FLIGHT MANUAL

COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS TECHNICAL PUBLICATION TO THE ATTENTION OF ALL PERSONNEL CLEARED FOR OPERATION OF G 91 R3 AIRCRAFT.

G 91-R3

THIS FLIGHT MANUAL REPLACES GAF TO 1F-G91(R3)-1 OF 1 APRIL 1963, ALL COPIES OF WHICH SHALL BE DESTROYED.

This manual has been prepared by FIAT and translated into English by ARGE 91. It is an interim issue subject to approval. Discrepancies found or recommendations shall be submitted to Materialamt der Luftwaffe, Abt. III A1.

TOTC's including TA. FL 194 issued by Materialamt der Luftwaffe have been incorporated in this Flight Manual. However, this does not necessarily mean that the modifications called for in these TOTC's have already been accomplished on all affected aircraft.

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WARNINGS, CAUTIONS, AND NOTES. For your information, the following definitions apply to the "Warning," "Cautions," and "Notes" found throughout the handbook.

WARNING	Operating procedures, practices, etc., which will result in personal injury or loss of life if not carefully followed.
CAUTION	Operating procedures, practices, etc., which if not strictly observed will result in damage to equipment.
Note	An operating procedure, condition, etc., which it is essential to emphasize.

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SECTION I DESCRIPTION

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THE AIRCRAFT

The FIAT G 91 R/3 (fig. 1-1) is a lightweight tactical fighter particulary suitable for high speed, low altitude photo reconnaissance missions. As a fighter-bomber, this aircraft can effectively operate against any tactical target. It can also be employed in air-to-air combat.

The G 91 R/3 is a single-seat aircraft with low, cantilever, swept-back wings, swept empennage, a fully retractable tricycle landing gear and a single turbojet engine. To accomplish its mission as a photographic reconnaissance aircraft the G 91 R/3 is equipped with three cameras mounted in the nose section (fig. 4-18) and a sound recorder. Photographic missions may be one of two types, namely oblique photography and vertical photography.

Each wing carries two pylons for external stores, the inner pylons being designed to take two jettisonable 260 liter (68.68 US-gals) fuel tanks as well as rockets or bombs whereas the outer ones are capable of carrying rockets or bombs only.

The BRISTOL SIDDELY ORPHEUS MK 803 D11 turbojet engine (fig. 1-2) provides a static thrust of 5.000 Lbs (2,270kp) at sea level.

Air conditioned and pressurized, the armor plated cockpit has been designed to permit excellent visibility forward and downward. The most vital sections of the aircraft's belly have also been armor plated for increased protection to pilot and ship (fig. 1-3).

The radio compass antenna is installed in the streamlined canopy. The canopy can be jettisoned either by operating the automatic ejection seat mechanism or, independent of the seat mechanism, by means of an emergency manual control.

Equipped with a Martin Baker ejection seat which can be catapulted even at runway level at 100 KIAS the G 91 R/3 is also provided with a drag chute.

AIRCRAFT DIMENSIONS

(a) Overall dimensions of the aircraft are as follows :

Length	10,29 m
Wing span	8,56 m
Height (to top of fin)	4,00 m

(b) WING

Wing span	8,56 m
Wing total area	16,42 m^2
Aspect ratio	4,46
Sweep back (at 25% wing chord)	37°12'24"
Airfoil section designation	NACA 65A 112 NACA 65A 111
Wing root thickness (normal to front spar)	12%
Tip thickness (normal to front spar)	11%
Angle of incidence at wing root	+ 1°
Angle of incidence at wing tip	- 1°
Dihedral angle	+ 1°30'
Wing twist	+ 2°

(c) AILERONS

Aileron total area (2 x 0,87 m^2)	1,74 m^2
Aileron chord (normal to front spar)	32%
Aileron length/half wing span	0,465
Maximum deflection	± 15°

(d) FUSELAGE

Length	10,06 m
Height (without canopy and fin)	1,48 m
Width	1,40 m

(e) HORIZONTAL EMPENNAGE

Span	3,70 m
Area	2,59 m^2
Airfoil section designation	NACA 65A 010
Thickness (normal to axis of rotation)	10%
Angle of incidence variable while in flight	

(f) VERTICAL EMPENNAGE

Fin area (exclusive of dorsal fin)	1,75 m^2
Rudder area	0,40 m^2
Airfoil section designation	NACA 65A 010
Thickness (normal to rear spar)	10%

(g) WING FLAPS

Type	Slotted
Flap total area (2 x 0,87 m^2)	1,74 m^2
Flap length/half wing span	0,36 m
Maximum travel	40°

(h) SPEED BRAKES

Speed brake total area	0,70 m^2
Maximum travel	50°

(i) LANDING GEAR

Main wheel tread	2,68 m
Wheel base	3,35 m

MAIN LANDING GEAR

Tire diameter	0,64 m (25.2 in)
Tire width	0,24 m (9.45 in)

NOSE GEAR

Tire diameter	0,43 m (16.93 in)
Tire width	0,17 m (6.69 in)

RECONNAISSANCE CAMERA SYSTEM

The system consists of three cameras (fig. 4-18) located in the nose section and arranged as follows:

- One camera in the nose tip arranged at a 15° downward angle (forward) from the longitudinal axis for oblique photography.
- Two cameras, arranged behind the first one, at a 15° downward angle to the horizontal plane and at right angles to the longitudinal axis for laterally oblique photography (left and right).

The left camera can be mounted for vertical photography.

The control panel is located below the main instrument panel. Camera operation is controlled by a button on the control stick grip (fig. 1-17).

A sound recorder permits the pilot to make explanatory remarks during his mission. The recorder controls are located in the instrument panel below the camera panel. In latest G 91 models (GERMAN PRODUCTION) the sound recorder controls are located above the left console underneath the canopy frame. To operate the recorder the MIC (microphone) buttons on the throttle or on the stick are used.

ARMAMENT

The armament system of the G 91 R/3 consists of basic and additional armament (fig. 5-3).

BASIC ARMAMENT

The basic armament consists of two DEFA 552, 30 mm guns mounted in compartments in both sides of the forward fuselage, their ammunition cans accommodating 125 rounds per gun (250 in all). Empty cartridge cases and belt links are ejected into stowage compartments.

ADDITIONAL ARMAMENT

The following combination of weapons can be mounted on the wing pylons (2 on each wing) as additional armament:

a) Inner pylons

twelve 3" rockets
two 500 lbs bombs
two 500 lbs NAPALM bombs
two 250 lbs bombs
two AS 20 missiles

b) Outer pylons

two 250 lbs bombs
two AS 20 missiles.

GUN CAMERA

The ELC-N9 gun camera is located above the instrument panel to the right of the gun sight.

GUN SIGHT

The gun sight is mounted above the center section of the instrument penel (model 83A SFOM reflection type with a fixed reticle).

ENGINE

DESCRIPTION

The Bristol Siddely Orpheus MK 803 D11 is an axial flow turbojet engine having a seven stage axial flow compressor, driven by a single stage turbine. The combustion section consists of seven separate combustion chambers. The entire powerplant weighs 460 kg (1023 lbs) and its static thrust at sea level is rated at 2270 kp (5000 lbs).

ENGINE FUEL SYSTEM

1. Fuel Pump

The engine main fuel pump is a high-pressure unit of the positive - displacement variable - stroke type. It is driven by the engine and delivers fuel from the downstream side of the low-pressure filter to the combined control unit (CCU). The pump incorporates a hydromechanical governor which controls the maximum engine RPM and depends solely on speed for its operation. Changes in outside air temperature and density of the fuel do not affect the governing point.

2. Combined Control Unit (CCU)

The combined control unit comprises a barometric pressure control unit (BPC), throttle valve and high-pressure shut-off cock (stopcock), dump valve and fuel flow distributor.

a) BAROMETRIC PRESSURE CONTROL (BPC)

The barometric pressure control is the basic metering unit of the control system. It senses intake pressure and pump delivery pressure and acts in the fuel pump through a servo valve to maintain the delivery of fuel at a fixed relationship between these two pressures. Thus a constant engine speed is maintained at a fixed

throttle angle (setting) if intake conditions vary (irrespective of changes in A/S + altitude).

b) THROTTLE VALVE AND SHUT-OFF COCK (STOPCOCK)

The throttle valve and high-pressure shut-off cock are combined in this unit and mechanically linked to the throttle. Movement of the throttle lever rotates a spindle to open or close progressively a series of ports, thus increasing the fuel flow to the engine. When the lever is fully retracted all ports are closed and the fuel flow to the engine is stopped.

c) DUMP VALVE

When the engine is being shut-down and pressure is falling the dump valve opens to drain the primary bruner fuel lines downstream of the throttle valve.

d) FUEL FLOW DISTRIBUTOR

The fuel flow distributor, or more correctly the pressurising valve functions firstly to keep the main burner lines closed until a primary burner pressure of about 350 PSI is reached, and secondly to ensure a progressive increase in flow without excessive pressure rise. Distribution is carried out by seven burners (DUPLEX SPRAY NOZZLE).

In addition the following control units are components of the engine fuel system.

Air/Fuel Ratio Control (AFRC)

The function of this unit is to permit rapid surge-free and stallfree engine accelerations by comparing the primary burner pressure, which is a function of fuel flow, with the compressor delivery pressure.

Pressure Ratio Limiter (PRL)

This device is, in effect, an anti-surge device which ensures that the maximum design compressor pressure ratio is not exceeded. When the engine is operating at a constant RPM, the reduction in air temperature which accompanies an increase in altitude will have the effect of increasing the compressor pressure ratio. When the compressor delivery pressure increases to a value greater than the designed limit, the PRL valve opens so that the stroke of the fuel pump and therefore the fuel supply to the engine will be limited. This in turn will reduce engine RPM and the pressure ratio.

Jet Pipe Temperature Limiter (JPTL)

The jet pipe temperature limiter keeps the JPT within safe limits. It affects the barometric pressure control unit thus reducing the fuel flow from the main pump if the JPT is exceeded.

CAUTION

The JPTL operates to about 15000 ft MSL. Above 15000 ft MSL pilot should reduce power in order to keep the JPT within limits - if necessary.

Throttle Quadrant

The throttle quadrant is located on the left hand console (fig. 1-10). On the grip of the lever are the SPEED BRAKES switch, the air start button IGNIT, and the microphone MIC. - BUTTON.

The throttle quadrant is marked as follows:

STOP, START & FLIGHT IDLE, CLOSED, and OPEN. A detent at the "IDLE" position prevents inadvertent retraction of the throttle lever into the stop cock position.

Throttle friction can be adjusted by rotating the handwheel marked TH. FRICTION. The FUEL L.P.COCK controls the shut-off valve in the low pressure system.

To the left of the throttle lever is the wing flap lever which can be set at three different positions: DOWN, UP and HOLD.

IGNITION SYSTEM

For ground starts, ignition is provided by setting the H.E.IGNITION switch to NORM and pressing in the STARTER button. The two H.E.ignition units are energized and one starter cartridge is fired. Ignition units provide current to the two igniter plugs on combustion chambers 4 and 7. Ignition of the fuel in these two chambers causes combustion to progress via the interconnectors to the remaining chambers. A timer is provided to cut off the ignition current circuit 30 seconds after the STARTER button has been pressed.

Air start ignition is obtained by depressing the ignition button IGNIT on the throttle lever (see Section III - Air starts).

STARTING SYSTEM

The B.S.Or. MK 803 D11 powerplant is equipped with a cartridge turbo-starter (type QT-29 FORM B/1) located in the air intake duct bullet.

The single stage starter turbine is driven by the expanding cartridge combustion gases which are routed to the starter through two stainless steel pipes. Each cartridge chamber is equipped with a safety valve which opens at a pressure of 1200 psi (84,5 kg/cm^2). Exhaust gases are released via an exhaust duct. Mechanical power from the starter turbine is transmitted to the engine compressor shaft by means of a toothed jaw which is automatically disengaged by engine oil pressure.

A modified starter (type QT-29 FORM C/1) replaces this starter in later aircraft. The modified starter has a ratched and pawl engaging mechanism, thus obviating the possibility of crash-reengaging of the drive mechanism following an abortive start.

The starter cartridges are electrically ignited by the cartridge selector which is controlled by a time relay. This relay prevents the second cartridge from being fired until 30 seconds have elapsed after the first cartridge has been fired.

ENGINE AIR FLOW

Air for the engine enters through the air intake and is routed to the compressor via the air inlet ducts.

ENGINE INSTRUMENTS AND INDICATORS

Tachometer

The tachometer is calibrated from 0% to 100% (of the rated RPM) and has two pointers. The large dial pointer indicates in increments of 10% from 0% to 100% and the small dial pointer indicates units from 0% to 9%.

Jet Pipe Temperature Indicator

The jet pipe temperature indicator is calibrated from 0° to 800°C in 20° increments.

Overheat Warning Light

The overheat warning light comes on at a temperature of 190°C in the tail pipe section.

Fire Warning Light

The fire warning light comes on at a temperature of 220°C in the engine bay.

FUEL GAUGE

The fuel gauge has two scales: the outer one is gratuated from 0 to 2730 lbs with intermediate graduations to indicate the total quantity of fuel in all 9 fuselage tanks (excluding fuel in the drop tanks). The inner scale for the collect tank quantity is divided into a red range: 0 - 160 lbs and a green range: 160 - 277 lbs (end of scale). There are intermediate graduations at 0 - 100 - 200 lbs.

A selector switch with the positions ALL TANKS and COLLECT TANK is provided to check fuel quantities.

Indicating Light Collect Tank Fuel Quantity On

The indicating light is an amber light which illuminates when the fuel gauge indicates the quantity of fuel in the collect tank (with the switch in COLLECT TANK position).

Fuel Low Pressure Warning Light

The fuel pressure warning light comes on when fuel pressure drops below 5 ± 0.5 psi (0.35 ± 0.035 kg/cm^2).

EMERGENCY FUEL SYSTEM

The H. P. Emergency Fuel System incorporates an additional Air Fuel Ratio Control, Barometric Pressure Control and a double acting servo solenoid change over switch valve.

The purpose of the Emergency Fuel System is to provide an alternative fuel system which may be used in the event of failure of the main fuel system.

Both the main and emergency fuel systems utilize the same fuel pump which incorporates the solenoid change over switch valve. This valve is brought into operation by selector switch marked NORMAL and EMERGENCY. The change over switch valve is spring loaded so that it returns to the normal position when the solenoid is de-energized.

On selection of Emergency, the main fuel system BPC, AFRC, PRL, JPTL and Fuel Pump Governor are isolated and the engine is controlled by the emergency BPC and AFRC.

When Emergency is selected, the AFRC is only effective up to 5000 ft. The throttle should be opened with care in order to avoid possible compressor stalling.

Maximum attainable engine speed when operating on the EFS decreases progressively with increasing altitude owing to the fact the maximum RPM is controlled by the BPC. Careful manual throttling to avoid exceeding JPT limitations will be necessary at all altitudes.

It should be noted that on selecting the Emergency Fuel System with the Normal System functioning satisfactorily, a drop in RPM will be observed. This is due to the fact that the Emergency BPC senses Engine Bay Pressure whilst the Normal BPC senses P1 pressure.

ENGINE LUBRICATING SYSTEM

The engine bearings and accessory drives (fig. 1-9) are lubricated by oil from a 10.79 liter tank (3.97 ltr usable) mounted on the left side of the engine compressor. Permissible oil consumption at maximum RPM is 1.14 ltr and minimum consumption is 0.85 ltr per hour.

For oil specification refer to section V.

CAUTION

The oil tank capacity limits the duration of normal level flight to 3 hours 30 minutes.

Oil is routed from the tank to the main pump which sends it under pressure via a check valve through two lines. One line routes the oil to the engine front bearing, on to the auxiliary scavenge pump, through another filter, to the main scavenge pump and back to the tank. The second line carries the oil via a filter to the metering pump which, in turn, sends it through four other lines.

Three lines supply oil to the accessory drives, which is then carried via a filter to the scavenge pump and back to the tank. The second line routes oil via a check valve to the rear engine bearing where it is lost through the tailpipe.

A pressure relief valve located next to the check valve in the main oil pump limits maximum pressure in the system to 55 psi, normal operating pressure being 45 psi.

Oil Low Pressure Warning Light

The oil low pressure warning light is a red light located in the center of the instrument panel. Its illumination indicates that oil pressure has dropped below 25 ± 2 psi.

CAUTION

Normally, the warning light must not illuminate. However, at high ambient temperatures and low engine RPM the light may come on.

FUEL SUPPLY SYSTEM

The fuel supply system (fig. 1-12) consists of 11 tanks:

9 fuselage tanks, 1 collect tank (No.5), and 2 drop tanks with a capacity of 260 ltr each mounted under the wings on the inner pylons.

The fuselage tanks, interconnected and divided into 2 groups (forward and aft), are, together with the No. 5 collect tank, serviced via the filler caps on tanks 2R and 3R. The drop tanks are refueled through their respective filler caps.

Note

Only fuels specified in Section V may be used.

The following table shows the fuel broken down by tank capacity and the total usable fuel distribution in the aircraft. Weights are based on the specific gravity of JP-4 (spec. gr. 0,779).

Tanks	Tanks capacity			Remaining fuel		Usable fuel		
	lt.	US Gal	lbs	lt.	lbs	lt.	US Gal	lbs
Fwd. Group	790	209	1358	+	+	+	+	+
Aft. Group	650	172	1118	+	+	+	+	+
Collect Tank	160	42	274	+	+	+	+	+
Total capacity intern tanks	1600	423	2750	25	45	1575	416	2705
Drop tanks	520	173	890	15	24	505	133	866
Total capacity	2120	560	3640	40	69	2080	549	3571

Two fuel lines from the drop tanks, each one equipped with a check valve, connect in the fuselage to form a single line. This line is then divided into two lines to transfer fuel to tanks 2R and 3L via two float valves .

Fuel flows from these tank groups through the proportioner into the collect tank, which contains a booster pump incorporating a device to maintain a steady fuel flow during inverted flight. Fuel from the booster pump (fig. 1-9) is routed through a low pressure filter to the engine main fuel pump via the low pressure cock (operated manually from the cockpit and marked FUEL L.P.COCK). The filter incorporates a pressure switch which actuates a warning light on the instrument panel when the pressure drops below 5 psi.

Bleed air from the seventh stage of the engine compressor is routed to a manifold and is distributed to all of the tank groups via restrictor valves.

Each tank group is pressurized as follows:

- Forward tank group — 3 psi (max. 3.85 psi)
- Aft tank group — 3 psi (max. 3.85 psi)
- Collect tank — 1 psi (max. 1.85 psi)
- Drop tanks — 8 psi (max. 8.85 psi)

Fuel transfer from the drop tanks to the fuselage tanks is accomplished by means of pressure differential. From the forward and aft tank groups fuel is transferred to the collect tank by pressure differential and gravity feed.

Note

Pressurization of the fuselage tanks is automatic. The drop tanks are pressurized by moving the "DROPPABLE FUEL TANK AIR PRESSURE CONTROL VALVE" switch on the left hand console to the ON position.

For ground checks two pressure gauges are provided to check the flow of fuel to the collect tank. The first one is located forward of the proportioner in the landing gear compartment and indicates the proportioner

discharge pressure when the engine is operating. The second gauge is on the left side of the fuselage and indicates the pressure in the collect tank.

The normal reading on the first gauge should be between 5 - 8 psi and 1 - 1,85 psi on the collect tank gauge.

Three sets of Waymouth fuel level transmitters (1st set - 4 for the forward tank group, 2nd set - 2 for the aft group, and 3rd set - 2 for the collect tank) are wired to a single junction box where a single coaxial cable extends to an amplifier connected to the fuel gauge in the cockpit. Depending on the setting of the switch the gauge will show the fuel quantity in the COLLECT TANK or in ALL TANKS.

FUEL FLOW PROPORTIONER

The hydraulically driven fuel flow proportioner simultaneously transfers fuel from the two tank groups to the collect tank to avoid shifting of the center of gravity.

FUEL BOOSTER PUMP

This pump supplies the fuel under a min. pressure of 10.4 psi from the collect tank through the low pressure filter to the engine driven main fuel pump.

The booster pump incorporates a device, for inverted flight.

Fuel Low Press Warning Light

The FUEL LOW PRESS warning light is a red light and is located in the center of the instrument panel. Its illumination indicates that filter outlet pressure is below 5 ± 0.5 psi due to malfunctioning of the booster pump or clogging of the filter.

ELECTRICAL SYSTEM

Electrical power is provided by a 6 kw., 28 V, engine-driven DC generator and a 24 volt, 36 ampere-hours battery. The generator is fully efficient under all operational conditions of the engine.

ELECTRICALLY OPERATED EQUIPMENT

See figures 1-11 and 1-12.

D.C. ELECTRICAL POWER DISTRIBUTION

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

The battery bus is energized at all times when the battery is connected so that emergency equipment can be always operated. The primary bus is powered from the generator and supplies power to all equipment essential for normal flight. In case of generator failure, the primary bus is powered from the battery bus, therefore the BATTERY switch has to be ON.

CAUTION

If an external power unit is used for checkout or engine start on the ground the BATTERY switch must be OFF. Otherwise the battery will discharge if the external power unit supplies less than 24 V.

The secondary bus is powered from the primary bus and supplies power to all equipment that is not essential for normal flight. In case of generator failure, a relay automatically disconnects the primary bus from the secondary bus.

External Power Receptacle

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

Grounding Receptacles

There are three grounding receptacles on the right side of the fuselage. Two are just forward of and below the fuel filler caps and the other one is located below the wing leading edge.

Circuit Breakers

All of the electrical circuits are protected by circuit breakers mounted on a panel located at the aft end of the right console (fig. 1-13).

Except for CANOPY ALT, EXTERN STORES JETT, FIRE & OVERHEAT WARN & EXTING, TEST & EXT, FIELD GEN and FIELD RELAY.

These circuit breakers are located in a small compartment just above the right wing root and are to be reached from the outside through an access door.

Battery Switch

The BATTERY switch is located on the right side of the instrument panel and has two positions, ON and OFF. It is spring-loaded and returns automatically to the center position. This switch connects the battery bus with, or disconnects it from, the primary bus via a relay when the battery is in the aircraft and hooked up.

Generator Switch

The generator switch is located on the right hand side of the instrument panel and has three positions, ON, OFF and RESET. It is spring-loaded from RESET to OFF. Placing this switch to ON connects the generator to the primary bus. If generator voltage becomes excessive the generator field circuit is automatically opened and the generator is disconnected from the primary bus. When the switch is held at RESET the generator is returned to the circuit and moving it to ON will connect the generator to the primary bus once again. With the switch in the OFF position, the generator is disconnected from the primary bus.

A.C. ELECTRICAL POWER DISTRIBUTION

The A.C. power is distributed to A.C. electrical equipment by the 115 volt, 400 cycle, single- and three-phase A.C. busses. The A.C. busses are powered by the primary and secondary inverters which, in turn, are powered by the secondary bus.

Primary Inverter

The primary inverter converts 28 volt D.C. secondary bus power into three-phase, 115 volt, 400 cycle, A.C. and supplies three-phase A.C. to the gyro horizon, yaw damper, pitch damper, and gyrosyn compass doppler and turn and bank indicator, as well as single-phase A.C. to the PHI.

Secondary Inverter

The secondary inverter converts 28 volt D.C. secondary bus power into 115 volt, 400 cycle, three-phase A.C. power.

Under normal conditions, single-phase A.C. power is supplied to the automatic cockpit air temperature regulator, the IFF and SIF equipment to avoid overloading the primary inverter.

Fuses

All equipment powered by A.C. is protected by fuses located on the right console (fig. 1-13).

ELECTRICAL SYSTEM INSTRUMENTS AND INDICATORS

Battery Out Warning Light

This red light is located on the bottom right side of the instrument panel. It illuminates when the battery bus is disconnected from the primary bus.

Generator Out Warning Light

This red light is located next to the BATTERY OUT warning light on the bottom right hand side of the instrument panel. It illuminates when the generator is not powering the primary bus. In this case, the secondary bus is cut off while the primary bus is powered by the battery bus provided the bus tie-in relay is closed (battery switch ON) and the battery is hooked up.

Voltmeter

The voltmeter is mounted on the bottom right hand side of the instrument panel and is hooked up to the primary bus via the BUS-TIE-IN circuit breaker. This instrument provides a visual indication of battery voltage when the BATTERY switch is ON and the GENERATOR switch is OFF, regardless of engine operation. It indicates the generator voltage when the BATTERY switch is OFF and the GENERATOR switch is ON with the engine running. With both switches ON and with the engine running, this instrument indicates the voltage of either battery or generator, whichever is greater.

Loadmeter

The loadmeter is mounted beside the voltmeter on the lower right hand side of the instrument panel and indicates percent power consumption by the various systems, reading "1" when consumption is 200 A.

Prim. Inverter Out Indicating Light (Amber)

This indicating light is located below the primary INVERTER switch on the right hand side of the instrument panel. It lights up when the primary inverter fails or is disconnected and indicates that all A. C. equipment, except the IFF, is powered from the secondary inverter.

Sec. Inverter Out Indicating Light (Amber)

This indicating light is located below the sec. INVERTER switch. It lights up when the secondary inverter fails or is disconnected. It indicates that all A.C. equipment is powered by the primary inverter, except the IFF, Automatic Cockpit Air Temp. Regulator.

UTILITY HYDRAULIC SYSTEM

The main hydraulic power supply system consists of a 19 ltr (5.02 U.S. gals) hydraulic fluid reservoir, a self-regulating MESSIER hydraulic pump, an accumulator, a pressure reducer, and a pressure transmitter connected to the pressure gauge in the cockpit. This system supplies power for operation of the landing gear, the speed brakes, the fuel flow proportioner, the flight control system, and the wheel brakes.

Hydraulic fluid is routed through a filter to the self-regulating pump which diverts it under pressure through a second filter to the accumulator. Fluid then flows from the accumulator to the equipment mentioned (figs. 1-14 and 1-25).

The hydraulic pump also has a return line to the fluid reservoir.

HYDRAULIC SYSTEM INDICATORS

Pressure Gauge

A pressure reducer and an electric pressure transmitter are located on the downstream side of the accumulator. The transmitter is connected to the HYDRAULIC UTILITY pressure gauge on the instrument panel. The gauge is gratuated from 0 to 5000 psi (0 to 350 kg/cm^2). The normal pressure reading, when the system is not utilized, should be 3450 - 3750 psi (245 - 265 kg/cm^2).

FLIGHT CONTROL HYDRAULIC SYSTEM

The flight control system incorporates the aileron and elevator servo controls.

LATERAL CONTROL (ROLL)

Lateral control (roll) of the aircraft is obtained by means of ailerons actuated by the control stick. Each aileron is connected to an irreversible hydraulic booster unit. The mechanical control linkage between control stick and booster unit incorporates a spring type artificial feel system providing stick feel to the pilot.

The control linkage is also equipped with a vibrator at the level of the first bellcrank in the wing leading edge which reduces friction at the joints.

The ailerons are not equipped with trim tabs. Lateral trim of the aircraft is obtained by the aileron trim motor. This motor is controlled by the trim switch located in the control stick grip. Corrective motion is then imparted to the artificial feel system and relayed to the ailerons. A corresponding change in the neutral position of the stick takes place simultaneously.

LONGITUDINAL CONTROL (PITCH)

Longitudinal control (pitch) of the aircraft is achieved by the stick-operated elevator via an irreversible hydraulic actuator. Stick feel is provided to the pilot by an artificial feel system (spring-loaded bungees and a bobweight) incorporated in the control linkage system.

