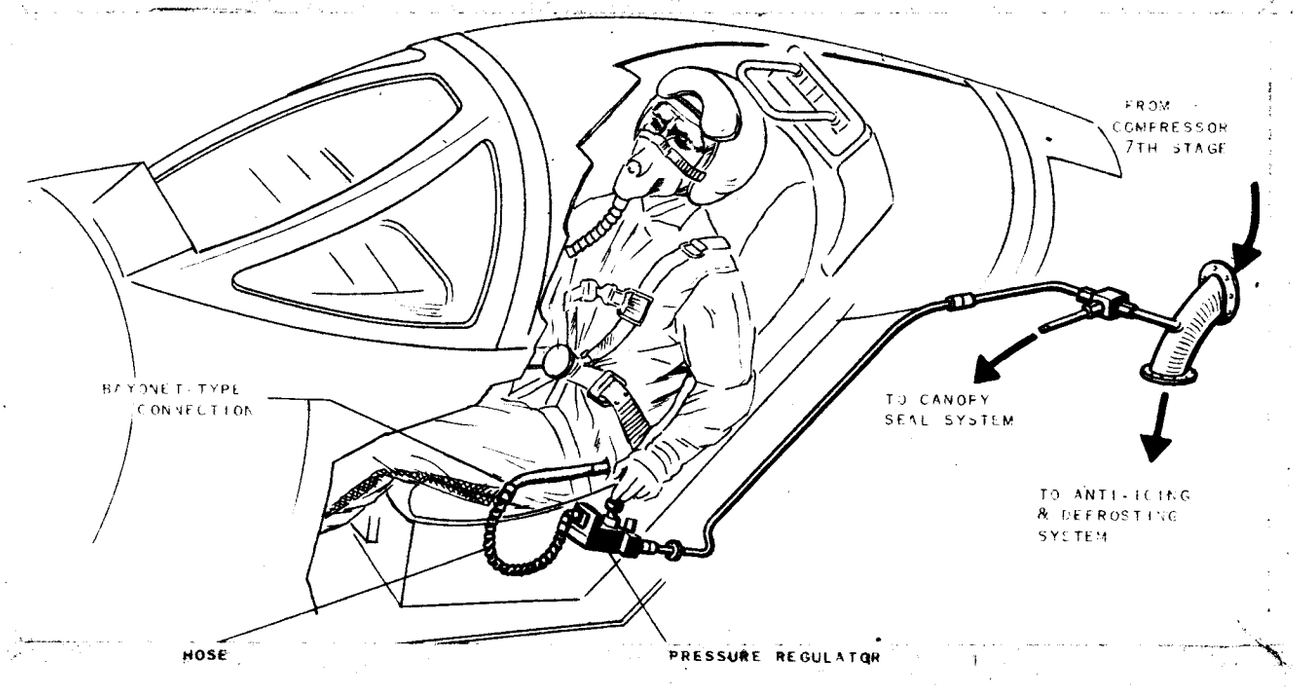


Figure 4-15

S E C T I O N V

O P E R A T I N G L I M I T A T I O N S

CONTENTS

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GENERAL

Information and data furnished in this section were obtained from the first flying tests of this airplane and are therefore, to be considered as temporary.

ENGINE LIMITATIONS

EXHAUST TEMPERATURE

The maximum allowable exhaust temperature during starting is 715°C.

The limiting exhaust temperature values during the different engine operating conditions are shown in figure 5-1.

WARNING

When climbing at maximum engine r.p.m., the throttle should be retarded to keep the exhaust gas temperature within the required limits.

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OIL TEMPERATURE

The minimum outside air temperature required to accomplish a start without preheating is -10°C.

Minimum oil temperature required for throttle advancement is 0°C. Limiting oil temperature during engine operation is 100°C.

OIL PRESSURE

The minimum oil pressure is 30 $\pm$ 2 p.s.i. If the oil pressure drops below this value, the "OIL LOW PRESS" warning light will illuminate.

THROTTLE VARIATION

The fuel-air ratio control, mounted on the engine, controls the fuel pump pressure and thus the fuel flow to the burners, during accelerations, only up to an altitude of 10,000 feet. Therefore, at altitudes higher than 10,000 feet, the throttle may be retarded to minimum very rapidly. However, the throttle should not be advanced too rapidly from the START & FLIGHT IDLE position, to prevent compressor stalls and over-temperature conditions.

ENGINE R.P.M.

When climbing at maximum r.p.m. from sea level, the engine maximum r.p.m. will increase approximately 200 r.p.m. at 40,000 feet due to governor creep. Therefore, during initial climb (and before the maximum temperature limit is reached), it may prove necessary to retard throttle in order to keep engine r.p.m. within maximum allowable limits.