No trim tabs are required in the elevator since the horizontal stabilizer is moved by an electric actuator controlled by the control stick trim switch or the EMERG. LONG' L TRIM switch on the left hand console.

DIRECTIONAL CONTROL (YAW)

Directional control (yaw) of the aircraft is provided by the rudder through the rudder pedals, which are connected to the rudder mechanically only. The rudder incorporates a trim tab that is positioned by an electric actuator controlled by the RUDDER TRIM switch located on the left hand console.

Note

In case of failure of the aileron and elevator servo hydraulic system, automatic change over to manual operation occurs. However, by actuating the AILERON SERVO EMERG. SYSTEM PRESSURE switch hydraulic pressure from the emergency hydraulic pressure accumulator is available to operate the ailerons for a limited period of time.

ARTIFICIAL FEEL SYSTEM

The aileron artificial feel system (fig. 1-15) is incorporated in the linkage between the control stick and the ailerons behind the rearmost bulkhead of the left hand gun compartment and consists essentially of a spring-loaded bungee. This device is linked on one side to the stick and to a trim motor on the other side. Adjusting the system changes the neutral position of the stick, thus trimming the ailerons.

A similar system is incorporated in the elevator linkage. However, it does not include means to trim the elevators.

PITCH DAMPER

The pitch damper augments the longitudinal stability of the aircraft by responding to movements around the pitch axis and thus varying the length of the hydraulically operated elevator

actuator rod to dampen out the oscillations. The pitch damper may be engaged whenever necessary to reduce oscillations.

Pitch Damper Switch

The pitch damper switch is located on the armament panel on the left hand console and has two positions, ON and OFF. The switch controls the shutoff valve in the pressure line to the hydraulic actuating cylinder.

Pitch Damper Disengage Lever

The pitch damper disengage lever is located on the forward side of the control stick just below the grip and enables the pilot to disengage the pitch damper instantly. Depressing this lever interrupts the current in the circuit and causes the switch on the armament panel to return automatically to the OFF position.

YAW DAMPER

The device (fig. 1-18) augments the directional stability of the aircraft by responding to changes in the yaw axis and thus displacing (through an electric actuator) the rudder to dampen out the oscillations. The yaw damper may be engaged at any time to eliminate oscillations.

Yaw Damper Switch

The yaw damper switch on the armament panel on the left hand console has two positions, ON and OFF and serves to control the yaw damper.

FLIGHTS CONTROLS AND INDICATORS

Control Stick

The control stick grip (fig. 1-17) incorporates the aileron and horizontal stabilizer trim switch, the gun camera/gun trigger, a microphone button, the bomb release, missile and rocket firing button, and the camera button.

Rudder Pedals

The rudder pedals (fig. 1-20) can be adjusted in forward and backward by rotating the toothed wheel located between them.

Control Lock

The control surfaces can be locked (fig. 1-19) by a lever located forward of the control stick. To do this the lever is pulled up until the spring-loaded pin engages the lug on the control column and locks. At the same time a rod engages and locks the pedals in the center position and the throttle is locked in the STOP position by a teleflex cable.

Normal Trim Switch

Normal trim is effected by a four-position switch on the control stick grip (fig. 1-17) which is spring-loaded to the center position. Holding the normal trim switch forward or aft changes the angle of the horizontal stabilizer and trims the aircraft nose down or up. Holding the normal trim switch to either side changes the control stick neutral position through the artificial feel system and causes aileron trim.

Emergency Longitudinal Trim Switch

An emergency four-position trim control switch designed EMERG. LONG' L TRIM is provided on the left console trim panel (fig. 1-20). Positions are marked: NORMAL, NOSE DOWN, NOSE UP, and OFF. In the NORMAL position, stabilizer trim is effected with the normal trim switch. Moving the emergency trim switch to OFF deactivates the normal trim control switch. In case of failure of the normal trim control circuit, a separate circuit permits stabilizer trim by placing the emergency trim switch in the NOSE DOWN or NOSE UP position.

Horizontal Stabilizer Position Indicator

The horizontal stabilizer position indicator is mounted left of the AILERON SERVO pressure gauge on the instrument panel. Its scale ranges from NOSE UP to NOSE DOWN and has a red mark for takeoff position. Stabilizer maximum deflections are +5° and $-2^{\circ}\ ^{+15'}_{-\ 0'}$ in the positive and negative range.

Rudder Trim Tab Control Switch

The three-position RUDDER TRIM switch is located on the trim control panel of the left hand console (fig. 1-20). Its positions are LEFT, OFF and RIGHT and it is spring-loaded to the OFF position. Holding the switch to the left or right actuates a trim motor, which moves the trim tab to the opposite direction, thus trimming the aircraft in direction of the trim switch.

Rudder Trim Check Light (Amber)

This check light, marked TAKE OFF POSIT, located next to the rudder trim switch (fig. 1-20) will illuminate for a short time whenever the rudder trim tab is within the neutral position.

FLIGHT CONTROL HYDRAULIC SYSTEM

The flight control hydraulic system (fig. 1-23) is supplied with pressure by the utility hydraulic system and has a return line to the hydraulic fluid reservoir. The system is comprised of the aileron normal system, aileron emergency system, and elevator system. Each system has an accumulator with a check valve upstream and a 4000 psi (280 kg/cm^2) pressure relief valve downstream. A restrictor valve is provided for the emergency system supply line to reduce fluid pressure to 2850 psi (200 kg/cm^2).

Aileron Servo System Pressure Gauge

The aileron servo system pressure gauge is a dual gauge located on the HYDRAULIC SYSTEM control panel and marked AILERON SERVO. It has two pointers, NORMAL and EMERG., that indicate system pressure of normal and emergency systems. Two pressure reducers (one for each circuit) installed before the pressure transmitter, protect the instrument from pressure surges.

Aileron Emergency System Pressure Switch

The switch has two positions, ON and OFF, and is protected in the OFF position by a red switch guard.

Raising the guard and turning the switch ON supplies standby accumulator pressure to the aileron servo controls through the emergency hydraulic circuit.

Aileron Low Press Warning Light

The normal system LOW PRESS red warning light is calibrated to 2630 ± 240 psi. This light illuminates whenever the normal system pressure drops below this value, indicating that automatic transfer to the flight control manual system will occur as soon as residual accumulator pressure is used, provided the pilot does not switch to the standby hydraulic system.

Elevator Servo Switch

The elevator servo switch located in the center of the instrument panel, left of the UTILITY pressure gauge, is labeled ELEVATOR SERVO PRESSURE. Its two positions, ON and OFF, are used to engage and disengage the elevator servo system.

Elevator Servo Disengaged

The elevator servo disengage amber warning light (labled DISENGAGED) is located above the elevator servo control switch. It illuminates when the switch is at OFF or when the servo control automatically disengages due to insufficient operating pressure which results in simple mechanical connection between stick and elevator.

WING FLAP SYSTEM

Each flap is operated by an individual, irreversible electric actuator (jackscrew type) interconnected by means of a flexible shaft that synchronizes flap travel. In case one actuator fails the other will drive both flaps at reduced speed via the synchronizing shaft.

Wing Flap Lever

The wing flap lever has three positions, UP, HOLD, and DOWN. It is located left of the throttle and is marked FLAP.

Placing the lever in UP or DOWN position power is directed to the UP or DOWN side of the actuator and the flaps will retract or extend. Microswitches are provided to shut off power to the actuators when the flaps contact the limiting stops. In order to stop the flaps at any increment of full travel, place the lever in HOLD when the desired flap position is reached.

Wing Flap Position Indicator

The wing flap position indicator marked FLAP is located below the altimeter on the instrument panel. This instrument covers the total flap travel from the retracted position (UP) to maximum deflection (DOWN) with all intermediate positions in percentage.

SPEED BRAKE SYSTEM

The speed brake consists of two interconnected doors under the fuselage that are operated by an electrically controlled hydraulic actuating cylinder (fig. 1-14).

Speed Brake Switch

The speed brake switch mounted on top of the throttle grip is labeled SPEED BRAKES and has three positions, IN, OUT, and NEUTRAL (a special mark shows this position). The speed brakes can be extended partially by returning the switch to neutral during an extension or retraction cycle.

Speed Brake Ground Safety Switch

This safety switch is provided to deactivate the speed brakes when the aircraft is on the ground. The switch opens the electric circuit to the appropriate solenoid. To actuate the switch, a key is inserted into the hole in the fuselage just forward of the speed brake, left side, and rotated until a click is heard.

Speed Brake Position Indicator

The speed brake position indicator marked AIR BRAKE is next to the wing flap position indicator. The pointer travels from IN to OUT and indicates the position of the brake at each reading in percentage.

LANDING GEAR SYSTEM

The landing gear is hydraulically actuated and its doors are opened mechanically by the motion of the gear (fig. 1-14).

In order to extend and lock the nose gear in an emergency, hydraulic pressure is supplied from an accumulator. The main landing gear, however, will be extended in case of

emergency by gravity when the uplock latches are released, and can be locked by yawing the aircraft.

Nose Gear Ground Safety Lock

The nose gear is equipped with a safety lock to prevent inadvertent retraction of the gear while on the ground. It is painted red and a red streamer is attached to it (fig. 1-22).

Landing Gear Handle

The landing gear handle marked LANDING GEAR is located on the left hand side of the instrument panel (fig. 1-23) and has two positions, UP and DOWN. It receives power from the primary bus.

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

Landing Gear Emergency Retract Button

This button, labeled LDG. GR. EMERG. UP is located above the landing gear lever. Actuation of this button will mechanically release the blocked landing gear lever which can be operated to retract the gear in case of emergency.

Landing Gear Emergency Handle

The landing gear emergency handle marked EMERG. LDG. GR. is located on the left hand side below the instrument panel (fig. 1-23). This handle actuates a microswitch that cuts off electrical power to the landing gear handle and to the electrically operated normal hydraulic pressure distributor. Secondly this handle mechanically opens the emergency hydraulic accumulator, this pressure unlocks the gear uplocks and operates the nose gear actuating cylinder.

The main gear extends by gravity (see NOTE - SECTION III - LANDING GEAR).

Landing Gear Position Indicator

This indicator (fig. 1-23) provides a visual indication of the landing gear position and an unsafe warning light is located in the landing gear handle for additional indication.

Three different symbols may appear in the three windows of the indicator (one window for each gear):

UP - appears when the gear is up and locked.

WHITE AND RED DIAGONAL STRIPES - appear when the gear is unlocked. They also appear when the gear is locked but the bus is not energized.

MINIATUR-WHEEL - appears when the gear is down and locked.

Landing Gear Unsafe Warning Light

The landing gear unsafe warning light is located in the landing gear handle and illuminates

a) When the gear is being operated or unlocked, regardless of throttle setting

b) When the throttle is retarded below the position for 65% engine RPM and the gear is still up and locked.

Landing Gear Unsafe Warning Horn

The landing gear unsafe warning horn is located to the rear of the cockpit on the left hand side. Whenever the gear is not down and locked, the warning horn will sound as soon as the throttle is retarded below the position of 65% RPM. When the throttle is advanced beyond the 73% - 75% RPM position, the warning horn will be de-

energized regardless of landing gear position or condition.

Ldg.Gr.Horn Cut Out

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

SHIMMY DAMPER

A shimmy damper is installed on the nose gear strut (fig. 1-24).

CAUTION

The shimmy damper must be engaged before the aircraft is towed. This is done by pulling out the pin that connects the lever to the control rod. Be sure that the shimmy damper is engaged before flight.

WHEEL BRAKES

The wheel brakes are applied through the hydraulic power system (fig. 1-27). The self-adjusting rotor-type brakes are installed on the main gear wheels and operated by hydraulic brake cylinders which, in turn, respond to pressure applied to the rudder pedals.

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

EMERGENCY AND PARKING BRAKE

The handle, marked EMERG.WHEEL BRAKE, is located above the instrument panel on the right hand side.

In case of failure of the normal brake system, braking is accomplished by using hydraulic pressure stored in the emergency brake system accumulator. Braking is accomplished by pulling the emergency brake handle.

Pulling on the handle supplies pressure to the braking units proportional to handle extension. This pressure is equally distributed to both wheels. When released, the handle will return to its normal position.

Setting of the park brake ist accomplished by pulling the handle and rotating it 90 degrees to the locked position.

Note

The emergency wheel brake when actuated in addition to the normal brake will usually overcome the latter one, because emergency brake pressure is higher than normal brake pressure.
(Emerg.pressure max.: 2210 psi, normal pressure max.: 1670 psi.)
Pressures of the two systems will not add up!

CAUTION

Because there is a chance that by simultaneous use of both braking systems all pressure may be lost momentarily (due to piston position in the pressure control valve) it is advisable to actuate only one system at the time.

DRAG CHUTE SYSTEM

A drag chute is supplied to reduce landing ground roll (fig. 1-26). The chute is of the ribbon type, having a pilot chute to pull it out, and is packed in a deployment bag which is stowed in a compartment located between the tailpipe and the base of the rudder. It is manually controlled from the cockpit by means of a teleflex cable.

CAUTION

A max. deploy speed of 150 KIAS should never be exceeded, as a predetermined shear pin installed in the connection link be-

tween chute and aircraft, will fail, releasing the drag chute and thereby preventing the tail-section from extreme stress (Kosteletzky).

Drag Chute Handle

The drag chute handle marked DRAG CHUTE is located on the upper left hand side of the instrument panel. Pulling this handle unlocks the compartment door and permits the pilot chute to be ejected by a spring. Pushing the handle in again separates the chute from the aircraft.

FLIGHT INSTRUMENTS

ADF INDICATOR

Refer to section IV, "ADF-102 RADIO COMPASS SYSTEM".

WIND UNIT

Refer to section IV, "PHI MARK III B NAVIGATION EQUIPMENT".

AIR SPEED AND MACH INDICATOR

The air speed and mach indicator is essentially a conventional airspeed indicator with an additional pointer to indicate the Mach number.

ALTIMETER

The altimeter is of the barometric type, indicating altitude from -1000 to 80 000 ft in increments of 20 ft. Adjustments in the Kollsman window are measured in millibars.

CABIN PRESSURE ALTITUDE INDICATOR

The cabin pressure altitude indicator is of the barometric type and is located on the right hand console. It indicates altitude from 0 - 40 000 ft in increments of 5000 ft.

PHI INDICATOR

Refer to section IV, "PHI MARK III B NAVIGATION EQUIPMENT".

TURN-AND-BANK INDICATOR

The turn-and-bank indicator is a conventional instrument powered by the 115 volt/400 cycle, three - phase, A.C. busses.

STANDBY TURN-AND-BANK INDICATOR

The standby turn-and-bank indicator is a conventional instrument powered by a 4.5 volt battery located behind the ejection seat armour. It is used in the event that the main indicator fails.

Standby Turn-And-Bank Indicator Switch

The switch is located on the right hand console and has two positions, ON and OFF.

ARTIFICIAL HORIZON

The artificial horizon is powered by the three-phase A.C. busses. It indicates the attitude of the aircraft in relation to the horizon and requires approximately 2 1/2 minutes to erect itself.

In the event of A.C., three-phase power failure an OFF flag will appear on the dial.

Since the angle of attack of the aircraft varies with load condition and speed, a pitch trim knob is provided on the indicator to center the horizon bar after the aircraft has been trimmed for level flight.

RATE-OF-CLIMB INDICATOR

The rate-of-climb indicator is a conventional instrument with 0 to 6 000 ft/min. graduations for either diving or climbing. The indicator scale is

non-linear to provide more accurate readings near the zero rate of altitude change.

CLOCK

The clock is of the chronometer type.

ACCELEROMETER

The accelerometer indicates instantaneous accelerations and records maximum positive and negative accelerations encountered during flight. The instrument has three needles on a common scale. One needle records maximum positive G-loads, the other one maximum negative G-loads. These two needles follow the third needle which indicates instantaneous accelerations. A push knob is provided to reset the instrument.

STANDBY COMPASS

The standby compass is a conventional magnetic compass mounted to the upper right on the windshield frame. It is used in the event of failure of the gyrosyn compass.

EMERGENCY EQUIPMENT

FIRE AND OVERHEAT WARNING SYSTEM

The fire warning system operates like the overheat warning system. The detecting wire is installed in the compressor bay und causes illumination of the red fire warning light 3 sec. after temperatures of 220°C are exceeded.

The overheat warning system consists of a bi-metal wire around the tailpipe section. 3 seconds after 190°C are exceeded the system causes to illuminate the amber overheat warning light.

Note

Both the overheat and the fire warning systems can be checked by pushing up the spring-loaded switch marked TEST CIRCUIT. This switch is located on the right hand side of the instrument panel under the FIRE and OVERHEAT warning lights and when it is pushed up both lights should illuminate.

CANOPY

The electrically actuated canopy (fig. 1-28) opens und closes by rotating around a hinge at the rear. It is locked mechanically by means of the lock handle located on the forward left hand side of the cockpit. When the canopy is locked, the seal along the canopy sill is automatically inflated.

Canopy Switch

The canopy switch located on the lower left side of the instrument panel has two positions, OPEN and CLOSED, and is spring-loaded to the center neutral position. This switch controls the opening and closing of the canopy, which can be left partially open by releasing the switch when the desired position has been reached.

Canopy Unsafe For Flight Warning Light

A canopy unsafe for flight warning light is mounted next to the canopy switch on the lower left hand side of the instrument panel. This light, covered by a red cover glass, will illuminate if the canopy latches are unlocked.

External Canopy Switches

Both EXT. CANOPY SWITCHES are located on the left hand side of the gun compartment door. Pushing the upper switch marked OPEN will open

the canopy while pushing the one marked CLOSE will close it.

Functionally, there is no difference between the canopy switch in the cockpit and the external switches. To operate the canopy externally either the battery or an external power source must be connected.

Canopy Jettison Handle

The canopy jettison handle marked EMERG. CANOPY JETT. is located below the instrument panel to the right. Pulling this handle will jettison the canopy independent of seat ejection.

External Canopy Emergency Release Handle

The external canopy emergency release handle is mounted on the left hand side of the fuselage aft of the gun compartment door and is accessible through quick lock door marked EXT. EMERG. CANOPY RELEASE. When pulled, it unlatches and releases the canopy from its hinge.

Canopy Locking Handle

The canopy locking handle is located on the left hand side in the cockpit above the throttle and serves to lock the canopy closed. When the handle is in the locked position, the CANOPY UNSAFE FOR FLIGHT warning light is de-energized and the pressure line to the canopy seal is opened.

Canopy Jettison Ground Safety Pin

The canopy jettison ground safety pin is installed behind the upper part of the rear seat armour. This safety pin locks the firing pin to prevent accidental firing of the canopy jettison cartridge.

EJECTION SEAT

The Martin Baker fully automatic light-weight ejection seat is designed to provide safe escape at all altitudes and speeds (min. 100 KIAS) and, after ejection to deploy the parachute automatically and to separate 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. This ensures that the occupant may descend quickly through the cold atmosphere, strapped in his seat and steadied by two drogue parachutes, to a more tolerable altitude where the automatic mechanism operates (down to 16 400 ft = 5 000 m). At very high ejection speeds the opening of the parachute is delayed by a G-switch until a safe speed for deployment is reached (decellerating force below 4 G's, approx. 220 KIAS).

To supply the occupant with oxygen while descending (until separation from the seat takes place) an emergency oxygen bottle is mounted on the right side of the seat.

The seat is fitted with a cartridge operated canopy jettison system which makes unnecessary any pre-ejection action as it is operated by the face screen primary firing handle on the headrest. There is one second delay before the seat cartridge is fired. The seat also has an alternative firing handle positioned in the leading edge of the seat pan.

The main parachute is stowed in a "horseshoe" wedge shaped pack behind the occupants shoulders.

The seat pan is fitted with a survival pack which serves the dual purpose of seat cushion and container for dinghy and survival equipment.

Primary Firing Handle

The primary firing handle is located above the headrest. Pulling the handle

extracts the face screen, both the sear of the canopy gun firing unit and the sear of the ejection gun causing the immediate jettisoning of the canopy followed one second later by the ejection of the seat.

Alternate Firing Handle

The alternate firing handle is located on the leading edge of the seat pan. Pulling this handle actuates the same sequence as primary firing handle. Only in cases where it's impossible to reach the screen firing handle should the alternate firing handle be used. In this case the pilot will not be protected by the face screen. Therefore he must sit upright with his head firmly leaned against the headrest to prevent spinal overstressing.

Time Delay Firing Mechanism

This device is incorporated in the firing unit of the ejection gun. On pulling either firing handle, it initiates ignition of the seat canon with 1 sec. delay. Thus, canopy unlocking, canopy jettison, and seat ejection occur in that order with safe timing.

Ejection Seat Ground Safety Pins

These safety pins must be inserted to prevent inadvertent firing of the initiators on the ground. One pin secures the primary firing handle and is inserted on top of the headrest, the second pin blocks the secondary firing handle on the leading edge of the seat pan. The third pin blocks the ejection gun firing sear and is inserted on top of the ejection gun. (All three safety pins plus the canopy jettison safety pin are attached to one red string to prevent, that either one could be overlooked for removal and/or installation).

Seat Raising Lever

The seat raising lever is located on the right hand side of the ejection seat. This lever permits seat adjustment up and down of appr. 15 cm (6 in.).

Emergency Harness Release Lever

The emergency harness release lever is located on the left hand side of the ejection seat. Pulling it up will release the pilot's harness, leg restraining straps, and main chute from the seat.

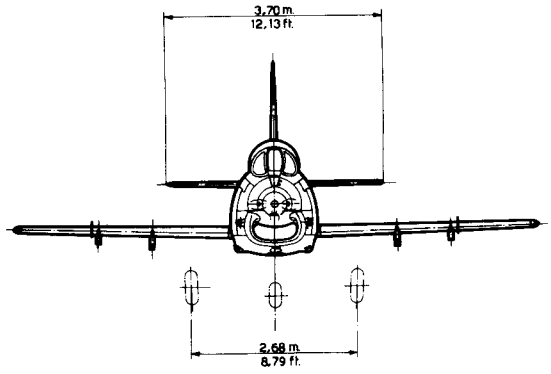
Shoulder Harness Unlock Lever

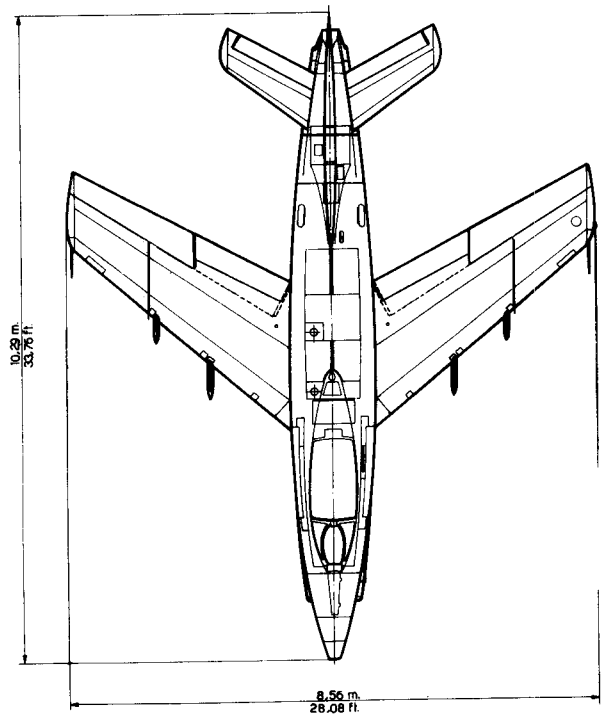
The shoulder harness unlock lever is on the right hand side of the seat in front of the seat raising lever. Moving this lever will unlock the shoulder harness so that the pilot may lean forward. When the lever is released the shoulder harness relocks.

Leg Restraining Mechanism

This automatic gear is designed to restrain the pilot's legs against the seat pan during ejection. Two nylon cords pass through the rings of the leg strap quick disconnectors. One end of each cord is connected to the back of the seat and the other end is passed through snubbing units on the front edge of the seat. They are connected to the cockpit floor by a bracket designed to fail at the load required to ensure that the legs are held back against the forward edge of the seat pan.