For engine maximum operating time at different engine speeds, refer to figure 5-1.

AIRSPEED LIMITATIONS

LANDING GEAR LOWERING SPEED

Limit airspeed for landing gear lowering is 185 knots IAS.

If the landing gear is lowered at speeds above this value, the air loads may damage the fairing, doors, or operating mechanism.

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WING FLAP LOWERING SPEED

The limiting airspeed for lowering of the wing flaps is 185 knots IAS.

If the wing flaps are lowered above this limiting airspeed, the flaps or operating mechanisms may be damaged.

CANOPY OPENING SPEED

The canopy is not to be opensd in flight.

On the ground, while taxiing, the canopy may be operated at airspeeds not exceeding 50 knots IAS.

If canopy is operated at airspeeds above this value, damage to canopy and canopy operating mechanism will result.

DRAG CHUTE OPERATING SPEED

The limiting airspeed for drag chute deployment is 150 Knots IAS.

The drag chute is automatically released from the airplane if deployed at speeds above this value.

PROHIBITED MANEUVERS

INVERTED FLIGHT

Extended inverted flight is prohibited. Inverted flight is limited to 12 seconds duration.

INTENTIONAL SPINS

International spins are prohibited.

TABLE OF OPERATING LIMITATIONS

ENGINE

OPERATING CONDITIONS	R P M	J P T °C	TIME LIMIT	RATED THRUST lbs
TAKE-OFF AND OPERATIONAL NECESSITY	9900	710°	10 MINS	4850
INTERMEDIATE	9700	670°	15 MINS	4500
MAX CONTINUOUS	9450	625°	UNRESTRICTED	4130
IDLE	3500	630°	UNRESTRICTED	--

LUBRICATING OIL

ENGINE OPERATING CONDITIONS	MIN. TEMPERATURE (°C)	MAX. TEMPERATURE (°C)	PRESSURE (P.S.I.)	
			NORMAL	MINIMUM
STARTING	-10	--	--	--
ACCELERATION FROM IDLE RPM	0°	--	--	--
ENGINE OPERATING	--	100°	40-50	30±2

THROTTLE VARIATION

HEIGHT (IN FT)	MINIMUM ADVANCEMENT TIME	MAXIMUM RETRACTION TIME
0 - 10,000	1 SEC.	1 SEC.
ABOVE 10,000	5 SEC.	1 SEC.

MAXIMUM AIRSPEEDS

LANDING GEAR LOWERING SPEED	185 KNOTS IAS
WING FLAP LOWERING SPEED	185 KNOTS IAS
CANOPY OPENING SPEED	50 KNOTS IAS
DRAG CHUTE DEPLOYMENT SPEED	150 KNOTS IAS

Figure 5-1

SECTION VI

FLIGHT CHARACTERISTICS

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SPEED

- Limiting straight level-flight speed at low altitude (no external load) . . . . . 520 knots
- Corresponding Mach number 0,90

TIME TO CLIMB

- To 15,000 feet . . . . . 2 min.10sec.
- To 30,000 feet . . . . . 6 min.

TAKE-OFF DISTANCE

Take-off distance required to clear a 15.24 m. obstacle with airplane loaded . . . . . 915 m.

LANDING DISTANCE

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Landing distance to clear a 15.24 m. obstacle, for landing with drag chute deployed and using the wheel brakes . . . . . 670 m.