Three Views Of The Aircraft





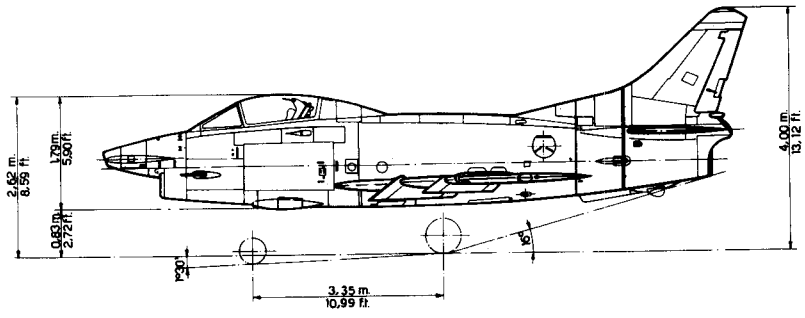


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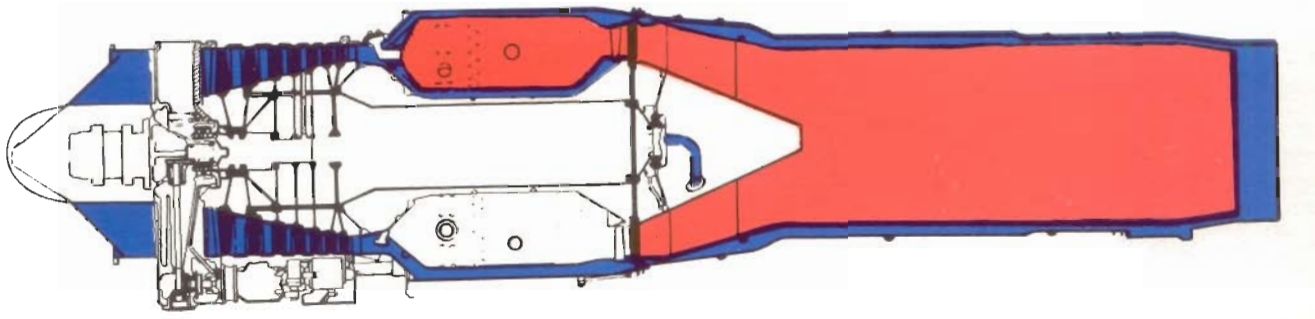
Figure 1-1

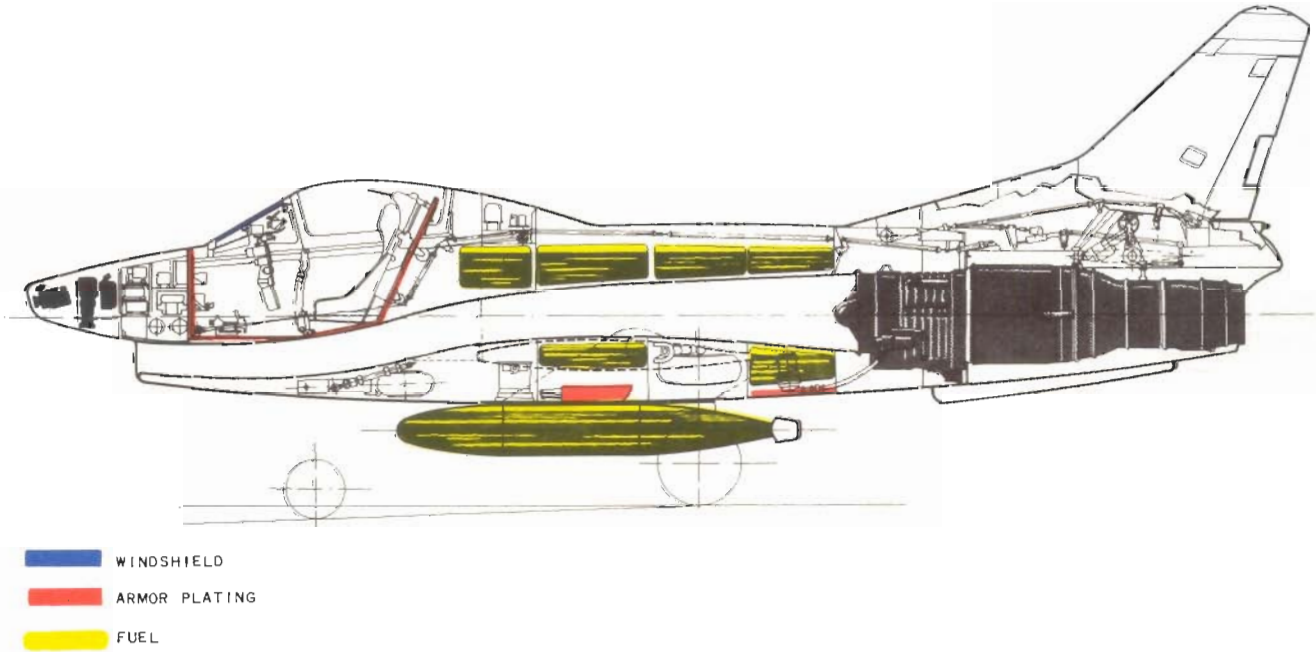
BRISTOL SIDDELEY ORPHEUS MK803 Turbojet Engine



F.0000/A

Figure 1-2

Aircraft Section



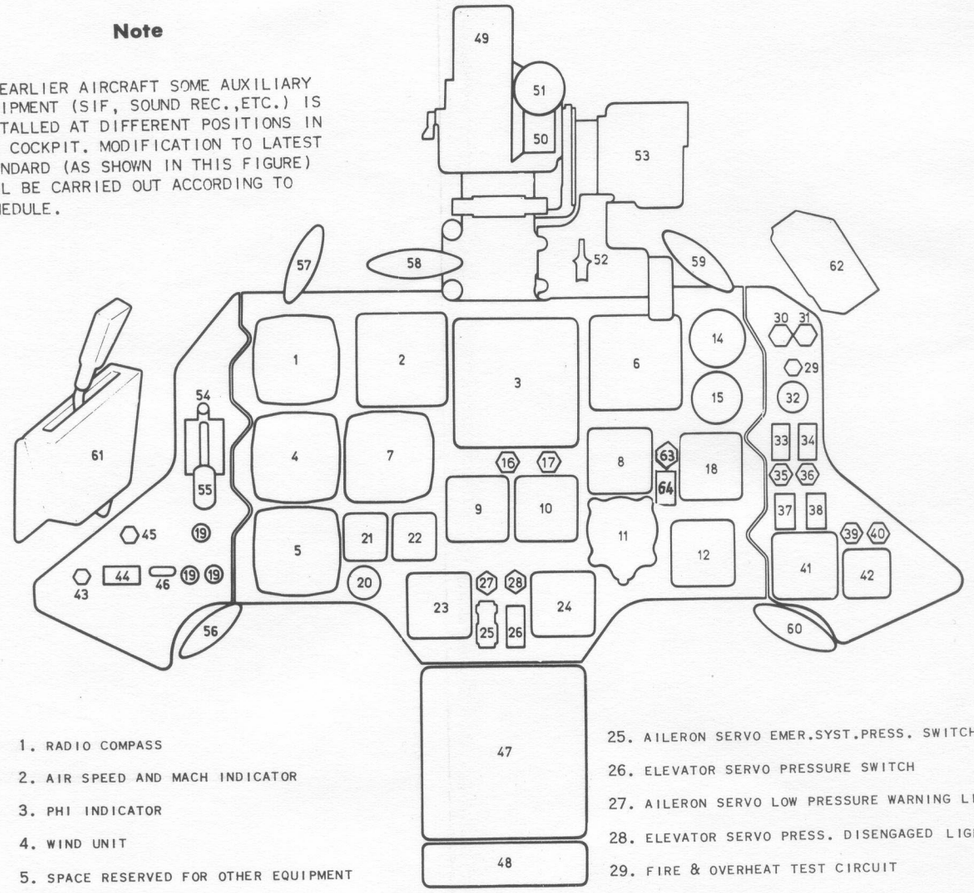
A.0001/B

Figure 1-3

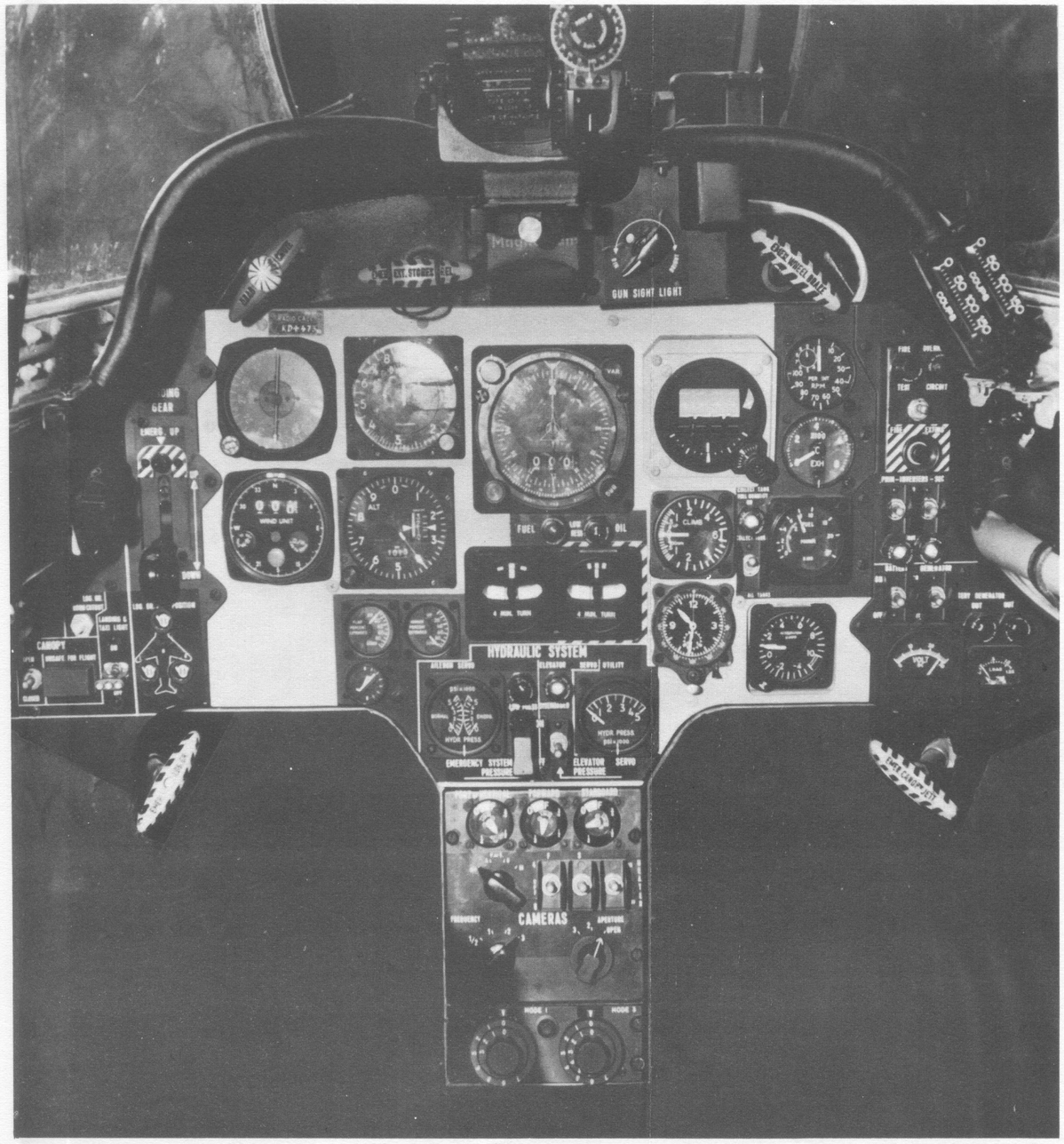
Instrument Panel

Note

IN EARLIER AIRCRAFT SOME AUXILIARY EQUIPMENT (SIF, SOUND REC.,ETC.) IS INSTALLED AT DIFFERENT POSITIONS IN THE COCKPIT. MODIFICATION TO LATEST STANDARD (AS SHOWN IN THIS FIGURE) WILL BE CARRIED OUT ACCORDING TO SCHEDULE.



1. RADIO COMPASS
2. AIR SPEED AND MACH INDICATOR
3. PHI INDICATOR
4. WIND UNIT
5. SPACE RESERVED FOR OTHER EQUIPMENT
6. ARTIFICIAL HORIZON
7. ALTIMETER
8. RATE OF CLIMB INDICATOR
9. TURN & BANK INDICATOR
10. STDBY. TURN & BANK INDICATOR
11. CLOCK
12. ACCELEROMETER
13. STANDBY COMPASS
14. ENGINE TACHOMETER
15. JPT INDICATOR
16. FUEL LOW PRESS WARNING LIGHT
17. OIL LOW PRESS WARNING LIGHT
18. FUEL QUANTITY INDICATOR
19. LDG.GR.POSITION INDICATOR
20. STABILATOR POSITION INDICATOR
21. FLAPS
22. SPEED BRAKES POSIT. INDICATOR
23. AILERON SERVO NORM. & EMER. PRESS. INDICATOR
24. HYDRAULIC UTILITY PRESS. INDICATOR
25. AILERON SERVO EMER.SYST.PRESS. SWITCH
26. ELEVATOR SERVO PRESSURE SWITCH
27. AILERON SERVO LOW PRESSURE WARNING LIGHT
28. ELEVATOR SERVO PRESS. DISENGAGED LIGHT
29. FIRE & OVERHEAT TEST CIRCUIT
30. FIRE WARNING LIGHT
31. OVERHEAT WARNING LIGHT
32. FIRE EXTING. BUTTON
33. PRIM.INVERTER SWITCH
34. SEC. INVERTER SWITCH
35. PRIM.INVERTER OUT INDICATING LIGHT
36. SEC.INVERTER OUT INDICATING LIGHT
37. BATTERY SWITCH
38. GENERATOR SWITCH
39. BATTERY OUT WARNING LIGHT
40. GENERATOR OUT WARNING LIGHT
41. VOLTMETER
42. LOADMETER
43. CANOPY SWITCH
44. CANOPY UNSAFE FOR FLIGHT WARNING LIGHT
45. LDG.GR.HORN CUT-OUT BUTTON
46. LANDING & TAXI LIGHT SWITCH
47. CAMERAS CONTROL PANEL
48. SIF CONTROL PANEL



49. GUN SIGHT
50. GRADUATED DRUM
51. GUN SIGHT ELEVATION CONTROL
52. GUN SIGHT LIGHT
53. GUN CAMERA
54. LDG.GR.EMER.UP BUTTON
55. LDG.GR.CONTROL HANDLE
56. EMER.LDG.GEAR HANDLE
57. DRAG CHUTE HANDLE
58. EMER.EXT.STORES REL. HANDLE
59. EMER.WHEEL BRAKE HANDLE
60. EMER.CANOPY JETT. HANDLE
61. CANOPY LOCKING HANDLE
62. ROUNDS COUNTER
63. COLLECT TANK FUEL QUANTITY ON LIGHT
64. FUEL QUANTITY INDIC.SELECTOR SWITCH

Fjure 1-4

Left Console

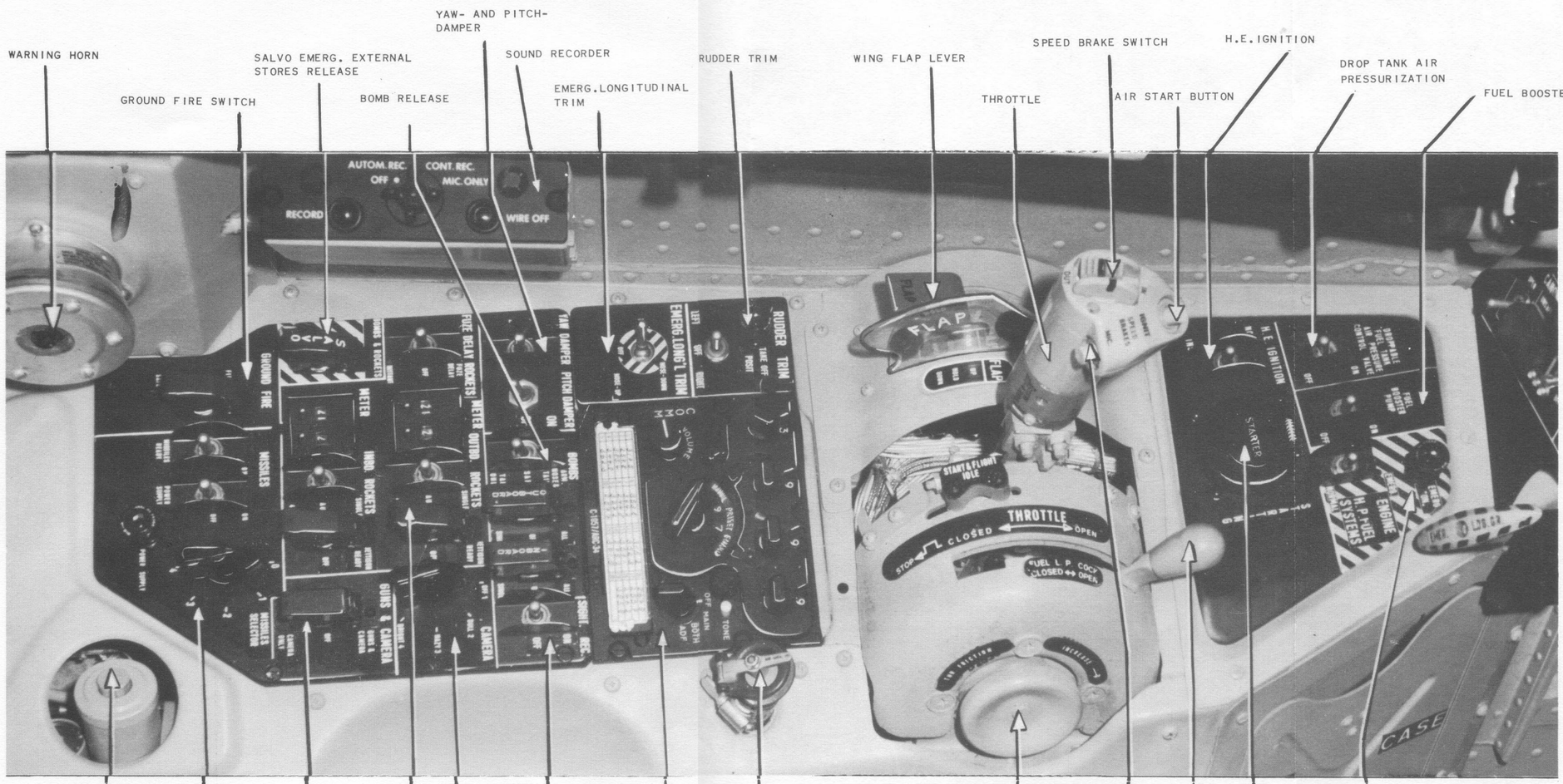


Figure 1-5

Right Console

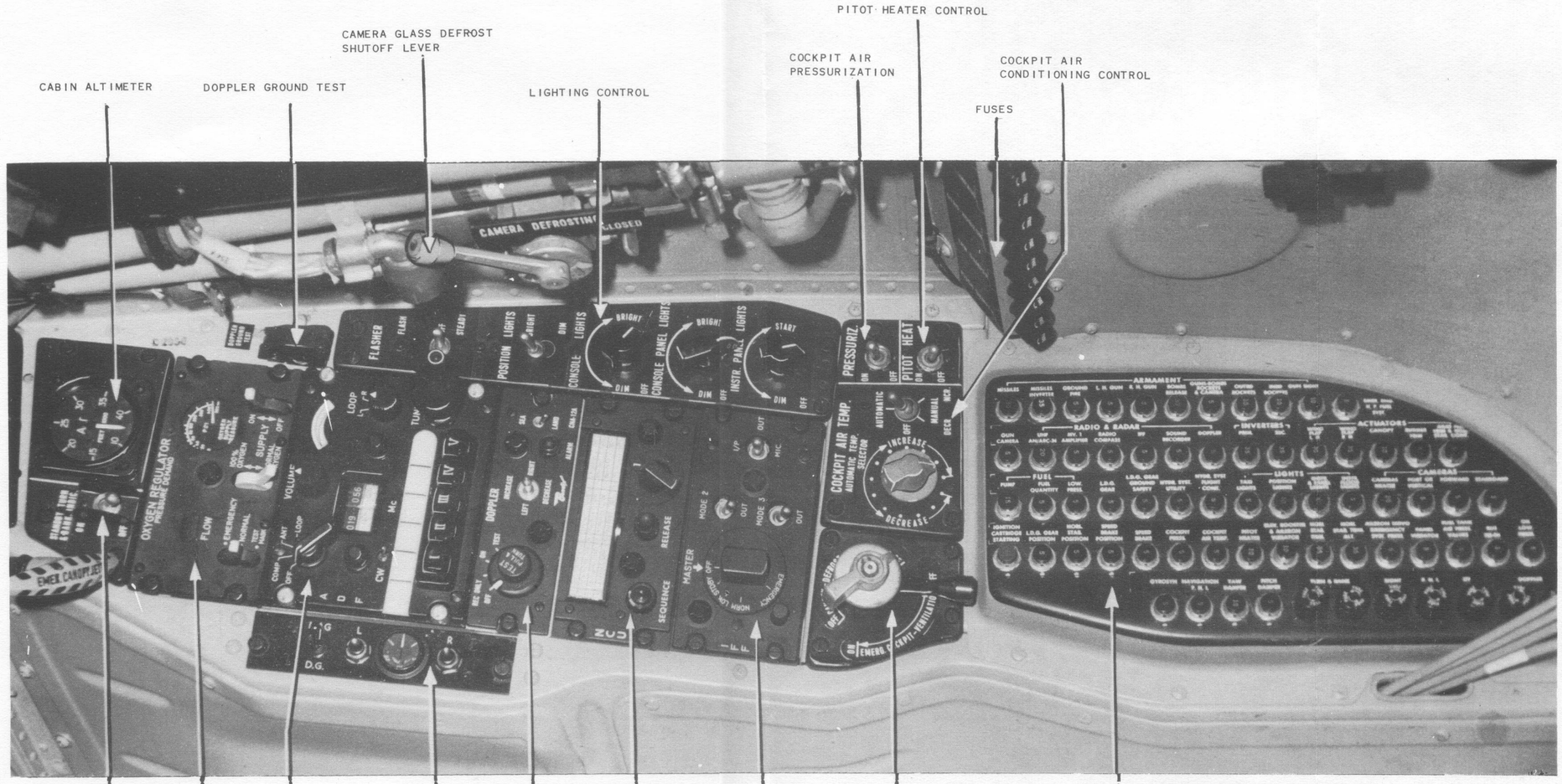


Figure 1-6

Engine Fuel H.P. Systems (Normal and Emergency)