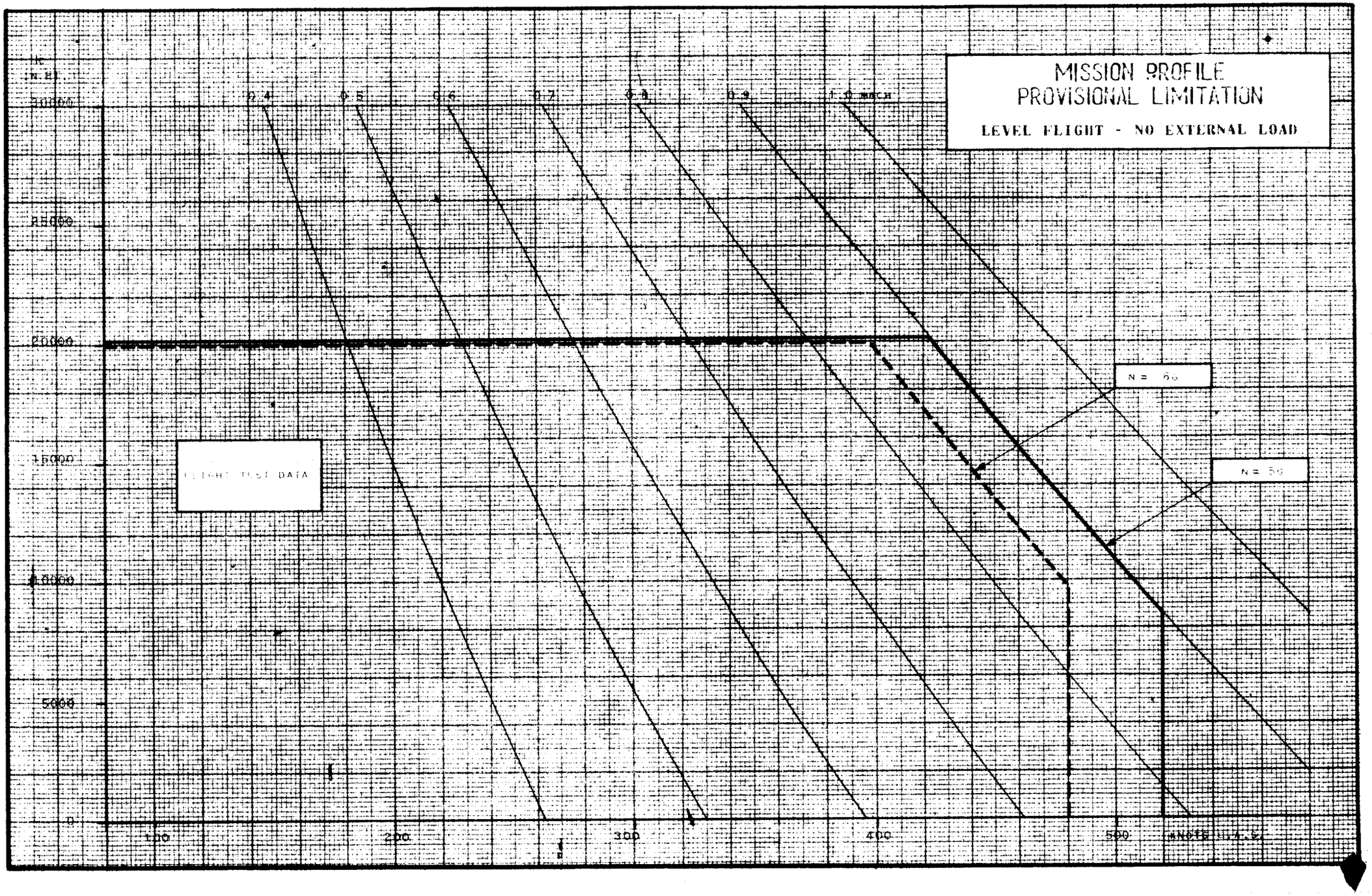
OPERATING COMBAT RADIUS

Combat radius for a low-altitude mission calling for leaving 250 pounds of fuel remaining at landing . . . . . 278 Km.

RANGE

Maximum obtainable range including take-off, climb to cruise altitude, descent and landing circuit, with no fuel remaining in normal fuel tanks at landing:

- Cruise altitude	30,000	40,000 feet
- Cruise speed	.75	0.75 Mach
- Maximum range	1,300	1,500 Km
- Duration of range	105	125 min.


MISSION PROFILE
PROVISIONAL LIMITATION
LEVEL FLIGHT - NO EXTERNAL LOAD
ft
(N.B.)
30000
25000
20000
15000
10000
5000
0
0.4
0.5
0.6
0.7
0.8
0.9
1.0 MACH
N = 6g
N = 5g
FLIGHT TEST DATA
100
200
300
400
500
KNOTS (I.A.S.)

S E C T I O N VII

S Y S T E M S O P E R A T I O N

CONTENTS

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ENGINE CONTROL

The jet engine of this airplane is controlled from a single throttle. The throttle controls, through a control valve, the fuel flows to the burners.

Engine speed is set by throttle movement to desired position. A barometric pressure control (B.P.C.) maintains the engine speed constant at a given throttle position as the altitude and speed change.

A fuel-air ratio control is incorporated in the fuel system. The fuel-air ratio control is operative only during acceleration periods; it prevents compressor stalls or flame-outs which would result if excessive fuel is injected at low airflow during acceleration.

Therefore this unit controls the rate of acceleration of the engine only.

START CHARACTERISTICS

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The engine starting procedure is extremely simple and the cartidge starting system permits a very rapid engine starting cycle.