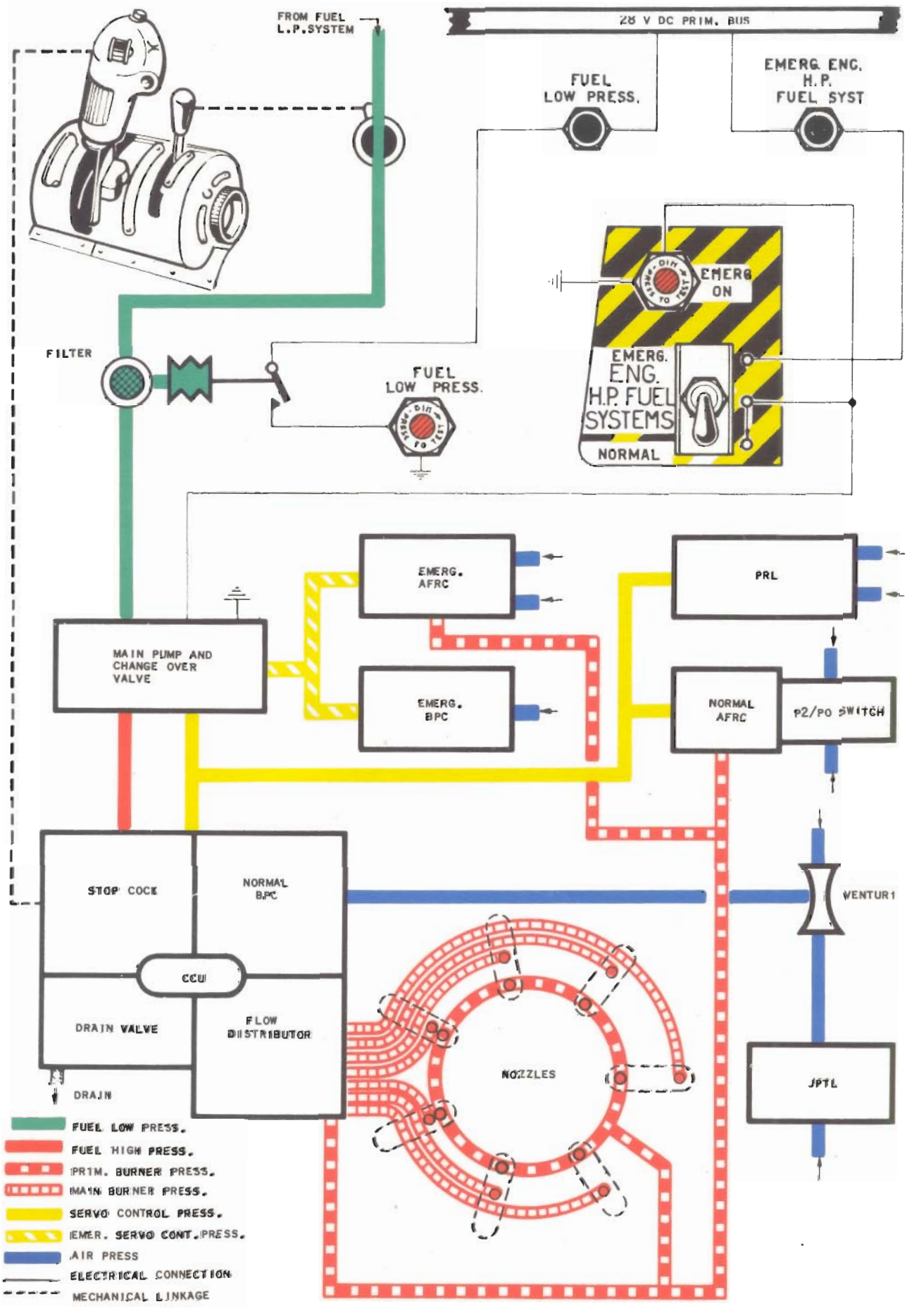


Figure 1-7

Throttle

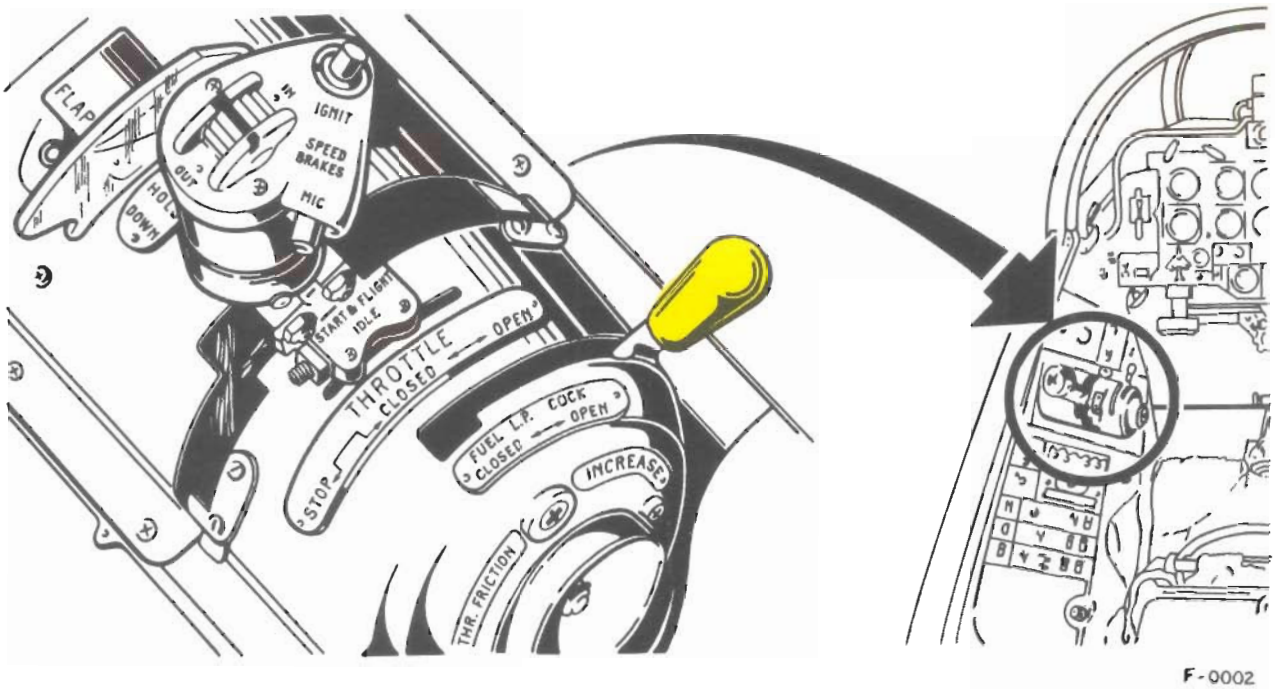


Figure 1-8

Engine Lubricating System

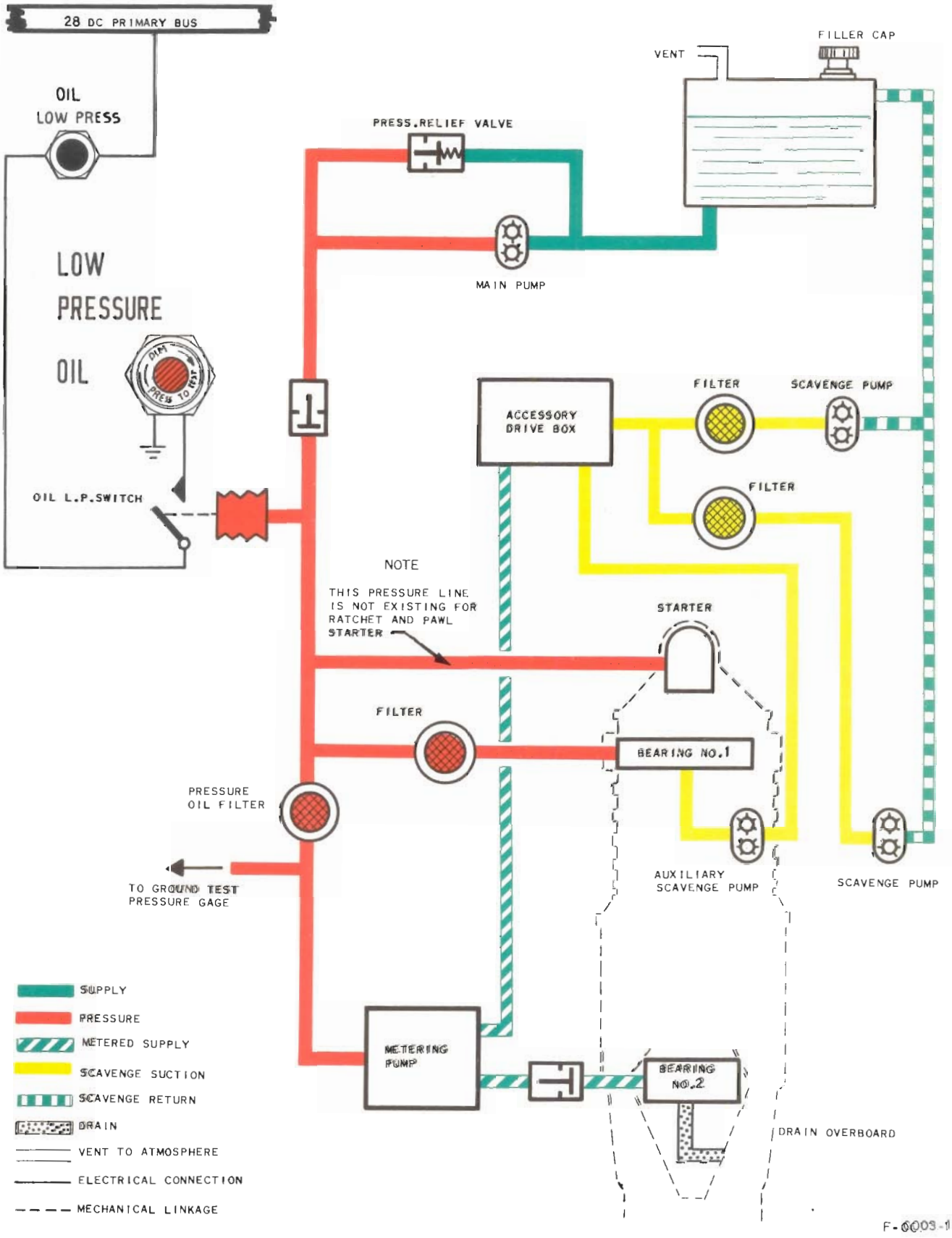


Figure 1-9

Fuel Low Pressure System

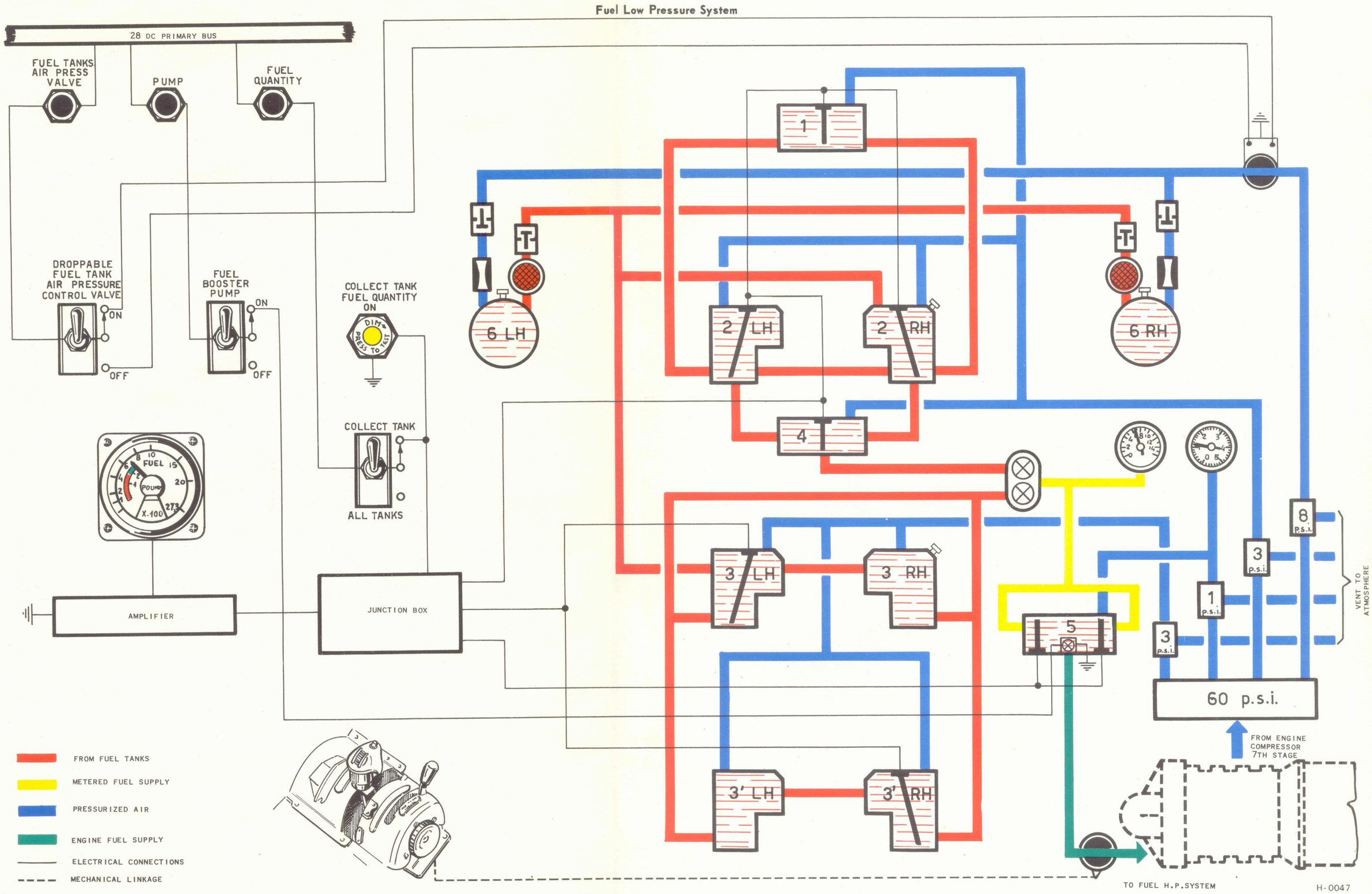
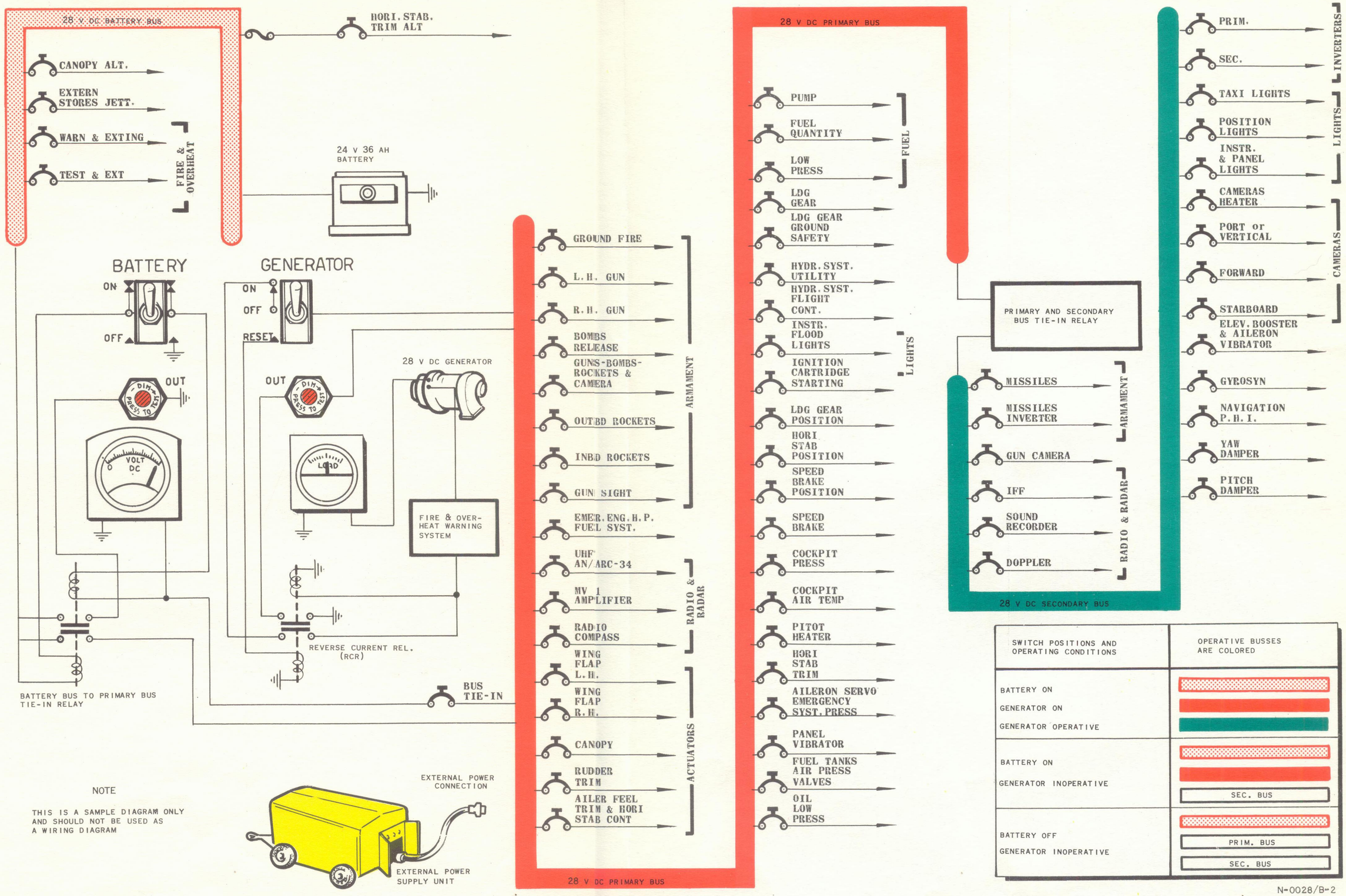


Figure 1-10

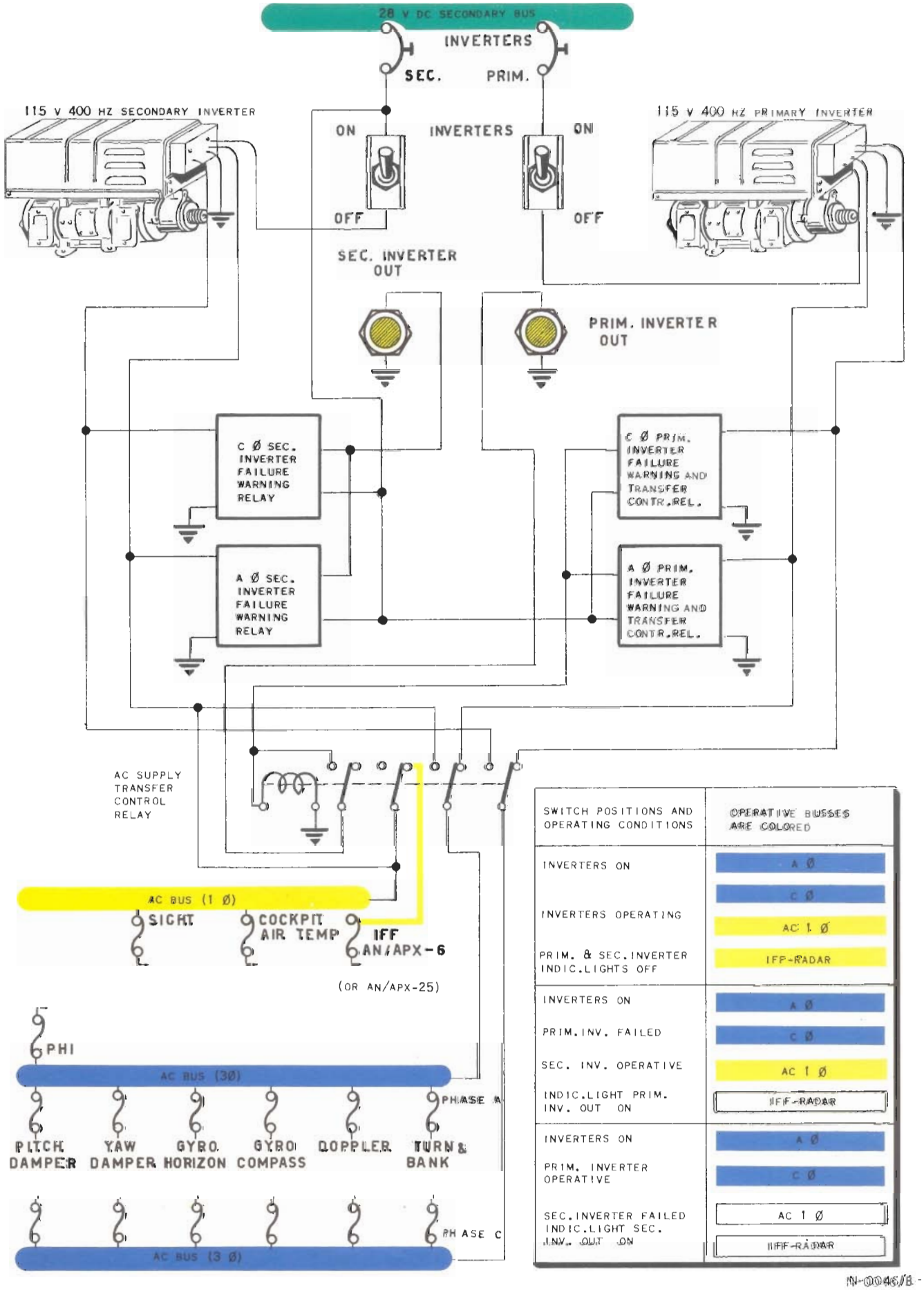


SWITCH POSITIONS AND OPERATING CONDITIONS	OPERATIVE BUSSES ARE COLORED
BATTERY ON GENERATOR ON GENERATOR OPERATIVE	
BATTERY ON GENERATOR INOPERATIVE	SEC. BUS
BATTERY OFF GENERATOR INOPERATIVE	PRIM. BUS SEC. BUS

N-0028/B-2

Figure 1-11

AC Electrical System



SWITCH POSITIONS AND OPERATING CONDITIONS	OPERATIVE BUSSES ARE COLORED
INVERTERS ON	A Ø
	C Ø
INVERTERS OPERATING	AC 1 Ø
PRIM. & SEC. INVERTER INDIC. LIGHTS OFF	IFF-RADAR
INVERTERS ON	A Ø
PRIM. INV. FAILED	C Ø
SEC. INV. OPERATIVE	AC 1 Ø
INDIC. LIGHT PRIM. INV. OUT ON	IFF-RADAR
INVERTERS ON	A Ø
PRIM. INVERTER OPERATIVE	C Ø
SEC. INVERTER FAILED INDIC. LIGHT SEC. INV. OUT ON	AC 1 Ø
	IFF-RADAR