The engine should become ignited in 4 to 6 seconds.

CAUTION

If the first cartridge fires normally but the engine does not start, investigate cause before selecting second cartridge.

The maximum allowable exhaust temperature during starting is 715°C.

CAUTION

If this limiting value is exceeded, immediately stop engine and investigate cause before making a further attempt.

SPEED AND EXHAUST TEMPERATURE FLUCTUATION

Minor fluctuations of the engine speed or exhaust temperature can be caused by a number of factors.

When climbing at maximum r.p.m., the engine maximum speed will increase approximately 200 r.p.m. at an altitude of 40,000 feet.

During initial climb, before the limiting exhaust gas temperature value is reached, it may prove necessary to retard the throttle in order to keep the engine speed within the required limits.

ABNORMAL ENGINE ACCELERATIONS

The fuel-air ratio control, mounted on the engine, controls the fuel flow to the burners during accelerations only at low altitudes. At altitudes above 10,000 feet, throttle movement should be slow to prevent compressor stalls or flame-outs.

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WARNING

At altutides below 10,000 feet, the throttle may be advanced rapidly (1 second) from minimum to maximum r.p.m. Above this altitude, a 5 seconds minimum is required for throttle advancement.
The throttle may be retarded very rapidly at all altitudes.

COMPRESSOR STALL

The air-fuel ratio control in this airplane has been designed to completely eliminate the possibility of compressor stall. However at altitudes above 10,000 feet, the air-fuel ratio control is of no pratical use.

Above 10,000 feet, the rapid throttle advancement injects more fuel into the combustion chamber than the engine can utilize for acceleration at the existing r.p.m.

The burning of this additional fuel increases the combustion pressures. As these pressures increase, they create a corresponding increase in the pressure against the compressor discharge air. This increase of pressure against the compressor discharge air results in a breakdown of airflow through the last stages of the compressor. This is known as a compressor surge. As a result of the surge, the compressor becomes stalled and the mass air flow through the compressor is reduced, causing a reduction in the airflow through the turbine.

Thus, the energy available to the turbine wheel is decreased, causing loss in engine speed.

If the engine is allowed to continue operation in a stalled condition, the temperature of the burning gases will increase until serious damage to the turbine section of the engine occurs, resulting in engine failure. A roaring, pulsating noise accompanies compressor stall and may precede any engine instrument indication of changing engine conditions. If the roaring noise is heard after a rapid engine acceleration, immediately retarding the throttle will eliminate the compressor stall.

If exhaust temperature stabilizes at a normal value, the throttle should be readvanced slowly. Exhaust temperature rise should be normal during throttle advancement. However, if temperature continues to drop after throttle is retarded, flame-out has occurred and an air start should be attempted.

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In addition to the roaring, pulsating noise, other indications of a compressor stall are a rapidly rising exhaust temperature, loss of thrust, and a heavy engine vibration.

In general, injection of excessive fuel into the engine at altitudes below 10,000 feet tends to cause compressor stall. Above this altitude, flame-out usually results.

FLAME-OUT

Flame-out can occur during rapid accelerations of the engine. Acceleration flame-out occurs when more fuel is injected into the combustion chambers, than the engine can utilize for acceleration at the existing r.p.m. But, unlike the fuel-air mixture that causes compressor stall, this mixture is so excessively rich that it cannot burn, so the flame goes out.

Flame out during rapid engine deceleration will result whenever

the amount of fuel injected into the combustion chambers is reduced to a level too low to sustain combustion at the existing r.p.m.

Flame-outs are indicated by loss in thrust, drop in exhaust temperature, and possibly by a loud noise similar to engine backfire. During any rapid throttle movement above 10,000 feet, flame-outs may occur because the fuel-air ratio control does not operate.

A normal air start may be accomplished after a flame-out.

ENGINE NOISE AND ROUGHNESS

Thermal expansion and pressure surge occasionally occur in the pressurization system during flight, resulting in a certain number of abnormal sounds. Therefore, when any unusual noise can be heard, dump cabin pressure for a few minutes. If the noise continues, have the engine checked after landing.

Usually, this roughness can be eliminated by a change of r.p.m. However, if engine roughness occurs at all altitudes and engine speeds, it indicates some mechanical failure.

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FUEL FLOW PROPORTIONER

Basically, the fuel flow proportioner consists of two volume pumps driven by the hydraulic pressure, and it is provided to drain the two groups of fuel tanks simultaneously so as to prevent serious unbalancing of the airplane with respect to its gravity center. To meet this requirement, the two bucket pumps are disaligned with respect to the container in which they totate so that each pump has a delivery capacity which is proportional to the capacity of its respective group of tanks.