N-0046/8

Figure 1-12

Cockpit Fuse And Circuit Breaker Panels

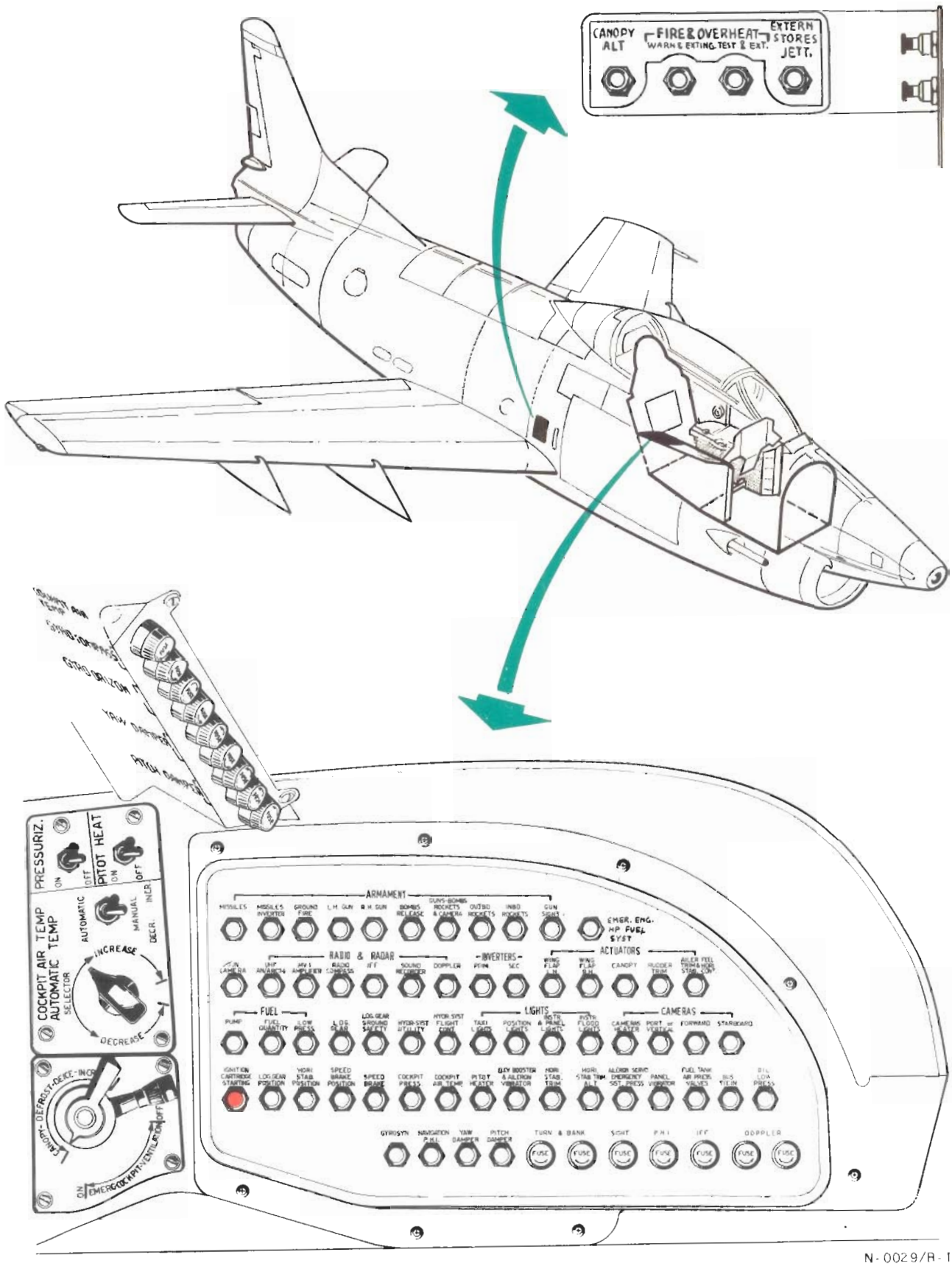


Figure 1-13

Utility Hydraulic System

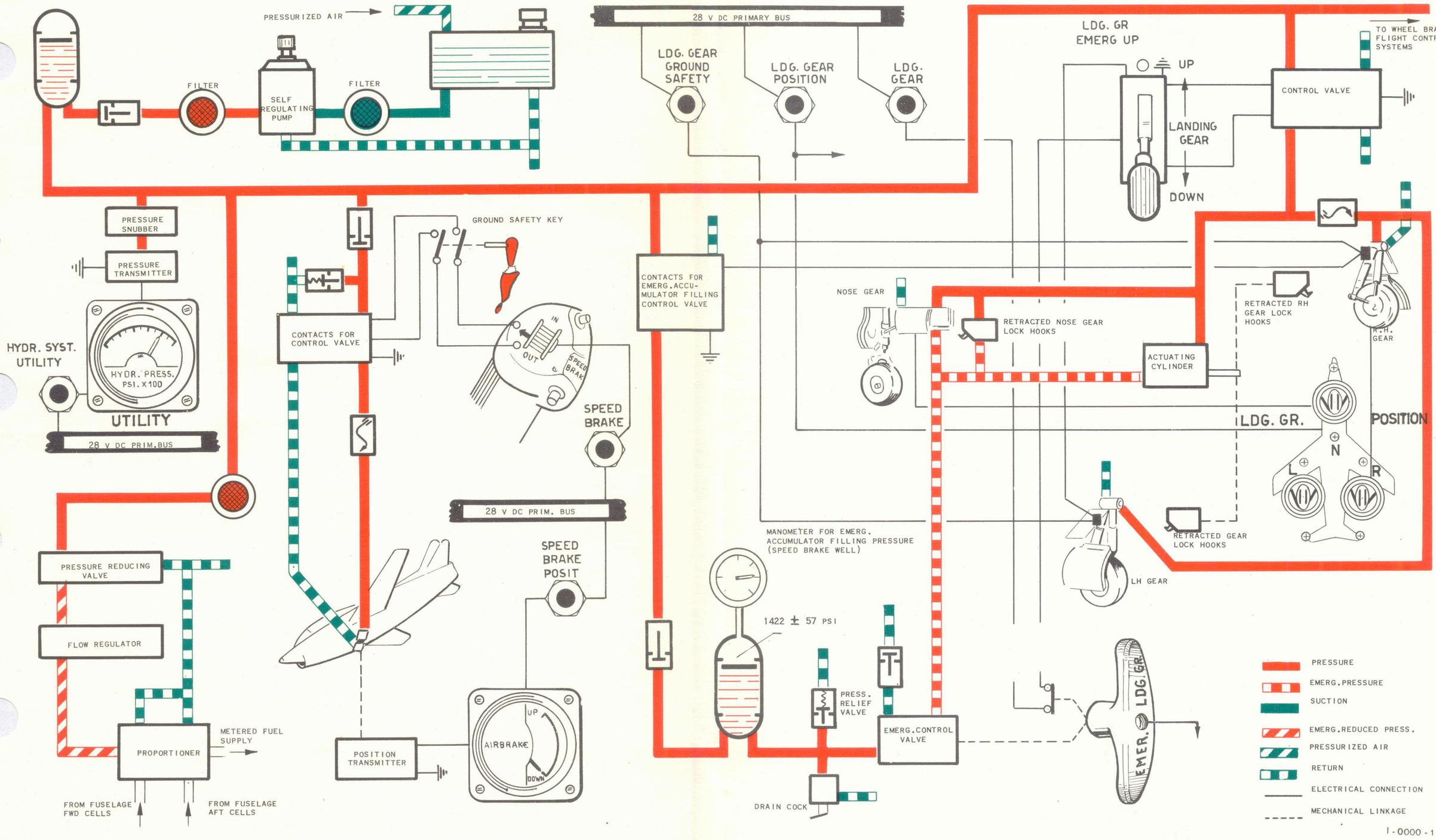


Figure 1-14

Artificial Feel System

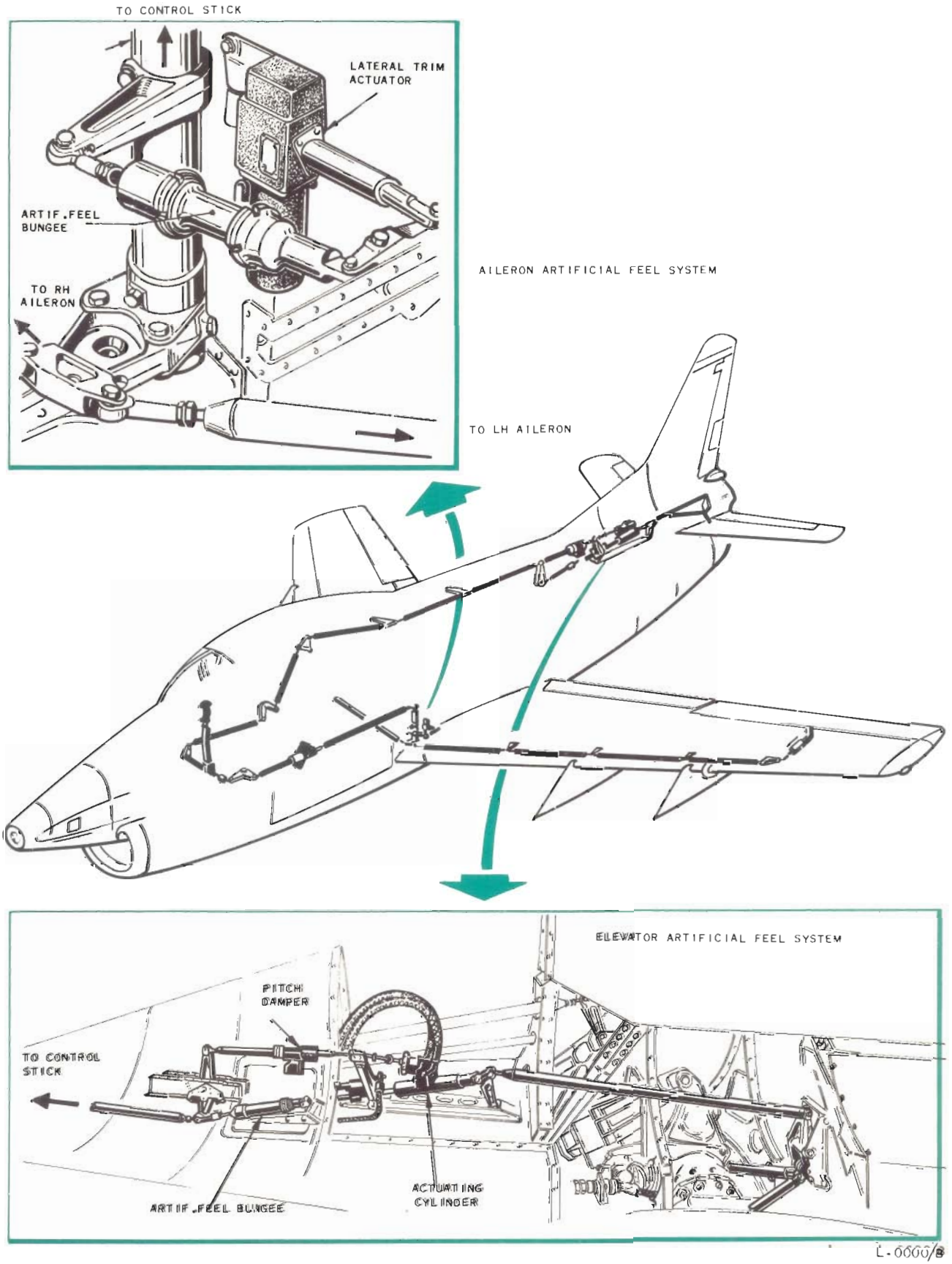


Figure 1-15

Pitch And Yaw Damper Systems

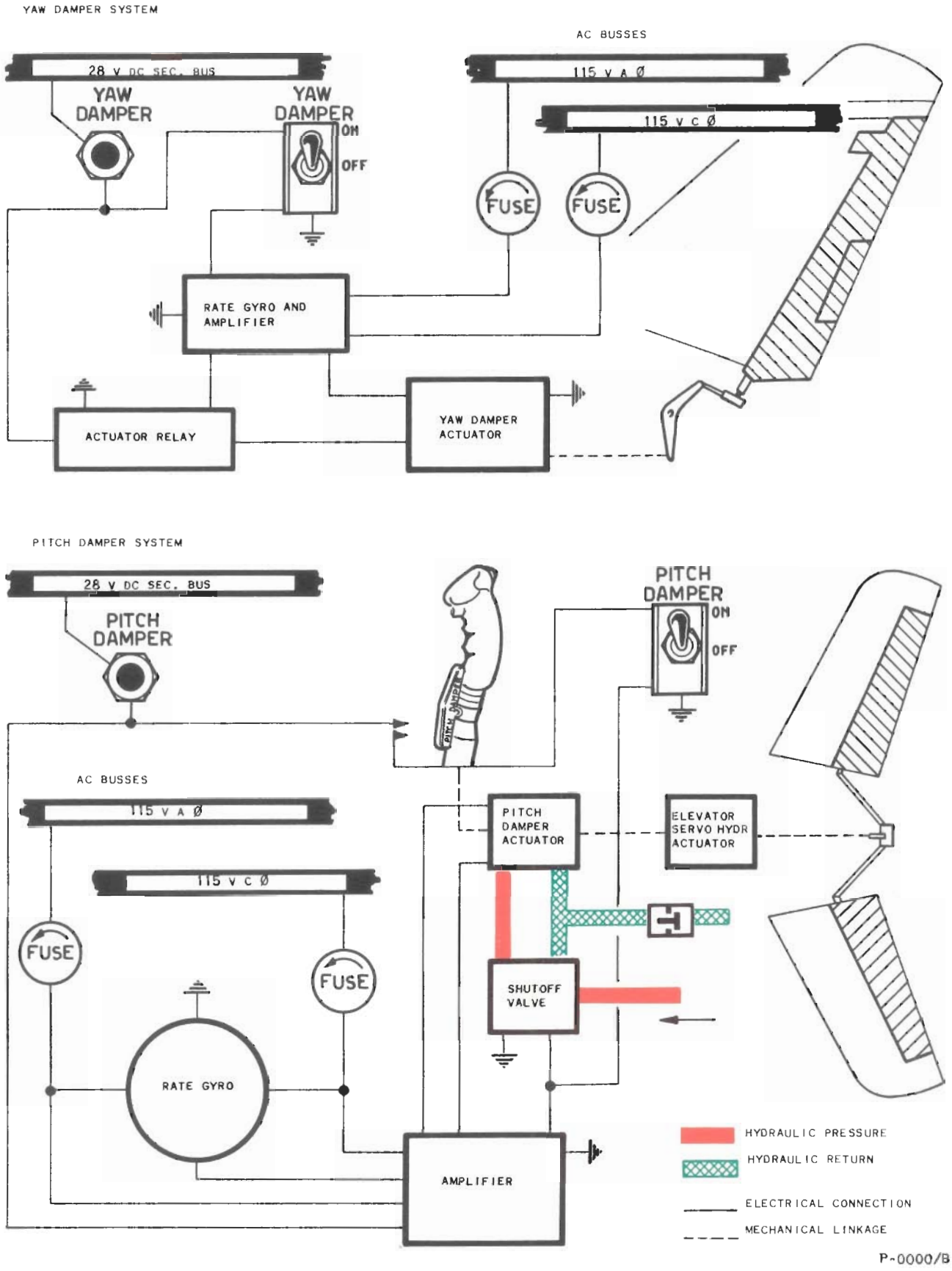


Figure 1-16

Control Stick Grip

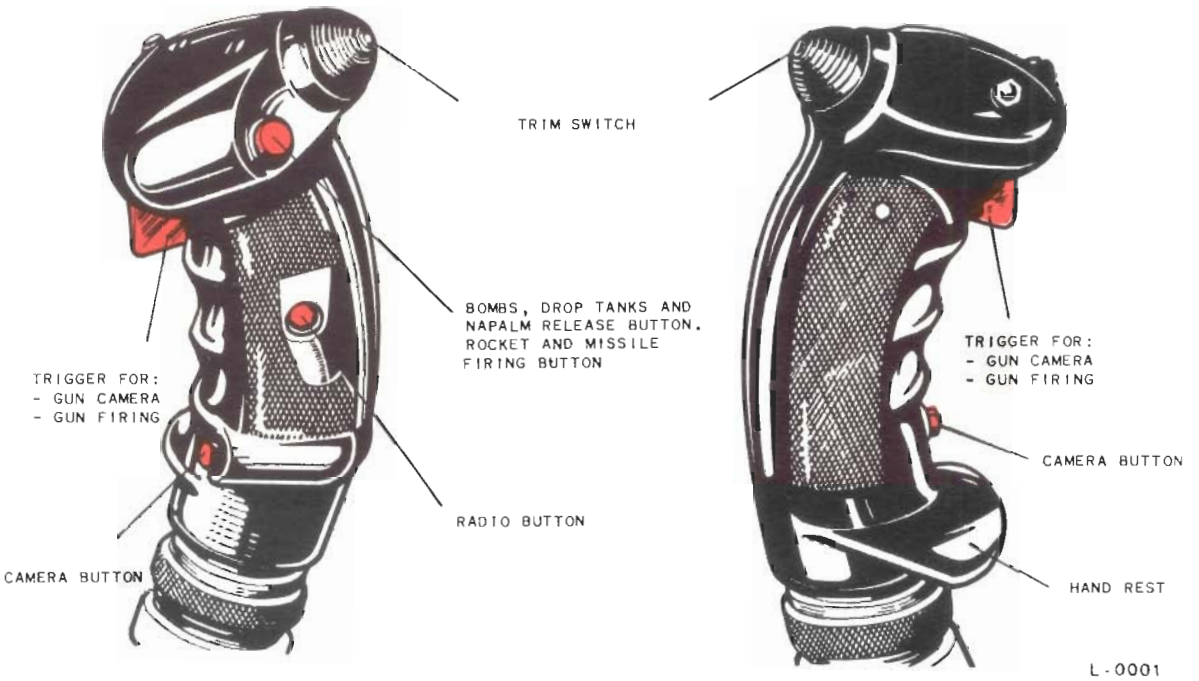


Figure 1-17

Rudder Pedals

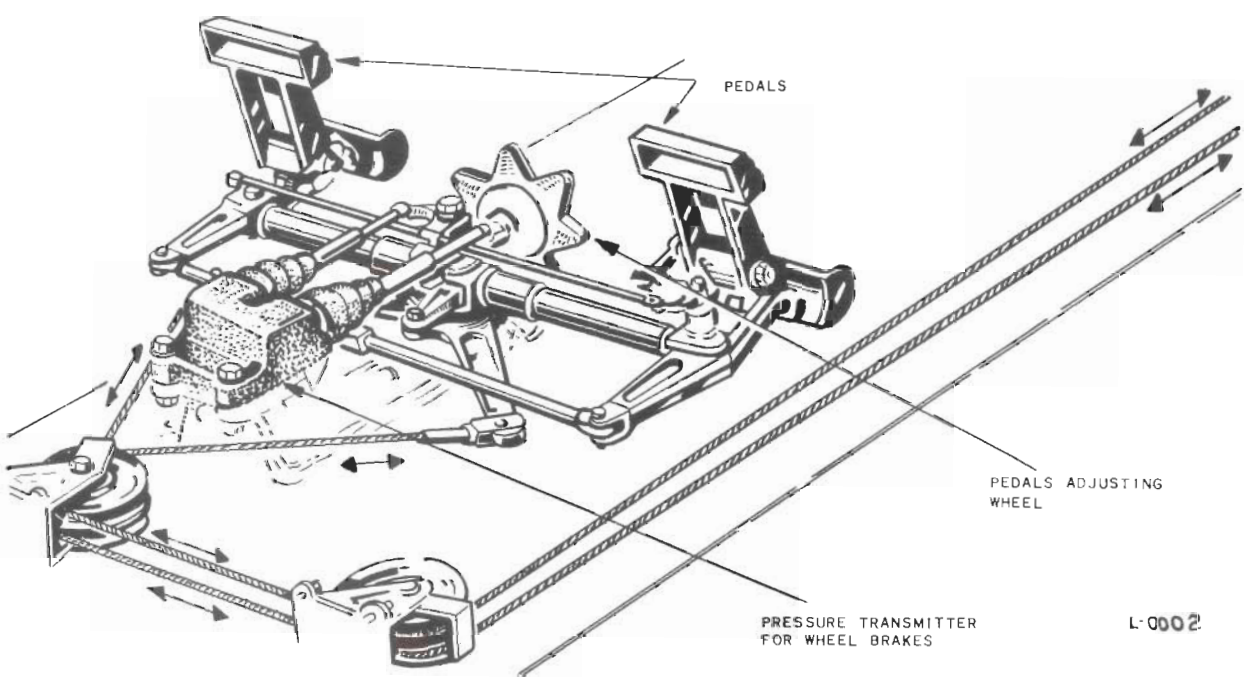
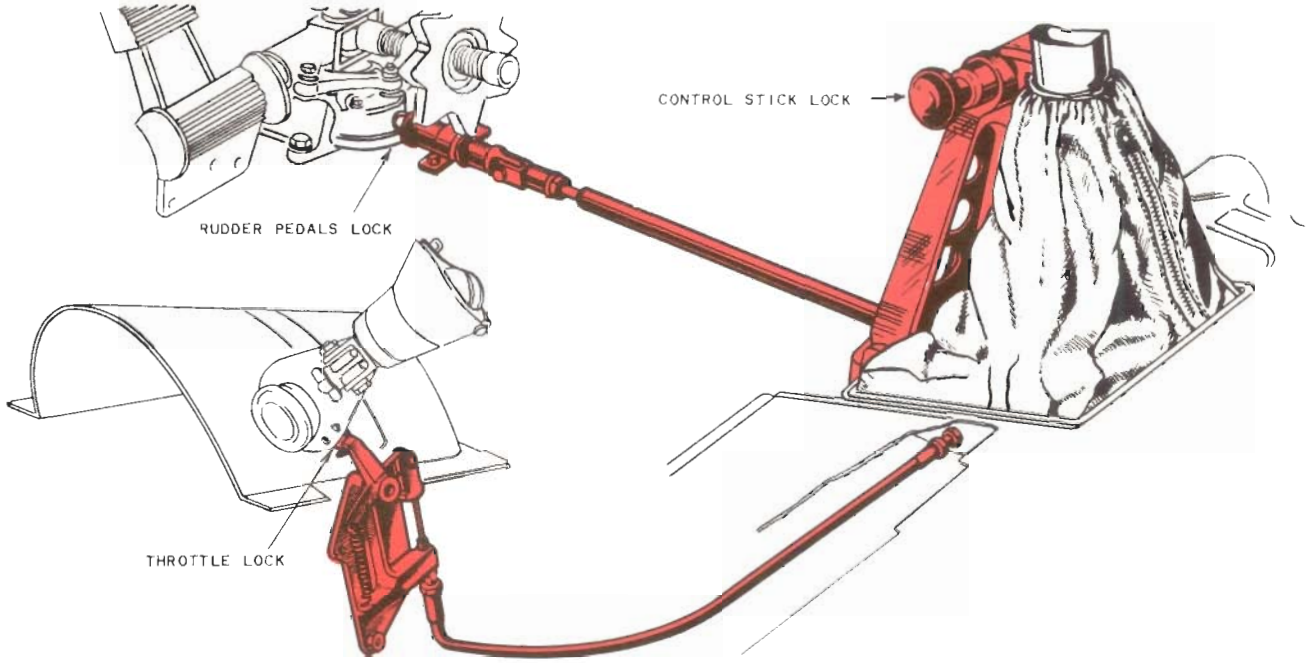


Figure 1-18

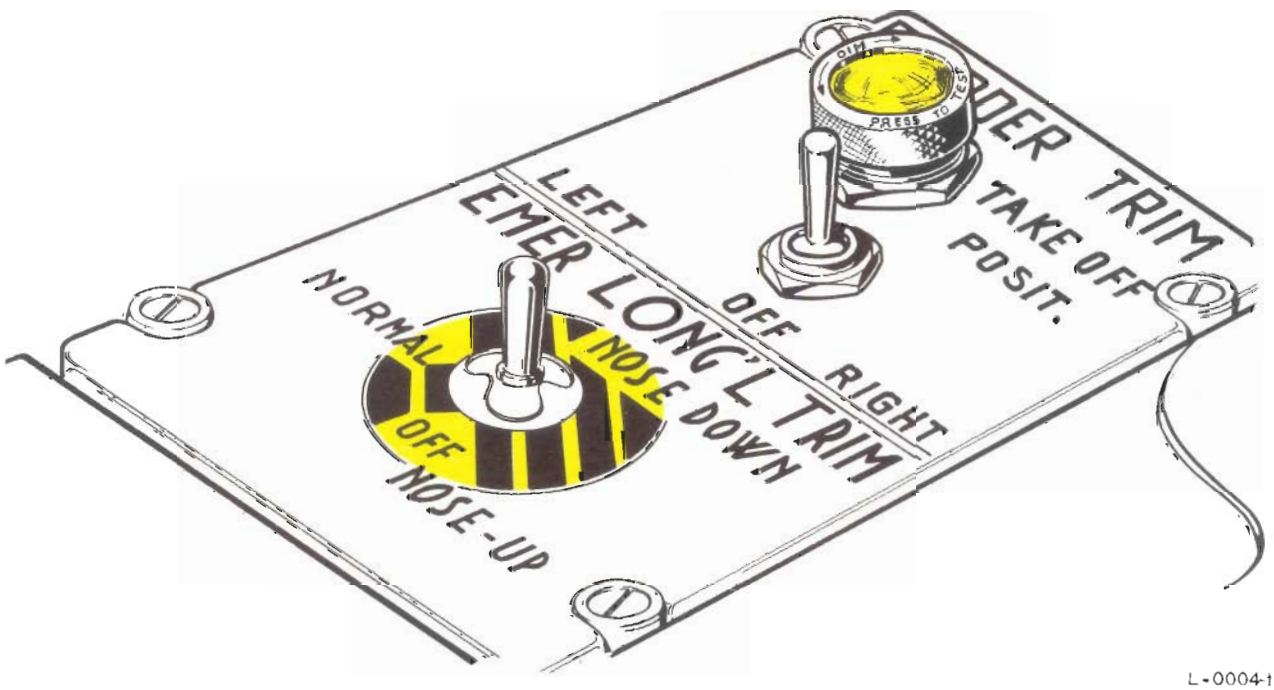
Flight Control Locks



L-0003-1

Figure 1-19

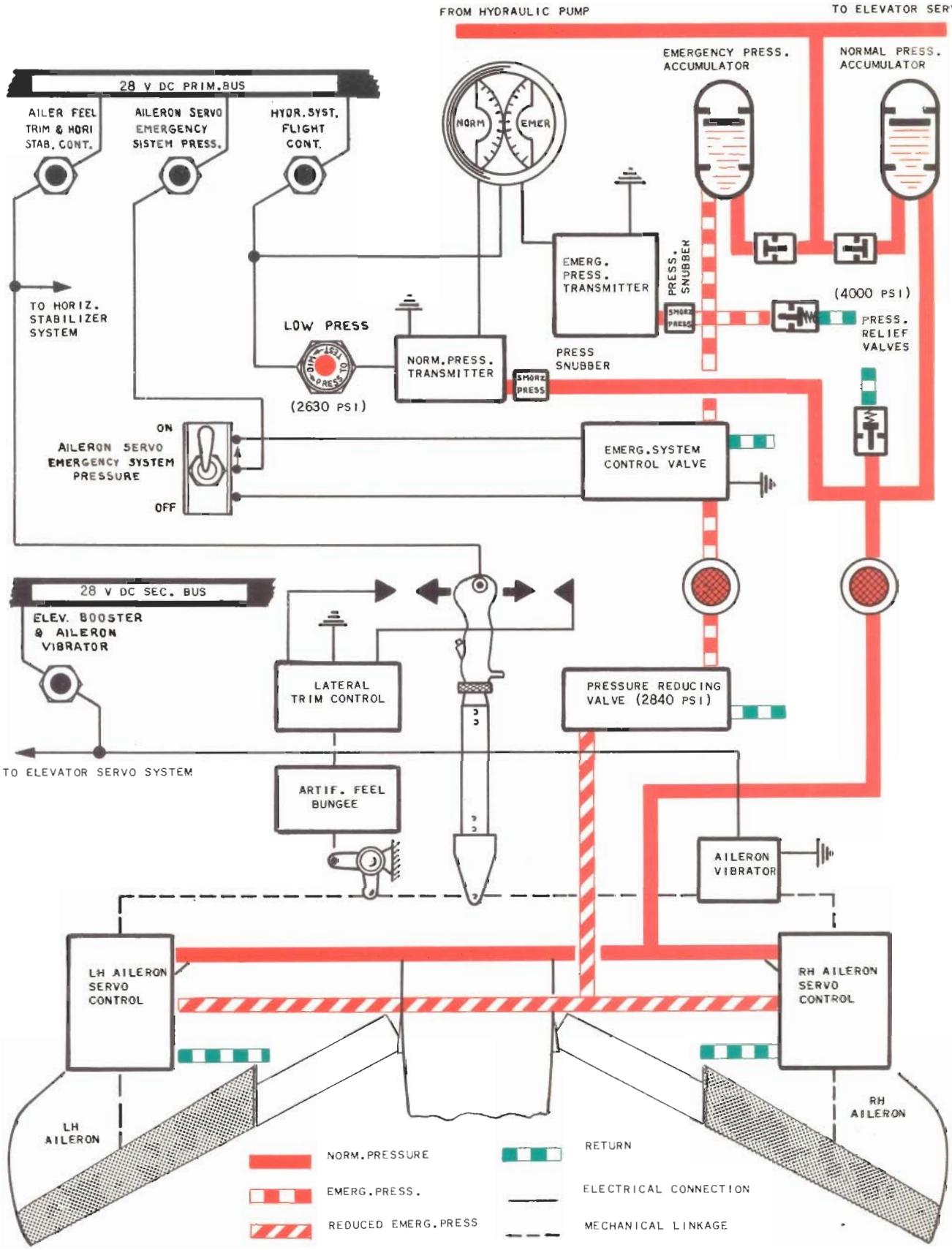
Trim Control Panel



L-0004-1

Figure 1-20

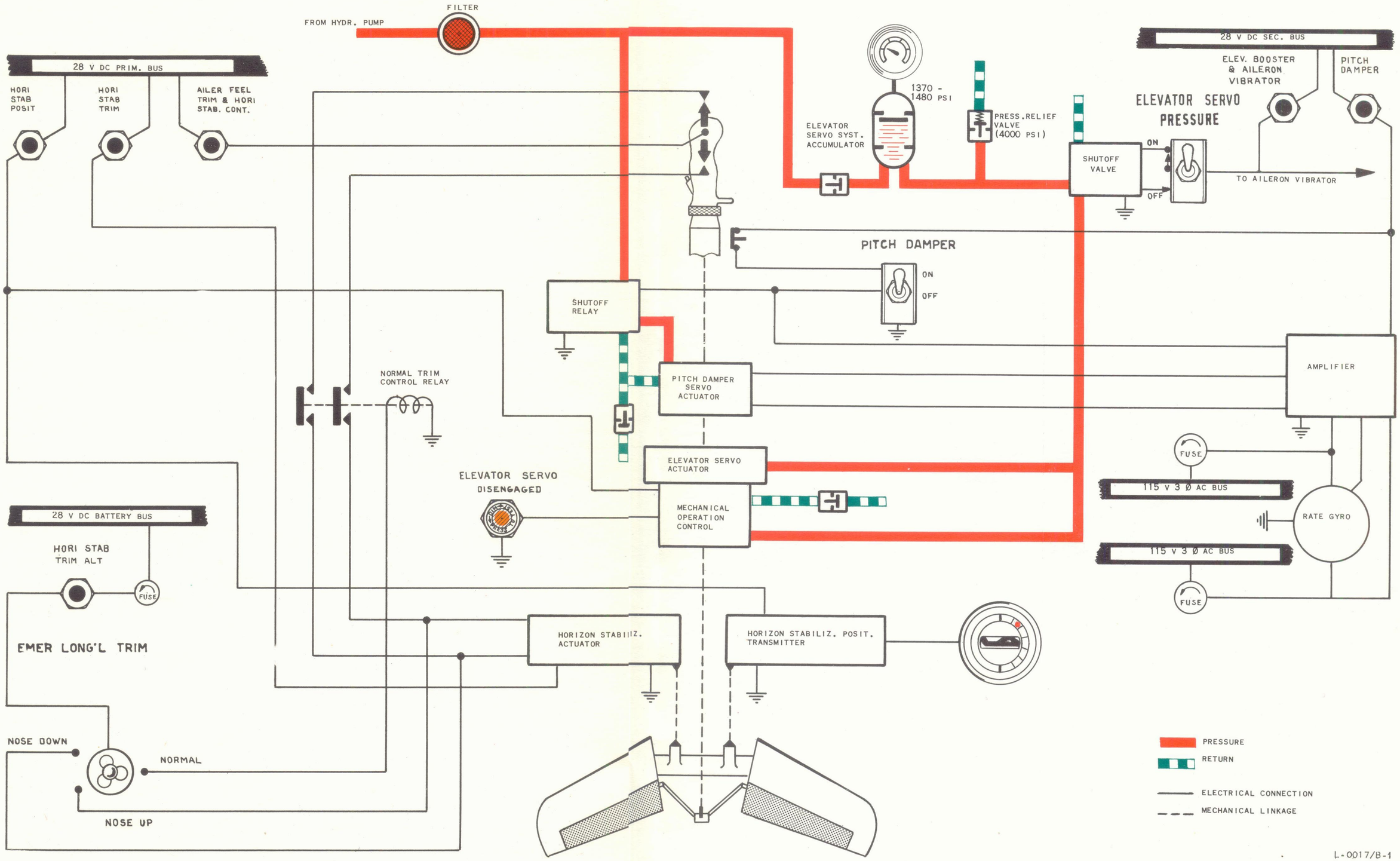
Aileron Servo System



L-0076

Figure 1-21/1

Elevator Servo System - Horizontal Stabilizer System - Pitch Damper System



L-0017/B-1

Figure 1-21/2

Nose Gear Ground Safety Lock

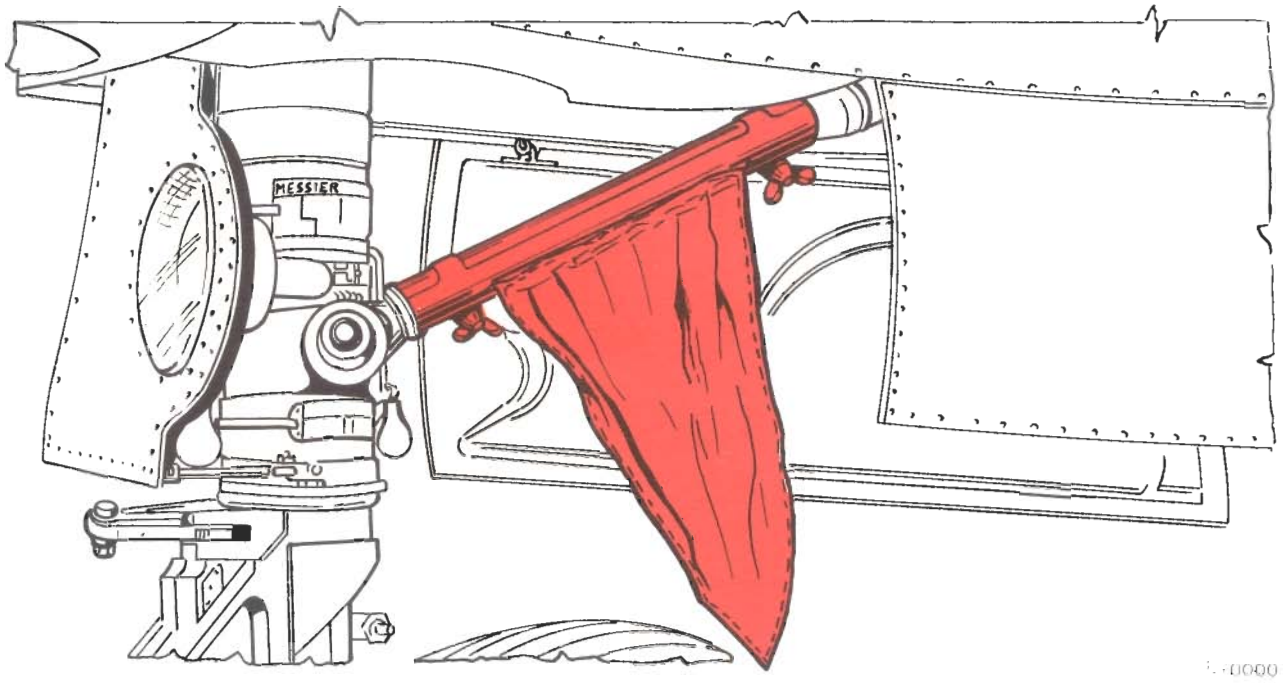


Figure 1-22

Landing Gear Position Indicator

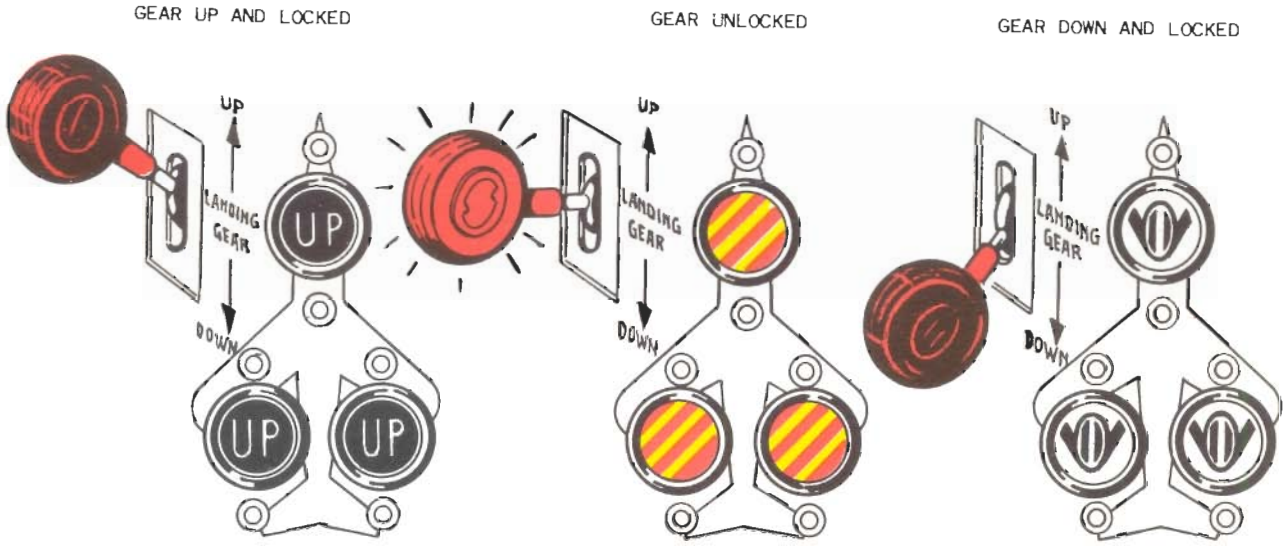


Figure 1-23

Antishimmy Device

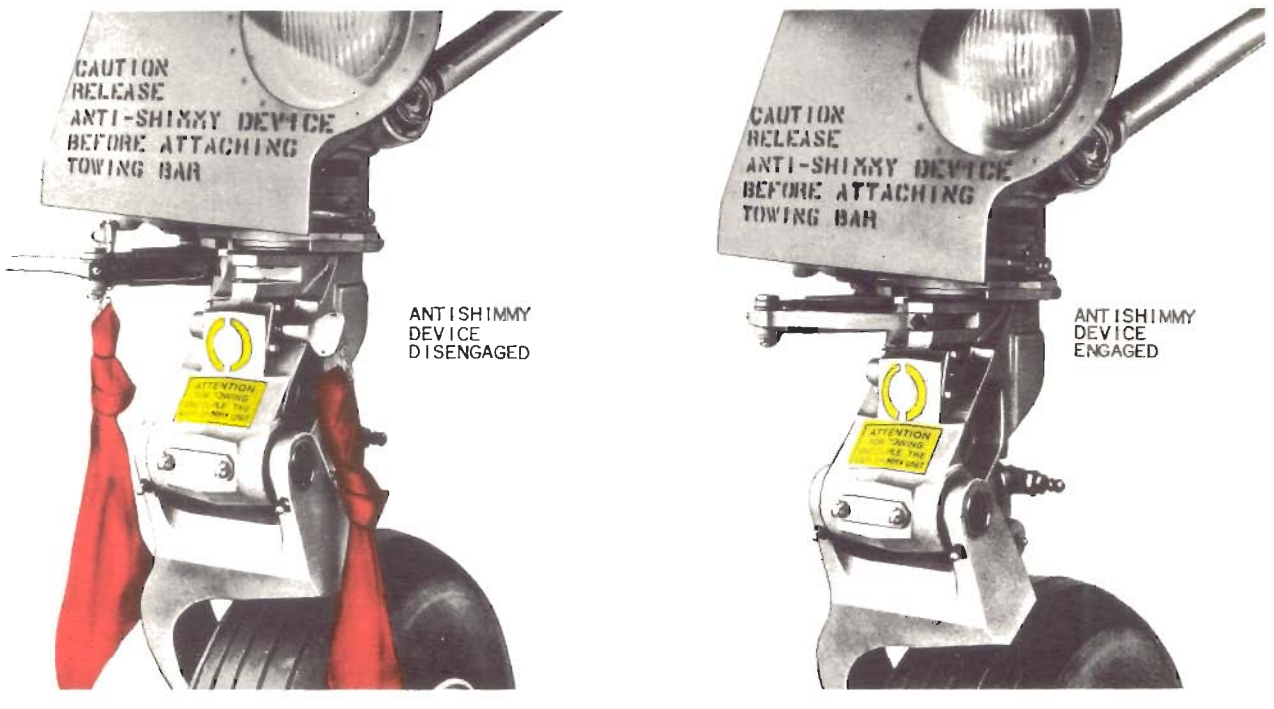


Figure 1-24

Wheel Brake System

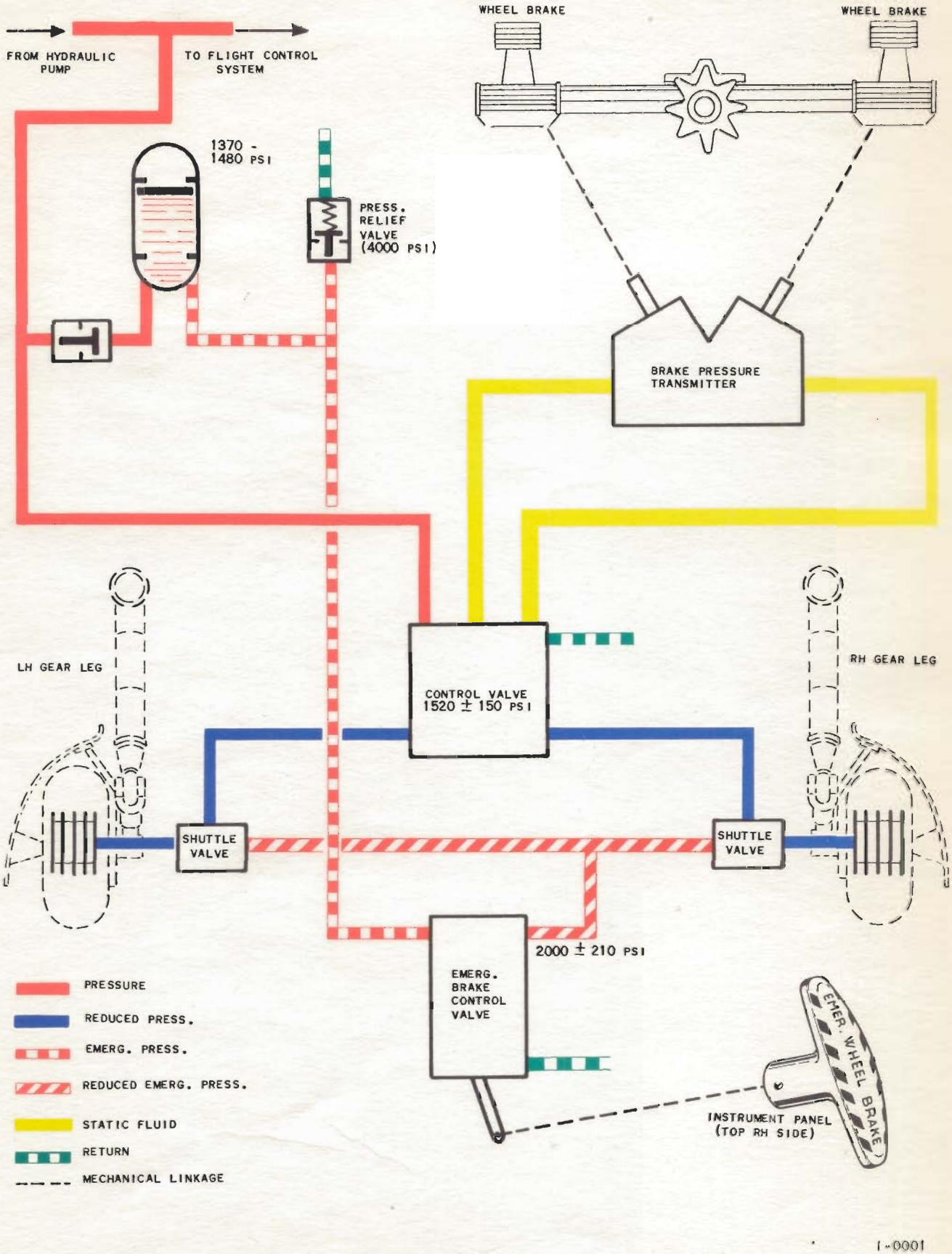


Figure 1-25

Drag Chute System

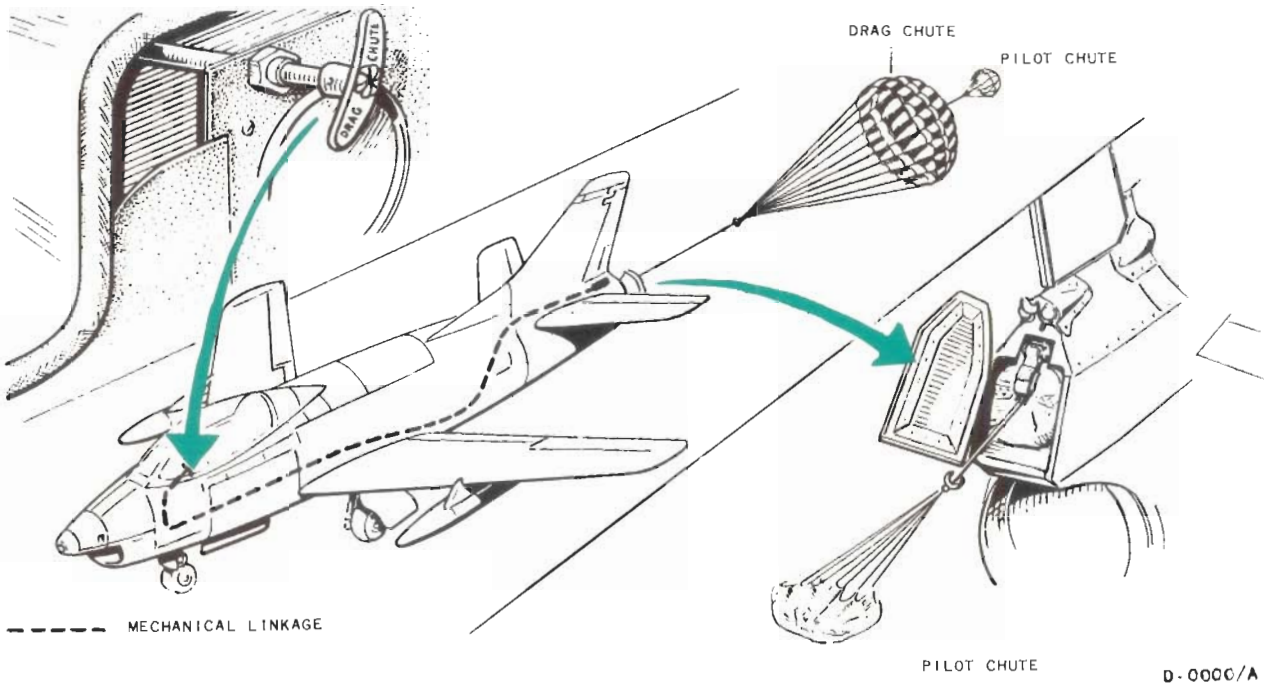


Figure 1-26

Fire And Overheat Warning System

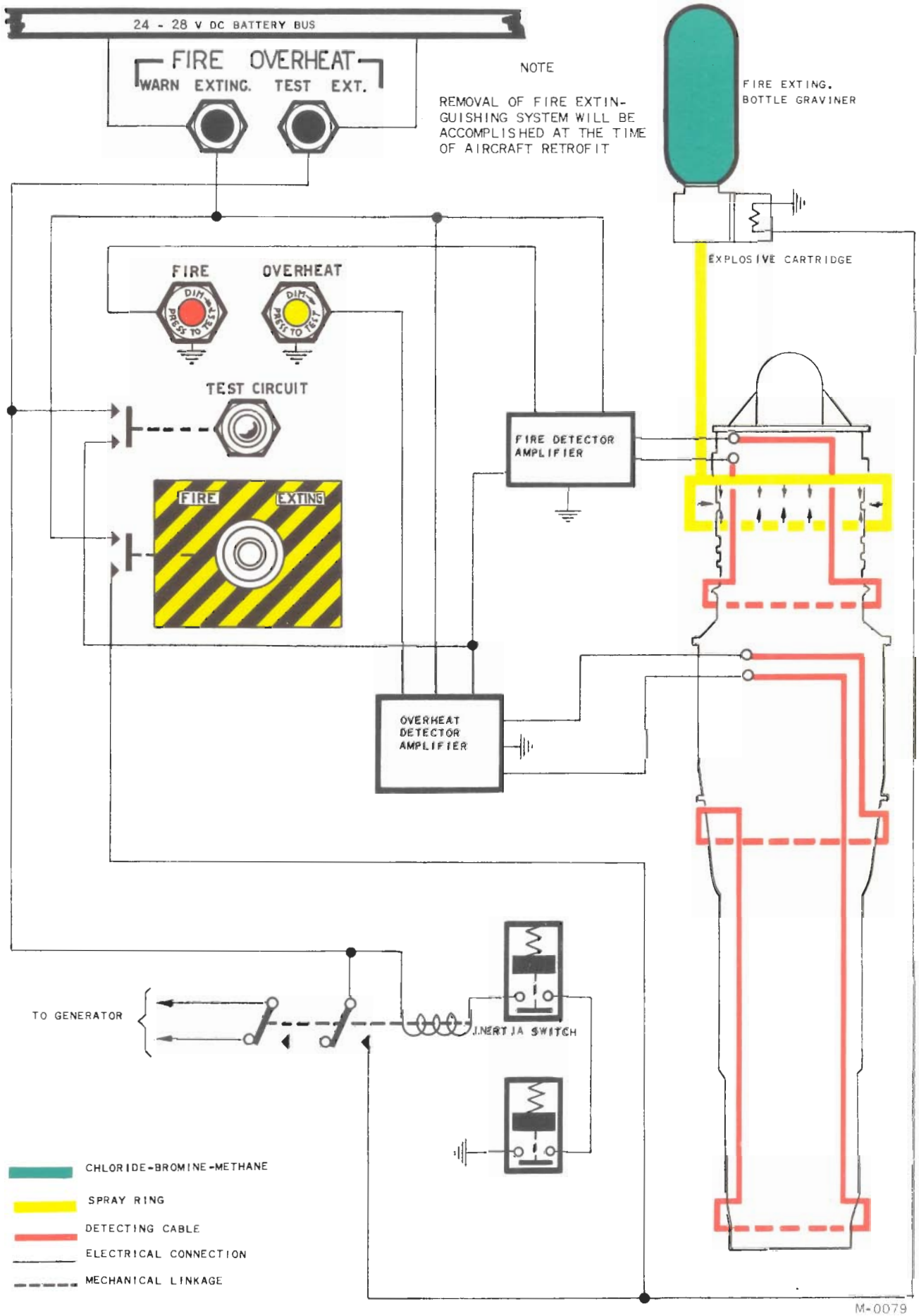


Figure 1-27

Canopy System

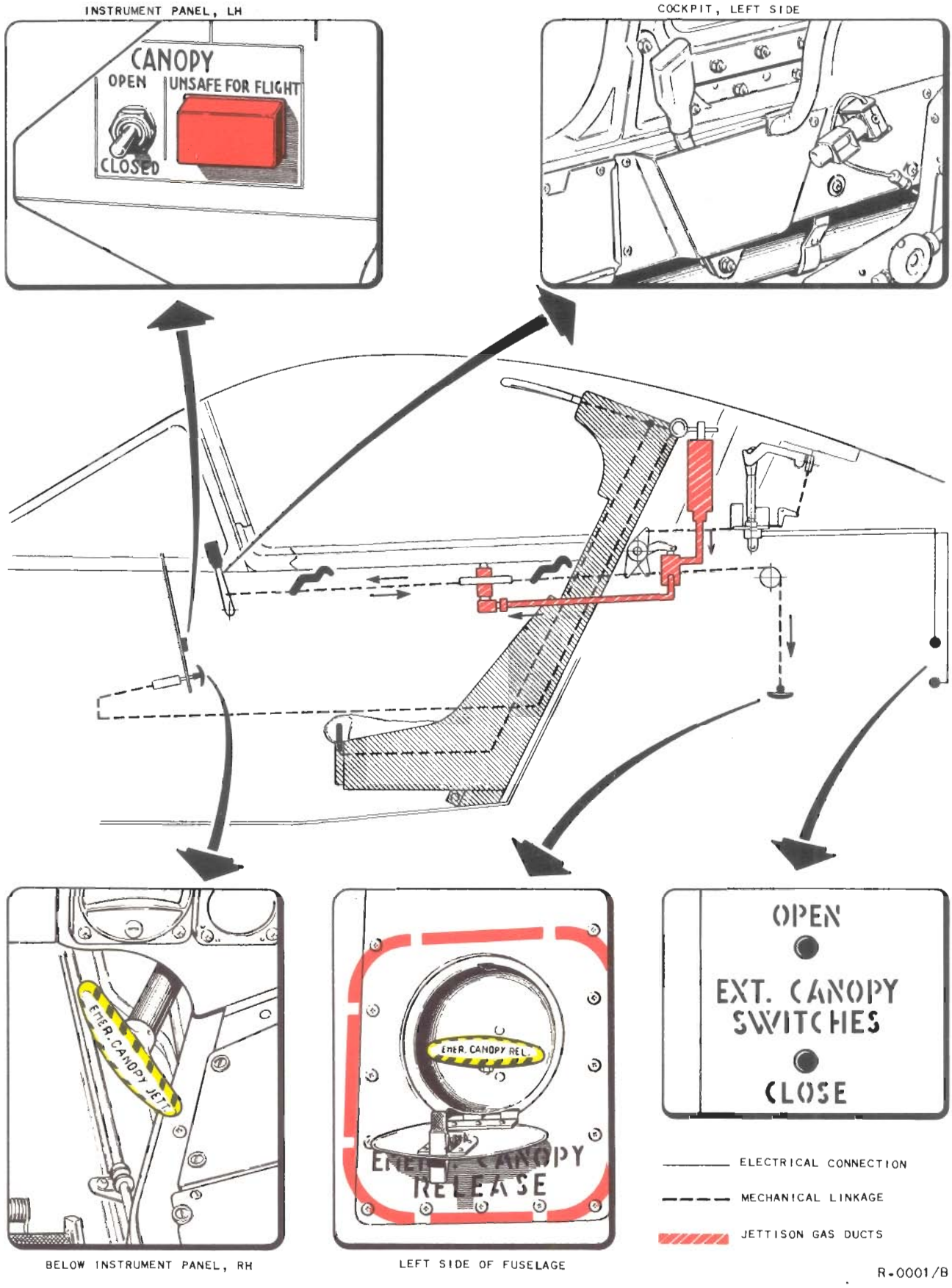
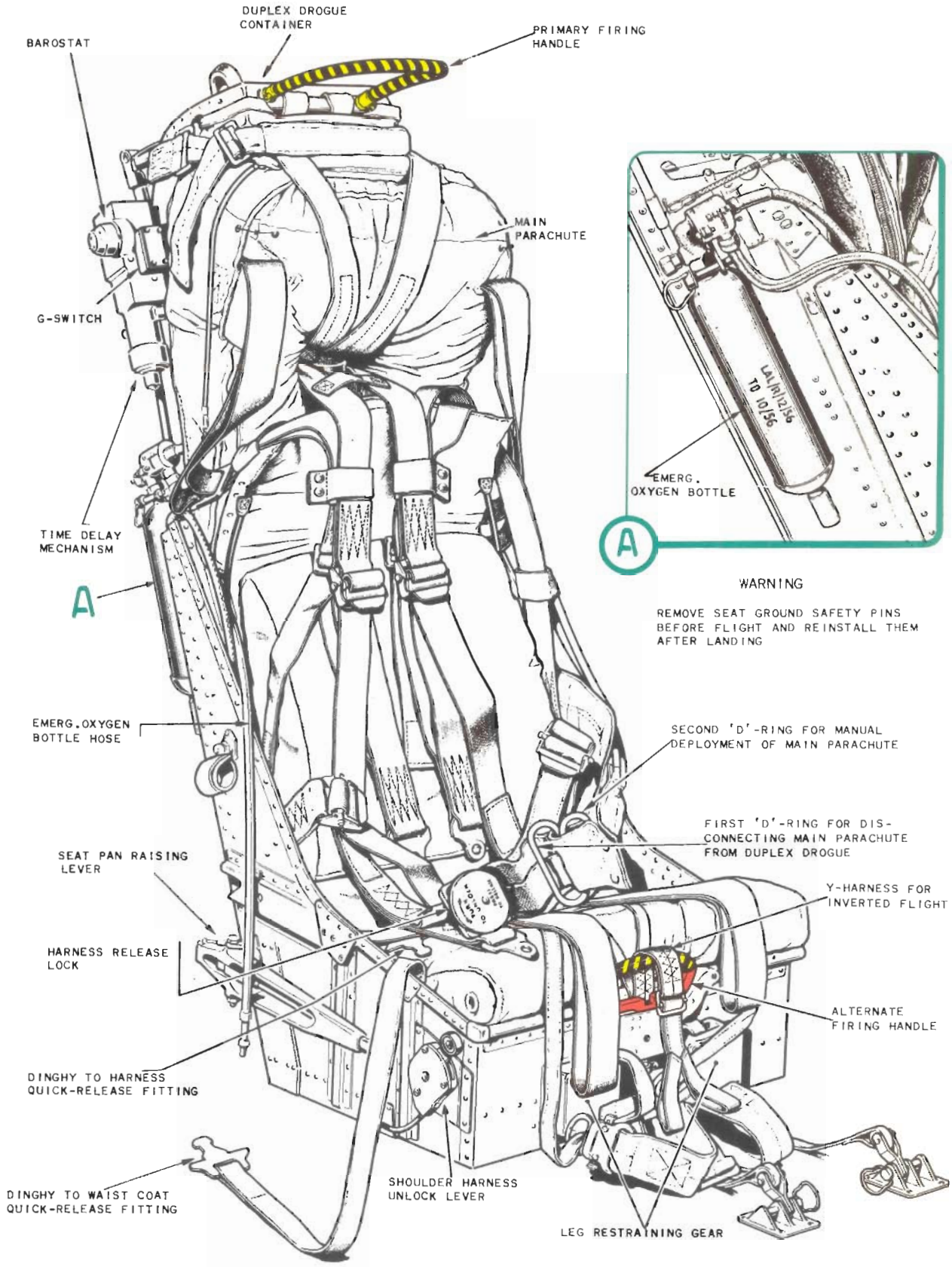


Figure 1-28

MARTIN BAKER MK-W4 Ejection Seat



R-0026-1

Figure 1-29

MARTIN BAKER MK-W4 Ejection Seat

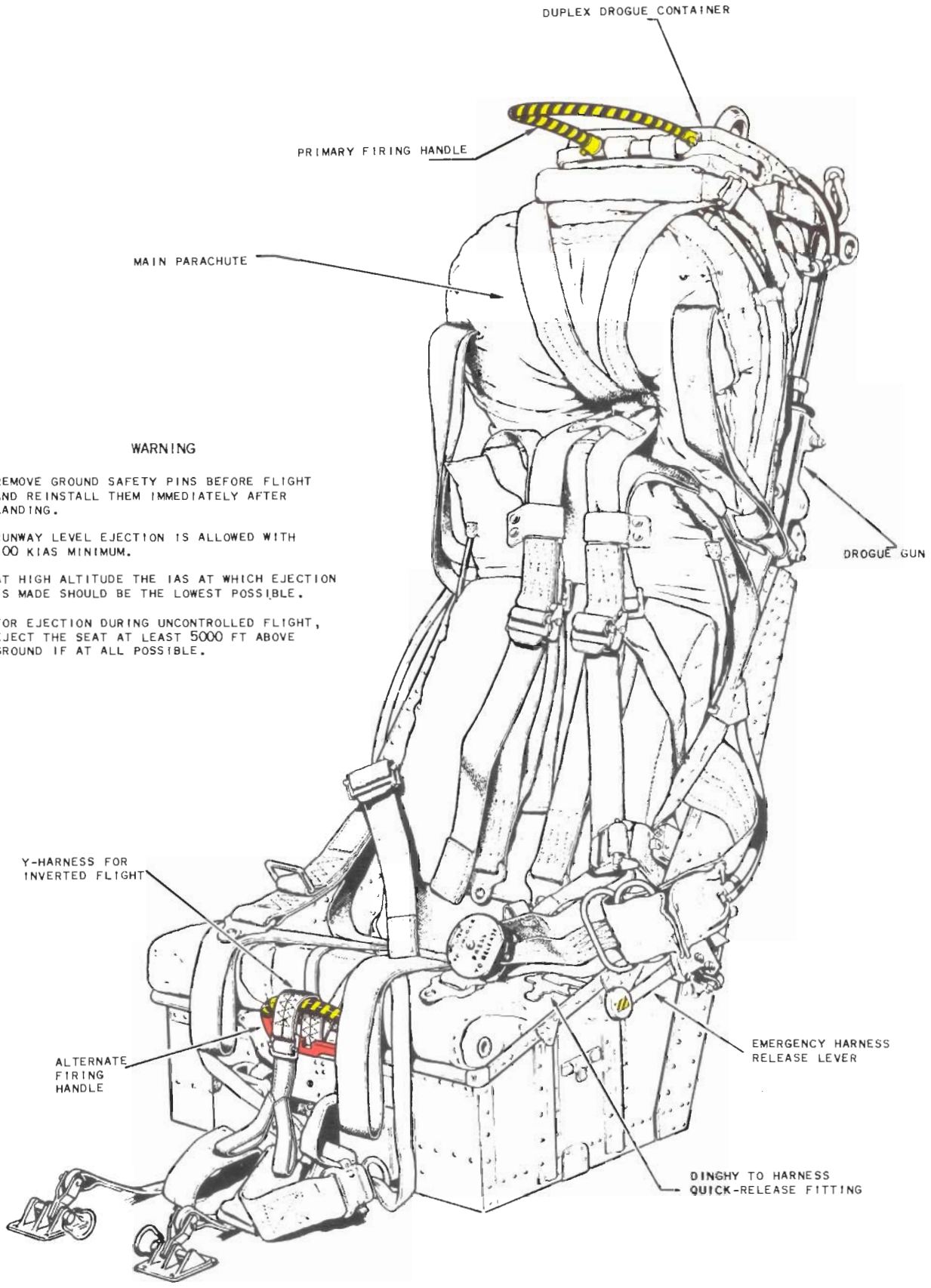


Figure 1-30

SECTION II NORMAL PROCEDURES

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GENERAL

Before each mission the pilot will perform the following detailed checks:

BEFORE EXTERIOR INSPECTION

Check:

1. Foreign objects, forgotten tools, etc.
2. All ejection seat straps properly connected and in perfect condition. Grasp both shoulder straps and pull hard to check whether securely fastened.

- Drogue gun connected. Knurled nut secured and sealed or knurled knob removed.
- Emergency oxygen bottle installed on seat.
- Normal firing handle in place.
- Ejection seat ground safety pins (3 on seat headrest, 1 in alternate firing handle, and 1 for emergency oxygen bottle) installed.

3. Oxygen system pressure: 400 psi minimum.
4. EMERG.EXT.STORES REL. handle in and secured.
5. EMERG. CANOPY REL. HANDLE - IN.
6. PHI-JUNCTION BOX - SET.

EXTERIOR INSPECTION

Perform exterior inspection as outlined in fig. 2-1, starting from the left hand side of the aircraft at the wing root and going clockwise around the aircraft.

The first thing the pilot has to do is check the aircraft log (DD form 781) that the aircraft is properly equipped and loaded for the flight and mission. The crew chief will assist the pilot during this inspection. For a gunnery mission the armament specialist will also assist the pilot.

Note

If the aircraft is not at its home base, the pilot must be able to execute the duties of the crew chief himself.

LEFT FORWARD FUSELAGE

Check :

1. Battery access door closed and secure.

Note

If the aircraft is not at its home base, check battery connection to aircraft.

2. Left hand side of canopy for general condition and cracks.
3. LH gun compartment door secure and gun plug inserted.

WARNING

Before a gunnery mission, check gun plugs removed and expended ammunition compartment empty.

4. All doors locked.
5. All air inlets and outlets clear.

NOSE

6. Nose secured and camera windows clean.
7. Engine air intake cover removed.
8. Check ground area and air intake duct for foreign objects.
9. Doppler antenna cover for damage.

NOSE GEAR AND WHEEL WELL

1. Hydraulic leaks.
2. Nose gear microswitch for operation.
3. Springs and hooks for condition and position.

4. Pitot drains.
5. Side doors and hinges for general condition.
6. Nose gear ground safety lock removed.
7. Nose gear door and taxi light.
8. Anti-shimmy device engaged.
9. Shock strut extension.
10. Nose wheel and tire for general condition, wear, inflation, etc.

RIGHT FORWARD FUSELAGE

1. Right hand side of canopy for general condition and cracks.
2. RH gun compartment door secure and gun plug inserted.

WARNING

Before a gunnery mission, check gun plugs removed and expended ammunition compartment empty.

3. All doors locked.
4. All air inlets and outlets clear.

RIGHT HAND SPEED BRAKE WELL

1. Hydraulic leaks.
2. Speed brake for general condition (distortion or breaks).
3. Speed brake position transmitter for general condition.
4. Pitot drains (in front of speed brake).