The hydraulic pressure shutoff valve is manually open; it closes by means of a solenoid, which, when energized, shifts this valve. Thus turning the "FUEL FLOW PROPORT" switch to "OFF" will close the electrical circuit while placing the switch at "ON" will open it. Therefore the proportioner is ready for operation when the LOW PRESS & FUEL FLOW PROPORT circuit breaker is off and the control switch is in the "ON" position, while it does not operate only if the circuit breaker is on and the control switch is in the "OFF" position (electrical circuit closed).

CAUTION

In order to prevent the fuel flow proportioner from rotating idle, it should be cut out when the fuel quantity indicator will indicate 450 lbs.

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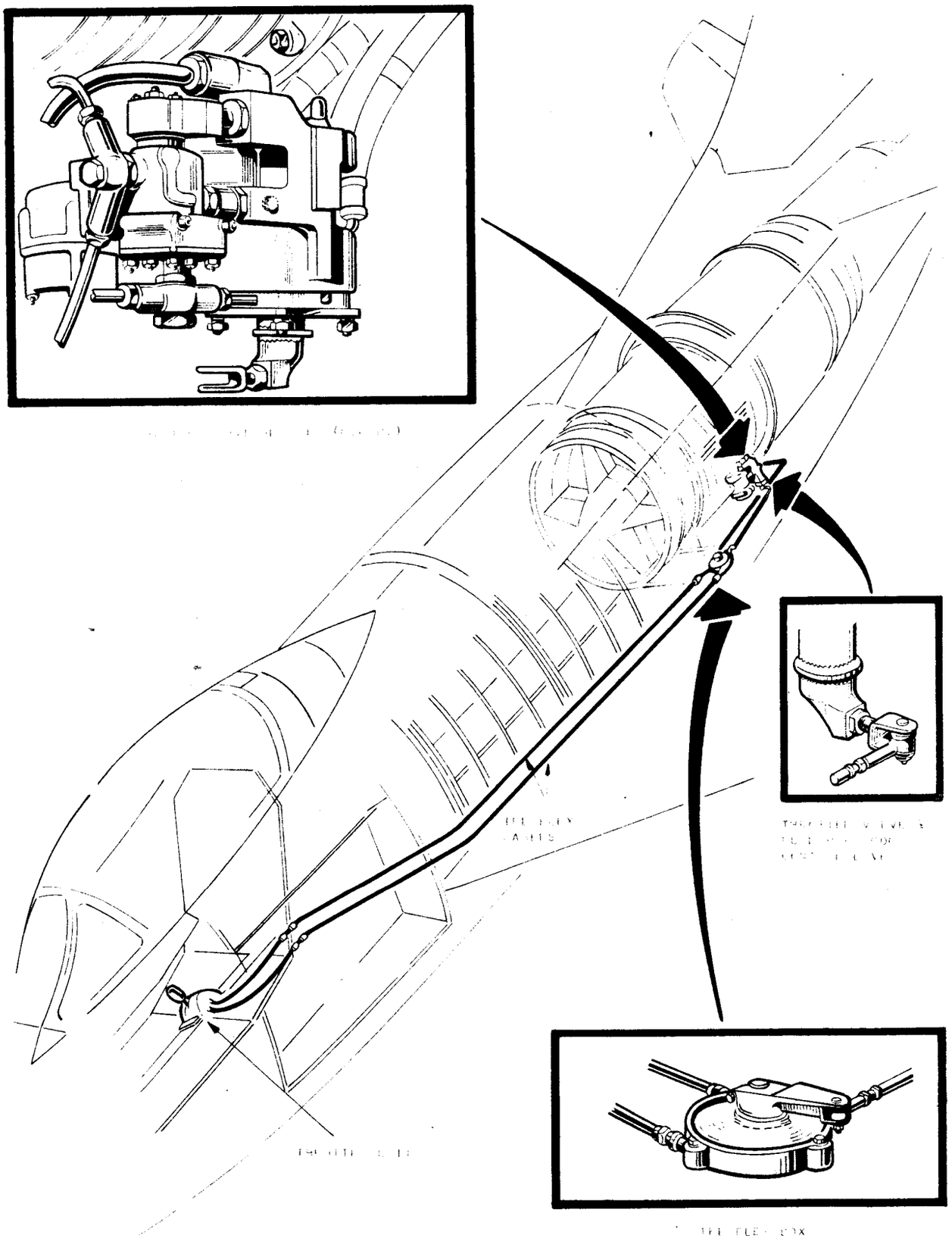

Figure 7-1