RIGHT MAIN GEAR WELL

1. Hydraulic and fuel leaks, especially in the area of the fuel proportioner.
2. Main gear fairing door for general condition.
3. Springs and hooks for general condition and position.
4. Microswitch for operation.
5. Hydraulic lines to wheel brake assembly and brake linings for condition.
6. Shock strut extension.
7. Wheel and tire for general condition, wear, inflation, slippage marks, etc.
8. Aircraft grounding wire.
9. Wheel chocked.
10. Strut, fairing, and linkage for general condition.

UPPER RIGHT FUSELAGE

1. Filler caps secure.
2. Doors and fairings (RH side and top) locked.
3. Identification light behind the canopy for condition.
4. Wing upper skin for dents, scratches, etc.

RIGHT WING

1. Leading edge and boundary layer fence.
2. Inner pylon and drop tank securely fastened to pylon (drop tank filler cap closed).
3. Outer pylon and stores.
4. Pitot cover removed and pitot tube.
5. Pitot static system - drain.
6. Wing tip and position light.
7. Aileron for general condition.
8. Flap for general condition and excessive play.

AFT FUSELAGE SECTION - RH SIDE

1. Pitot static system - drain.
2. Through right engine bay access door, check for hydraulic, oil, and fuel leaks, broken or burned electric cables. Leave door open (will

be closed by crew chief after engine has been started).

CAUTION

Make sure that the starting cartridge breeches have been properly secured (see "Precautions for Reloading"). Avoid overtightening of caps since this may cause jamming and subsequently difficulty in removal after firing.

Check :

3. All removable fairings and access doors closed and locked. (Check for fuel leakage from collect tank.)
4. All air inlets, outlets, and drains clear.

EMPENNAGE AND TAIL

1. Elevator servo accumulator gauge through the inspection window for 1370 - 1480 psi reading (after operating pressure has been reduced to zero).
2. All fairings and doors closed.
3. Horizontal stabilizer for play and general condition.
4. Elevator for free movement and self-centering, play and general condition.
5. Rudder for free movement, trim tab for excessive play.
6. Position lights.
7. Drag chute installed compartment door locked.
8. Tailpipe cover removed.
9. Tailpipe, thermocouples, and JPTL limiter for general condition, cracks, breaks and distortion.
10. Turbine for missing, damaged or burnt off buckets.

AFT FUSELAGE SECTION - LH SIDE

1. Through LH engine bay access door, for hydraulic and engine oil leaks, broken or burnt cables. Oil level and filler cap secured. Leave door open (will be closed by crew chief after engine has been started).
2. Through engine bay bottom access door, for hydraulic, fuel, and engine oil leaks. Leave door open (will be closed by crew chief after engine has been started).
3. All doors and removable fairings locked.

CAUTION

If at other than home base, check hydraulic fluid and oil levels. Add oil, if necessary.

4. All drains and vents clear.
5. Fuel leaks from collect tank access door.
6. Armored plates (bottom fuselage) closed and locked.

LEFT WING

1. Flap for general condition.
2. Aileron for general condition.
3. Wing tip and position light.
4. Pitot cover removed and pitot tube.
5. Leading edge and boundary layer fence.
6. Outer pylon and stores.
7. Inner pylon and drop tank securely fastened to pylon (drop tank filler cap closed).

LEFT MAIN GEAR WELL

1. Hydraulic and fuel leaks, especially in the area of the fuel proportioner.
2. Main gear door.

3. Springs and hooks for general condition and position.
4. Microswitch for operation.
5. Hydraulic lines to wheel brake assembly and brake linings for condition.
6. Shock strut extension.
7. Wheel and tire for general condition, wear, inflation, slippage marks, etc.
8. Wheel chocked.
9. Strut, fairing, and linkage for general condition.

LEFT HAND SPEED BRAKE

1. Speed brake for general condition (distortion or breaks).
2. Hydraulic and fuel leaks (check fuel drain).
3. Landing gear emergency lowering accumulator gauge for 3450 - 3750 psi reading (or 1370 - 1480 psi when operating pressure reduced to zero).
4. Landing gear emergency system dump valve lever normal.
5. Landing gear emergency system control valve spring for condition.
6. Speed brake ground safety key will be removed prior to speed brake check with engine operating.

INTERIOR INSPECTION

Enter the cockpit and carry out the following :

1. Connect :

- leg straps (see fig. 2-2)
- dinghy (if required)
- inverted flight, thigh, and shoulder harness straps
- anti-G suit
- oxygen lines (normal and emergency)
- radio cable.

2. Adjust seat and pedals.
3. Actuate harness unlock lever and check for perfect operation.

Check left and right hand consoles and instrument panel from left to right.

LEFT CONSOLE

1. Armament panel switches	- OFF
2. Sound recorder	- OFF
3. Yaw damper and pitch damper	- OFF
4. Radio	- OFF
5. Emerg. long'l trim	- NORMAL
6. Flaps	- HOLD or DOWN
7. Throttle	- Check for free movement - advance to OPEN and retard to STOP
8. Throttle friction	- adjust
9. Fuel L.P. cock	- OPEN
10. Speed brakes switch	- OUT
11. H.E. ignition	- INS
12. Droppable fuel tank air pressure control valve switch	- OFF
13. Fuel booster pump	- OFF
14. Engine H.P. fuel systems	- NORM

INSTRUMENT PANEL

1. Emerg. ldg. gr. handle	- IN
2. Landing & taxi light	- OFF

3. Landing gear handle - DOWN (red-white stripes)
4. Drag chute handle - IN
5. Emerg. ext. stores rel. handle - IN (secured)
6. Altimeter - Set for field elevation
7. Aileron servo emergency system pressure - OFF (cover down)
8. Elevator servo pressure - OFF
9. Cameras control panel - (All switches OFF)
10. SIF Dials - ZERO or as required
11. Clock - Wind and set
12. Emerg. wheel brake handle - pulled out and locked
13. Inverters - OFF
14. Battery & Generator - OFF ("Battery out warning light" ON)
15. G-meter - CHECK
16. Emerg. Canopy Jett. handle - IN
17. Collect tank fuel quantity - ALL TANKS

RIGHT CONSOLE

1. Standby turn & bank indicator - OFF
2. Cabin altimeter - ZERO
3. Oxygen regulator - 400 psi minimum
   - Green lever - OFF
   - Red lever - NORMAL
   - White lever - NORMAL
4. Radio compass - OFF
5. Gyrosyn - MAG
6. Camera defrosting - CLOSED
7. Doppler - OFF
8. Lighting panel: Switches and rheostats - OFF
9. PHI Station selector box - insert into receptacle
10. IFF - OFF (Mode switches - OUT)
11. Canopy defrost-deice - OFF
12. Emerg. cockpit ventilation - OFF
13. Cockpit air temp. - AUTOMATIC
14. Cockpit pressuriz. - ON
15. Pitot heat - OFF
16. Fuses - TIGHT
17. Circuit breakers - all IN, except:
18. Ignition & cartridge starting and armament - OUT

While making these checks power must be OFF.

STARTING ENGINE

1. Ignition & cartridge starting - red circuit breaker IN
2. Oxygen - green lever ON
3. Battery & generator - ON
   - Check: Battery OUT, warn light OUT
   - Generator OUT warn light ON
   - Fuel and oil low press. w.l. ON
   - Both hydr. serv. press. w.l. ON

4. Inverter - ON (warning lights "out")
5. Fire & overheat - Actuate TEST CIRCUIT switch
6. Check all warning lights - Push to test (except inverters)
7. Ldg. gear position - Three wheels
8. Ldg. gear horn cutout - Push to test gear handle warn l.
9. Fuel booster pump - ON (warn. light off)
10. H.E. ignition - NORM
11. Ignit - Actuate IGNIT button and listen for sparkplug operation
12. Throttle - full open then START & FLIGHT IDLE
13. Attitude gyro - Pull to cage and hold
14. Starter button - depressed for 2 sec.

CAUTION

Depressing the STARTER button will immediately energize the engine ignition circuit. The button is automatically held depressed for 30 seconds by a time switch controlled solenoid which prevents simultaneous selection of the two cartridges. The starter turbine would otherwise be damaged. Never open circuit by recycling the battery switch or IGNITION & CARTRIDGE circuit breaker.

WARNING

If engine does not turn, investigate cause before igniting second cartridge.

15. JPT and RPM - The JPT should begin to rise at approximately 15% RPM within 3 seconds after pressing STARTER button. JPT should normally increase to and stabilize at 450° - 550°C. Max. allowable JPT during engine start is 700°C. Idle RPM should stabilize within 13 sec. between 35% and 40%, depending on QFE value.

WARNING

If the JPT rises too quickly and threatens to exceed 650°C, immediately chop throttle to STOP. Investigate cause before attempting restart. If the JPT exceeds 700°C enter following in DD FORM 781/2:

a) The highest temperature reached.

b) The duration of highest temperature.

If engine and oil temperature is lower than -26°C (-5°C with emergency oil) do not attempt a start before prewarming.

FAILURE OF ENGINE TO START

If the JPT does not rise within 5 to 6 seconds after pressing the starter button, retard the throttle to STOP and investigate.

To drain excessive fuel from the tailpipe execute a DRY MOTORING CYCLE as follows :

CAUTION

Do not touch AIR START IGNITION BUTTON!

1. Throttle - STOP
2. Fuel L.P. cock - CHECK OPEN
3. H.E. ignition - INS
4. Fuel booster pump - CHECK ON
5. Starter - Press in for 2 seconds
6. Wait until engine stops
7. Insert new starting cartridge into chambers (see PRECAUTIONS FOR RELOADING CARTRIDGE CHAMBERS).

CAUTION

Before starting again have the drained fuel under the aft fuselage section removed by mechanics or move the aircraft elsewhere to avoid fire hazard.

PRECAUTIONS FOR RELOADING CARTRIDGE CHAMBERS

1. Battery - OFF
   - Battery OUT warn light ON
2. H.E. ignition - INS
3. After firing one cartridge wait one minute before firing the other one.

CAUTION

Do not insert cartridges into hot chambers.

4. Before firing a third cartridge wait 10 minutes to allow the starter assembly to cool off.

BEFORE TAXIING

AFTER STARTING ENGINE

WARNING

If in very cold weather the OIL LOW PRESS warning light does not got out within 1 min. between IDLE and 40% RPM, shut down the engine and investigate cause.

1. Anti-G regulation valve - Check operation
2. Sound recorder - as required
3. Radio - ON
4. Emerg. long'l trim - Switch to NOSE DOWN and NOSE UP. Check travel on position indicator, then to NORMAL.
5. Normal long'l trim - Push trim switch on control stick grip up and down. Check total travel on position indicator, then set to TAKE OFF position.
6. Rudder trim - Set trim switch to LEFT and RIGHT, then NEUTRAL (TAKE OFF POSIT. light must shortly illuminate).
7. Elevator servo pressure - ON (sudden jerk on stick, DISENGAGED warning light out).
8. Hydraulic system pressure - 3450-3750 psi
9. Gyrosyn comp. - SET

10. Check all warning lights	- OUT: FIRE & OVERHEAT, LOW PRESSURE, GENERATOR OUT, BATTERY OUT, AILERON SERVO LOW PRESSURE, OIL LOW PRESSURE (if still ON, RPM to 45% and check again if no success shut down).

WARNING

Retard the THROTTLE to STOP if the FUEL LOW PRESS warning light comes on during or after starting and investigate cause.

11. Voltmeter	- Check indication 28 V (± 0.5 V)
12. Loadmeter	- Check indication .3 - .5
13. Oxygen regulator	- Check flow by use of spring-loaded TEST MASK switch
14. Radio compass	- ON
15. Doppler	- REC. ONLY
16. PHI	- as required
17. IFF	- STDBY
18. Cockpit temperature	- as desired
19. Speed brakes	- UP upon crew chief's signal
20. Flaps	- UP upon crew chief's signal, check aileron trim at NEUTRAL (aligned with retracted flaps) then FLAPS DOWN
21. Throttle	- Advance to 80%
22. Pressure of No. 5 fuel cell and propotionator	- Checked by crew chief
23. All safety pins on ejection seat and safety key for speed brakes	- Removed and put into MAP CASE
24. Canopy	- As desired

TAXI

1. Wheel chocks	- removed
2. Fuel quantity indicator	- to COLLECT TANK
3. Throttle	- Max. 75% to initiate taxiing
4. Parking brake	- push in
5. Taxiing	- Check wheel brakes, then taxi with max. 60% RPM

CAUTION

While taxiing, pay attention to how your feet are resting on the pedals to avoid applying the brakes unintentionally.

Apply the brakes only to steer the aircraft.

WHILE TAXIING, RECHECK:

1. All instruments	- operating properly
2. Speed brakes	- UP
3. Flaps	- DOWN
4. Aileron servo emerg. pressure	- OFF
5. Elevator servo pressure	- ON
6. Oxygen	- NORMAL

7. Flight controls	Free movement and trim set
8. Harness	TIGHT
9. Canopy	CLOSED and LOCKED
	CANOPY UNSAFE FOR FLIGHT warning light OUT check manually
10. Ejection seat hight	Adjusted to permit easy reaching of ejection handle

LINE-UP CHECK

Align the aircraft with the runway so that the nose wheel will be centered when the brakes are released for take off.

Gyrosyn compass	recheck with runway heading
All flight instruments	recheck
Collect tank indication	full

Note

For an armed mission the armament specialist will hook up the electric cable to the guns, rockets or missiles, respectively.

ENGINE RUN-UP

1. Emerg. wheel brake	PULL and LOCK
2. RPM and JPT	40% and JPT stabilized
3. Throttle	Advance to FULL OPEN quickly and check engine acceleration time (from 40% to max. available RPM - 2%, 5 - 7 sec) and max. temperature.
4. Throttle	retard to 80%

Note

JPT at max. throttle required for takeoff are as follows :

Ambient temperature in C°	JPT in C°
- 10 to 0	640
0 to + 25	650
over + 25	660

Note

At an ambient temperature of less than 15°C the RPM should reach 100% and the JPT will not be more than 720°C.

At ambient temperatures of more than 15°C the JPT limiter will hold the temperature at 715° (+ 5°, - 0°), thereby reducing RPM to less than 100%.

At very high ambient temperatures, due to JPTL lag, it may be necessary initially to retard the throttle somewhat to avoid exceeding 730°C before the JPT limiter takes over.

HIGH PRESSURE EMERGENCY FUEL SYSTEM CHECK

The Emergency system must be checked before the first flight of the day, and the first flight on the afternoon.

With the emergency brake still set :

Throttle	retard to 80%
High pressure emerg. fuel system	EMERGENCY

RPM drop	check max. 15%
RPM + JPT	40% and JPT stabilized for 15 sec.
Throttle	Advance to full open quickly and check stall-free engine acceleration time (from 40% to 95% max. 7 sec)
High pressure emerg. fuel system	NORMAL
RPM	80%

TAKE-OFF

Proceed as follows (fig. 2-4):

1. Advance throttle to full open.
2. Simultaneously release parking brake and check if fully pushed in. Hold aircraft using pedals. Maintain directional control during take off run by using wheel brakes until rudder becomes effective (at approximately 50 KIAS).
3. At 95 KIAS, apply back pressure on the stick to reduce weight to the nose wheel.
4. At 125 KIAS (without external stores) or 135 kts (with external stores) break ground.

AFTER TAKE-OFF

1. Ldg. gear	Up and locked before reaching 185 KIAS
2. Flaps	UP between 160 - 185 KIAS and lever to HOLD. Trim aircraft.
3. RPM	100% (max. 101%)
4. JPT	730°C max.
5. Oxygen regulator	NORMAL
6. Fuel quantity indic.	Switch to ALL TANKS and check
7. Instruments	Check
8. Drop tank press. switch	Move to ON as soon as fuel supply indicator shows 2000 lbs. When a steady fall of fuel (approx. 20 min.) is indicated, switch to OFF again.

CLIMB

Note

During take-off or initial climb with full open throttle the RPM could rise to 101%, which is permissable for take-off or operational necessity for a duration of 15 min. per flight, provided the JPT is not exceeding 730°C. Normally, however, up to approximately 15000 ft the JPT limiter will reduce RPM to less than 100% as soon as the JPT exceeds 715°C.

If the JPT exceeds 730°C at any time, the throttle must be retarded sufficiently to reduce the JPT to below 730°C.

Should prolonged exceeding of 720°C occur during flight at considerably less than 15000 ft, report this after landing (the JPTL must be rechecked for proper operation above 715°C).

Above 30000 ft (at cold temperatures even lower) the Pressure Ratio Limiter will limit the max. obtainable RPM down. For a reduced power climb observe engine operating limitations :

99% RPM - 685°C JPT (30 min)
97% RPM - 655°C JPT (unlimited).

CRUISE

1. Canopy defrost-deice	- as required
2. Camera defrosting	- as required
3. Periodically check	- LOADMETER-VOLTMETER-HYDR. PRESS-FUEL-JPT-RPM-OXYGEN

FLIGHT CHARACTERISTICS

See SECTION VI.

SYSTEMS OPERATION

See SECTION VII.

DESCENT

1. Speed brakes	- as required
2. Throttle	- as required
3. Canopy defroster	- ON
4. Pitot heat	- as required
5. JPT	- 200°C minimum
6. Altimeter	- set to field QNH

BEFORE LANDING

The entry leg and speed are depending upon local field conditions. When not otherwise recommended, proceed as follows :

1. Armament	- All switches OFF
2. Yaw & pitch damper	- OFF
3. Hydraulic system	- 3450 - 3750 psi
4. Oxygen regulator	- NORMAL
5. Fuel quantity indicator	- check fuel quantity, figure safes KIAS for final approach, then switch to COLLECT TANK
6. Instruments	- check
7. Harness	- TIGHT

LANDING

(fig. 2-5)

INITIAL APPROACH

1. 1500 ft above ground	
2. Speed	- 300 KIAS

PITCH OUT

1. Speed brakes	- OUT
2. Throttle	- IDLE

DOWNWIND LEG

1. Speed brakes	- IN (approx. 185 KIAS)
2. Power	- approx. 65%
3. Ldg. gear	- DOWN and locked at or below 185 KIAS
4. Flaps	- DOWN

BASE LEG

1. Speed	160 KIAS (500 lbs FUEL remaining, and 5 kt additional for every extra 500 lbs FUEL).
2. Ldg. gear + flaps	- recheck DOWN

FINAL APPROACH

1. 500 ft above ground	- Complete line-up with the runway

2. Speed - 140 KIAS (500 lbs FUEL remaining, and 5 kt additional for every extra 500 lbs of FUEL)

AFTER TOUCH DOWN

1. Drag chute - Deploy
2. Wheel brakes - Apply intermittently, if necessary

WARNING

Touchdown must be made at a minimum speed of 130 KIAS.

Note

The maximum speed for deployment of the drag chute is 150 KIAS. Pull out the DRAG CHUTE handle entirely as soon as the aircraft touches down. The chute requires about 1 second to open after the handle has been pulled out.

The drag chute can be used after crosswind landings on a dry runway provided the effective crosswind speed does not exceed 25 kt. Pilots should be alert for a quick release in case of difficult directional control.

GO-AROUND

If you decide to go around, proceed as follows: (fig. 2-6)

1. Speed brakes - Recheck UP
2. Throttle - Advance to maximum power
3. Ldg. gear - UP below 185 KIAS
4. Flaps - UP between 160 KIAS and 185 KIAS

CAUTION

Speed brakes must be IN before retraction of landing gear, otherwise the gear could remain unsafe (due to turbulence caused by the speed brakes).

AFTER LANDING

1. Flaps - UP and lever at HOLD
2. Drag chute - Jettison as soon as possible after leaving the runway
3. a. Radio compass - OFF
   b. Doppler - OFF
   c. IFF - MASTER switch OFF, mode switches OUT
   d. All unnecessary equipment - OFF
   e. Trim - NEUTRAL
4. Taxi at a max. 60% RPM.

WARNING

After an armed mission the armament specialist must be disconnect the power supply line to the guns, rockets, or missiles immediately after the aircraft leaves the runway.

ENGINE SHUT-DOWN

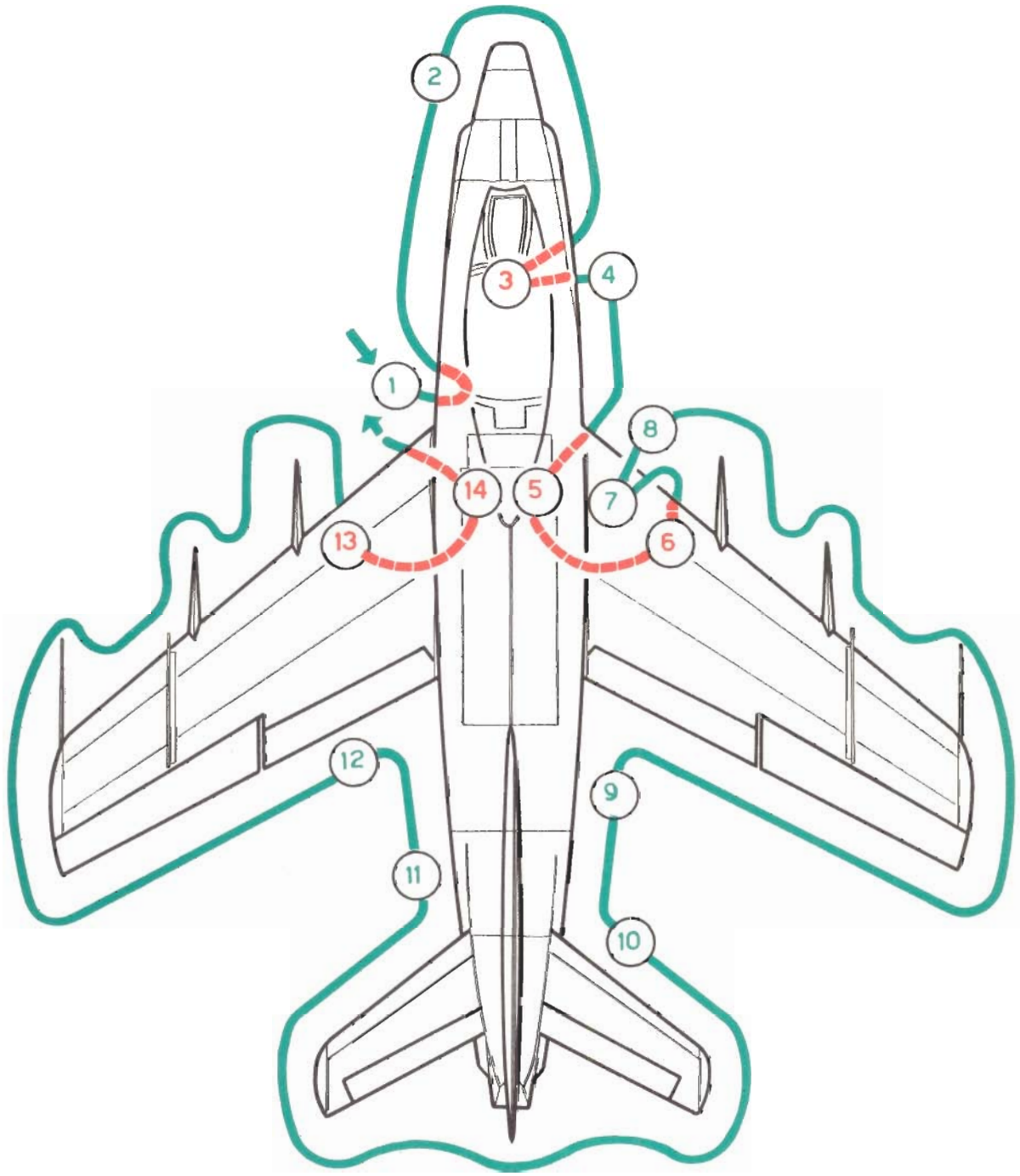
1. Taxi to the parking area and open canopy.
2. Throttle to IDLE.
3. Have chocks placed under wheels.

CAUTION

Do not use the parking brakes when the wheel brakes are hot.

4. Lower FLAPS and set flap lever at HOLD.
5. SPEED BRAKES - OUT.
6. After RPM and JPT have stabilized, throttle to STOP and note engine rundown times (25-40 sec.).
7. All switches OFF and all equipment disconnected expect: BATTERY and ELEVATOR SERVO PRESS.
8. IGNITION & CARTRIDGE STARTING - circuit breaker OUT.
9. AILERON EMERG.SERVO PRESS. - ON.
10. Relieve operating pressure in the aileron and elevator hydraulic systems to ZERO.
11. Elevator servo press. and aileron servo emerg. press. - OFF
12. Battery - OFF
13. Insert the 5 safety pins for the ejection seat and canopy.
14. Insert speed brake ground safety key.
15. Complete DD FORM 781.

Exterior Inspection

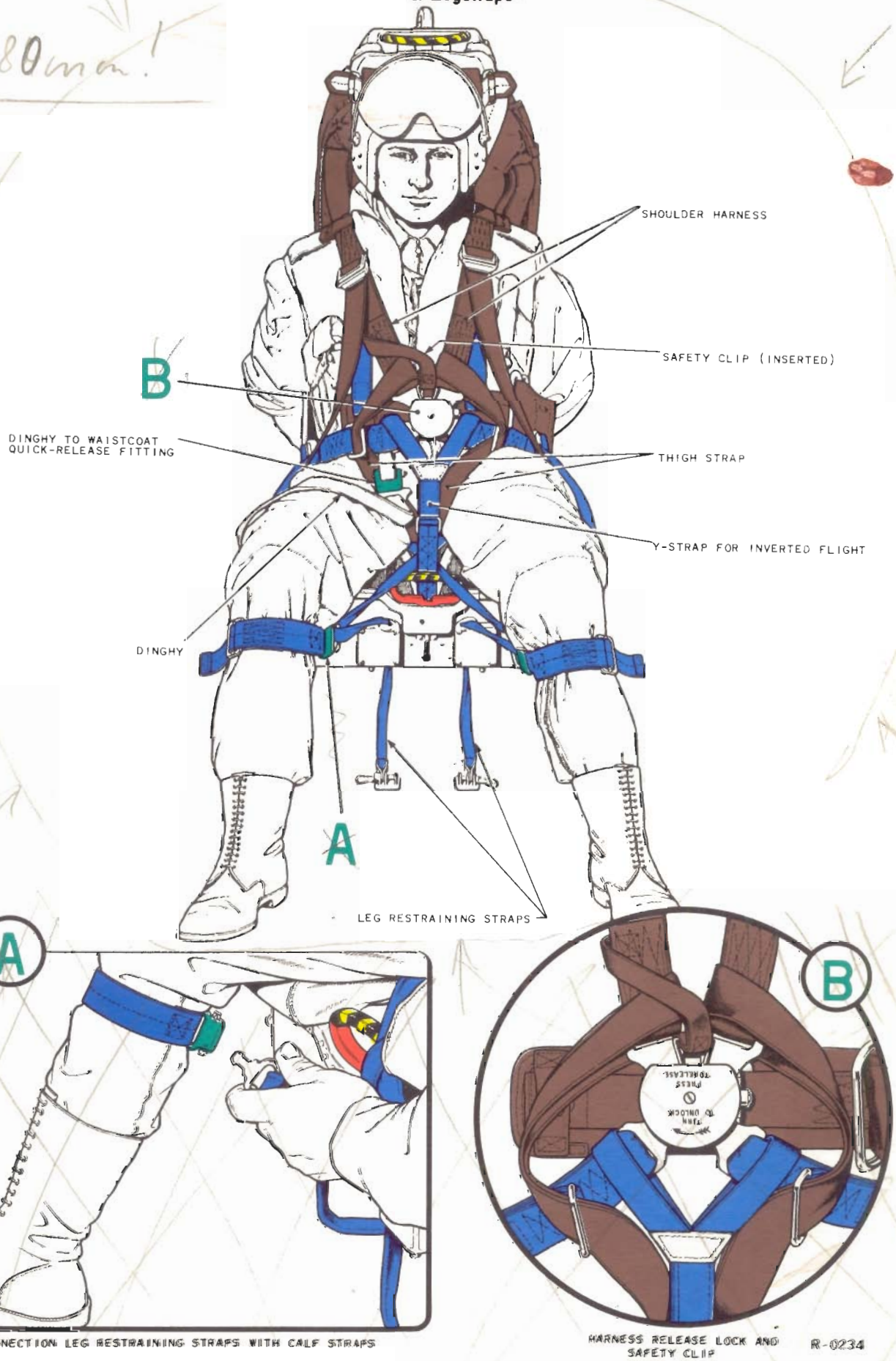


1. FUSELAGE - FWD LH SIDE
2. NOSE
3. NOSE GEAR
4. FUSELAGE FWD RH SIDE
5. SPEED BRAKE RH
6. RH GEAR LEG
7. FUSELAGE TOP RH SIDE
8. RH WING
9. FUSELAGE AFT RH SIDE
10. EMPENNAGE AND TAIL
11. FUSELAGE AFT LH SIDE
12. LH WING
13. LH GEAR LEG
14. LH SPEED BRAKE

S-0000/B

Figure 2-1

Harness & Legstraps



CONNECTION LEG RESTRAINING STRAPS WITH CALF STRAPS

HARNESS RELEASE LOCK AND SAFETY CLIP

R-0234

Figure 2-2

Danger Area

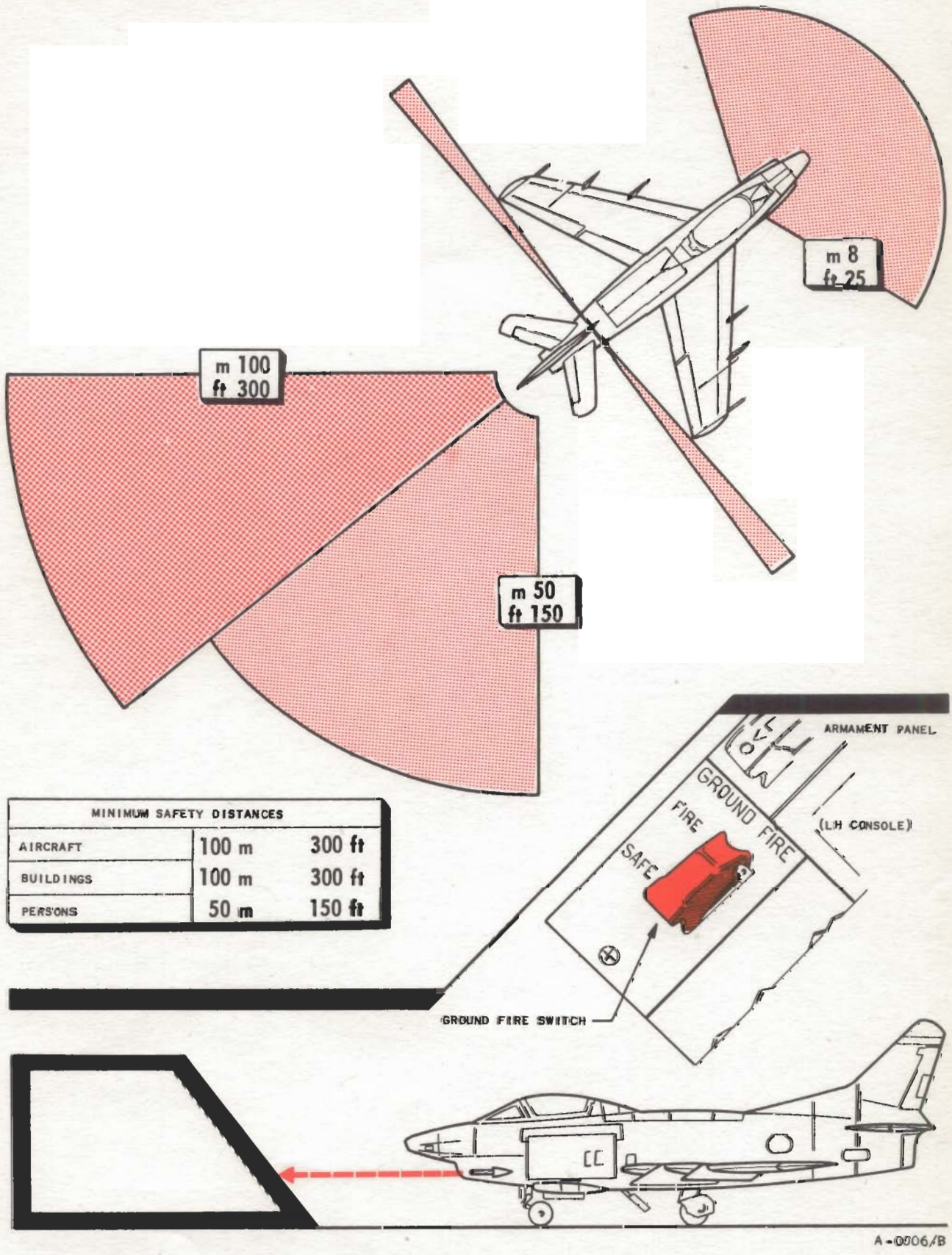


Figure 2-3

Typical Take-Off

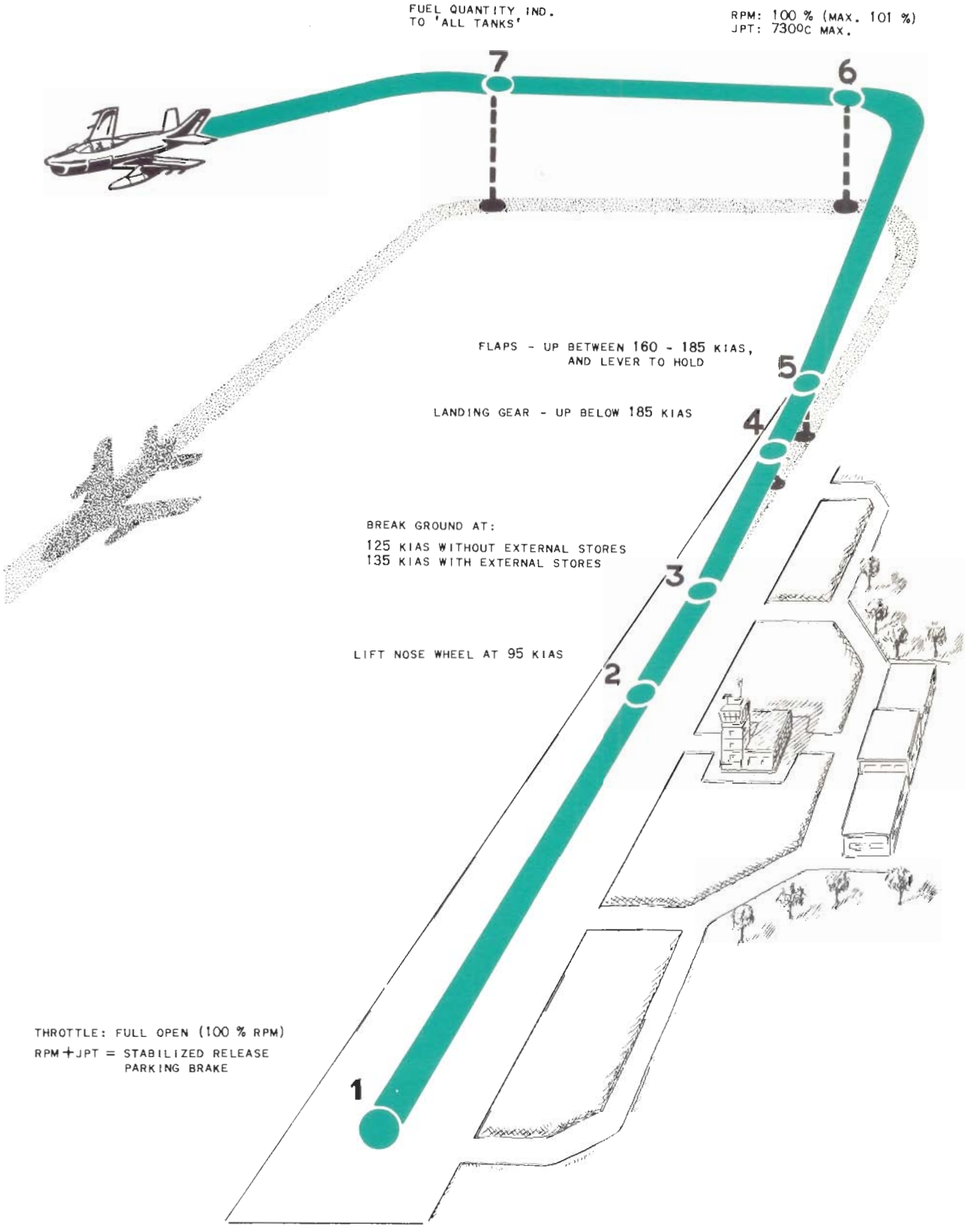


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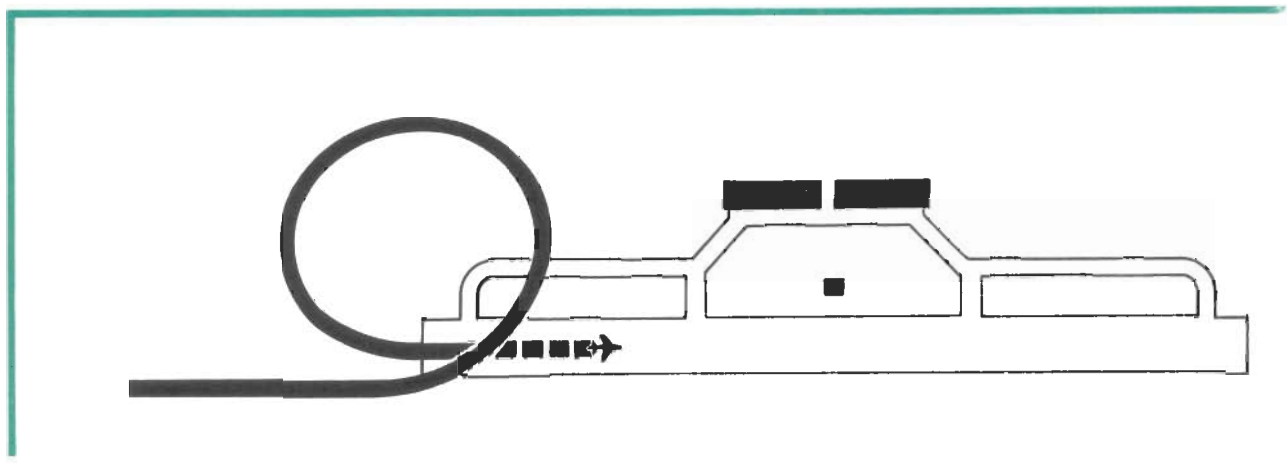
Figure 2-4

Typical Landing Pattern



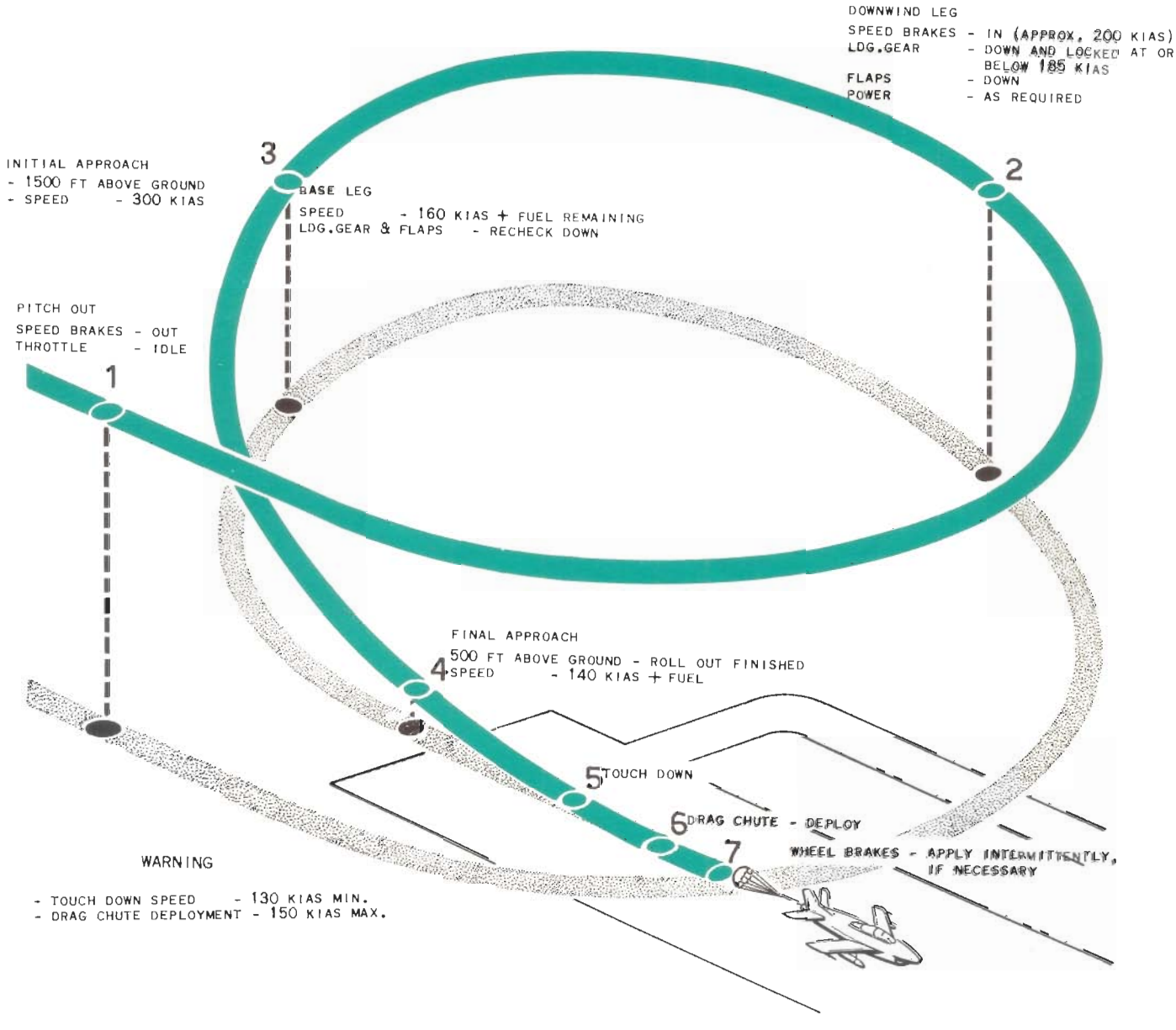


Figure 2-5

Typical Go-Around

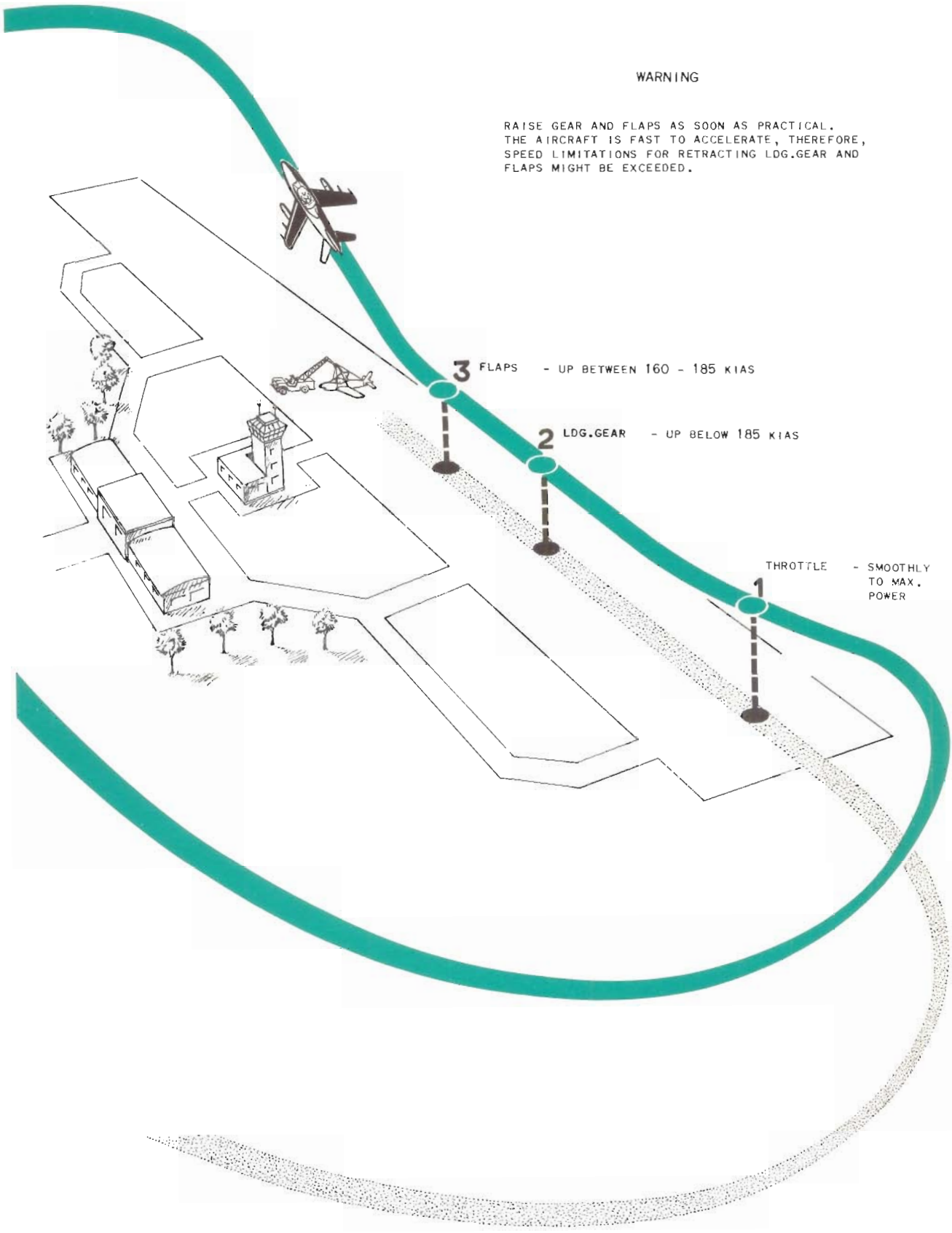


Figure 2-6

SECTION III EMERGENCY PROCEDURES

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ENGINE FAILURE

PARTIAL LOSS OF THRUST

1. Partial loss of thrust during take-off. Same procedure as for "Flame out during takeoff" will apply.
2. Partial loss of thrust in flight. If altitude and airspeed permit:
   1. Utilize airspeed in order to gain altitude
   2. Throttle — IDLE
   3. Engine H.P. fuel system — EMERG
   4. Throttle — RESET as required

CAUTION

The throttle should be reset with care in order to avoid compressor stalling.

If this procedure fails to correct loss of thrust proceed with Forced Landing or eject depending upon situation.

FLAMEOUT

General

If a flameout accurs an air start may be attempted, provided that the flame-out is not due to mechanical failure.

A flameout is indicated by a simultaneous loss of engine RPM and JPT. When oil pressure drops below 20 psi the starter is recoupled to the engine drive shaft by spring action, unless engine is equipped with modified starter (ratchet and pawl engaging mechanism type).

Note

Noises due to starter engagement after a flameout are normal.

SYMPTOMS OF FAILURE

1. Loss of thrust.
2. Loss of RPM.
3. JPT drops below 200°C.

CAUSES:

Fuel Supply Failure

1. Fuel expended.
2. FUEL L.P. COCK accidentally closed.
3. Low pressure fuel filter clogged.
4. Fuel supply line between fuel booster pump and main fuel pump broken.

Compressor Stalls

1. Compressor stall during acceleration. Noticeable by a loud detonation and the strong odor of burned oil.

   Cause :

   Throttle has been opened too fast.

2. Compressor surge at full throttle:

   When engine RPM is above 90%, compressor surge is indicated by a series of loud detonations and heavy vibrations and may be accompanied by a strong odor of burned oil.

   Cause :

   The PRL is defective or wrongly set.

Mechanical Failures

PRECAUTIONARY MEASURE

If mechanical failure is suspected, immediately retard throttle to STOP and move FUEL L.P. COCK to CLOSED.

WARNING

In case of mechanical failure, do not attempt restart due to the risk of fire or explosions.

AIR START

WARNING

See instructions under Section V concerning use of alternative fuels.

The chances of a successful air start are better at low altitudes. Never attempt to restart above 30.000 ft.

AIR START (Hot Engine)

1. Ignit	- Press in immediately, hold depressed and retard throttle to IDLE
2. JPT-RPM	- A simultaneous rise indicates a successful air start.
3. Ignit	- Release when RPM have increased to above 40%
4. Power	- As required.

UNSUCCESSFUL AIR START (Hot Engine)

If the attempted air start is unsuccessful or if the engine starts, but the JPT rapidly exceeds 700°C, proceed as follows :

1. Ignit	- release button immediately
2. Throttle	- retard to STOP
3. Speed	- reduce to 150-190 KIAS, according to altitude
4. Thereupon, use cold engine air start procedure.	

WARNING

After an unsuccessful air start of the hot engine wait 20 seconds (if altitude permits) before attempting another start.

AIR START (Cold Engine)

Proceed as follows (fig. 3-1) :

1. Throttle	retard to STOP
2. FUEL L.P. COCK	OPEN
3. Altitude	- raise nose of aircraft to gain altitude
4. Speed	- above 25.000 ft - 150 KIAS
	- below 25.000 ft - 190 KIAS
5. RPM	- appr. 15% (windmilling)
6. Recheck :	
Battery	- ON (BATTERY OUT warning light - OUT)
Fuel L.P. cock	- OPEN
Fuel booster pump	- ON
H.E. ignition	- NORM
Ignition & cartridge starting	red circuit breaker IN
7. Engine H.P. fuel systems	- EMERG
8. Ignit	- keep button depressed while slowly advancing throttle to IDLE
9. JPT-RPM	- A simultaneous rise indicates a successfull air start

10. Ignit	Release button not below 40% RPM
11. Throttle	Advance to required RPM

WARNING

If there is play in the mechanical linkage between the throttle lever and the engine, it may be necessary to continue pressing the IGNIT button and slowly open the throttle up to one inch beyond START & FLIGHT IDLE before ignition is accomplished. Do not advance the throttle to more than one inch beyond START & FLIGHT IDLE until the engine has been restarted and is operating normally.

UNSUCCESSFUL AIR START (Cold Engine)

If relight does not occur within 15 seconds or if the engine starts but the JPT rapidly exceeds 700°C, proceed as follows :

1. Ignit	release button immediately
2. Throttle	STOP

WARNING

After an unsuccessful air start of the cold engine wait 20 seconds (if altitude permits) before attempting another start.

Note

An unsuccessful air start may have been due to failure of the IGNIT circuit. Retard throttle to STOP, press IGNIT button for 2 seconds and listen for sparking. If no sparking is heard in the headphones IGNIT failure is confirmed. Only in this case, attempt air start using STARTER button.

EMERGENCY AIR START WITH STARTER BUTTON

Proceed as follows :

1. Throttle	- STOP
2. Fuel L.P. cock	- OPEN
3. Altitude	- raise nose of aircraft to gain altitude
4. Speed	- above 25.000 ft - 150 KIAS
	- below 25.000 ft - 190 KIAS
5. RPM	- appr. 15%
6. Recheck :	
Battery	- ON (BATTERY OUT warning light OUT)
Fuel L.P. cock	- OPEN
Fuel booster pump	- ON
Engine H.P. fuel systems	- EMERG
H.E. ignition	- NORM
Ignition & cartridge starting	red circuit breaker IN
7. Starter	- press button
8. Throttle	- slowly to IDLE
9. JPT-RPM	- a simultaneous rise indicates a successful air start
10. Throttle	- advance to required RPM.

FLAMEOUT

During Takeoff

a) Before being airborne and if the aircraft can still be stopped on the runway :

1. Throttle	STOP
2. Drag chute	deploy and brake efficiently.

b) Before being airborne, if the aircraft can not be stopped on the runway: Depending on situation the pilot may have to retract the gear by use of the E.L.GEAR UP button.

1. Throttle	retard to STOP
2. Drag chute	deploy
3. Wheel brakes	apply efficiently
4. External stores	jettison all external stores. Up to pilot's decision depending on local arresting gear.
5. Canopy	jettison at pilot's discretion
6. Fuel L.P.cock	closed
7. Battery & generator	OFF
8. Abandon aircraft	as soon as possible.

After Being Airborne:

If there is sufficient runway to make a landing, do so immediately and bring the aircraft to a stop. If a landing is not possible, eject.

The MARTIN BAKER MK-W4 ejection seat permits ejection at runway level at a minimum speed of 100 KIAS.

In Flight

WARNING

If a mechanical failure occurs accompanied by severe roughness and vibration, abnormal noises, or rapid loss of RPM and flameout, do not attempt to restart in flight.

If no runway is available:

1. Steer the aircraft towards unpopulated area.
2. Eject.

If a runway is available:

1. Throttle	retard to STOP
2. Fuel booster pump	OFF
3. Fuel L.P.cock	CLOSED
4. Make forced landing (see FORCED LANDING WITH DEAD ENGINE).	

GLIDE WITH DEAD ENGINE

To obtain best glide range (fig.3-2):

1. Ldg.gear	UP
2. Flaps	UP
3. Speed brakes	IN
4. Speed	200 KIAS without external stores
	210 KIAS with external stores.

TYPICAL FORCED LANDING PATTERN (Dead Engine)

Proceed as follows:

1. HIGH KEY POINT

Altitude	7.000 ft above ground
Speed	185 KIAS
Ldg.gear	DOWN

2. LOW KEY POINT

Altitude	4.000 ft above ground
Speed	170 KIAS
Flaps	as required

3. FINAL APPROACH

Speed	170 KIAS
Flaps	as required

BATTERY & GENERATOR	OFF
Fuel L.P. cock	CLOSED
DRAG CHUTE	deployed immediately after touchdown.

CAUTION

During Forced Landing Pattern aim for the first 1/3 of the runway. If necessary, jettison external load. Jettison canopy.

SIMULATED FLAMEOUT LANDING

TO HIGH KEY POINT

Speed	210 KIAS with external stores
	200 KIAS without external stores
Speed brakes	OUT
Throttle	60%

HIGH KEY POINT

Speed	185 KIAS
Throttle	IDLE
Ldg. gear	DOWN
Collect tank	ON

EMERGENCY LANDING

GEAR UP LANDING

If a gear up landing is unavoidable, proceed as follows :

1. External stores - jettison (except empty drop tanks).
2. Expend all fuel down to a safety minimum.
3. Make normal approach (see Section NORMAL LANDING).

Just before touchdown :

4.	Throttle	STOP
5.	Drag chute	Deploy
6.	Fuel L.P. cock	CLOSED
7.	Battery & generator	OFF
8.	Canopy	JETTISON at pilot's discretion.

9. Abandon aircraft immediately after it stops and leave its vicinity.

NOSE GEAR UP OR UNLOCKED

1. Expend all fuel down to a safety minimum.
2. External stores - JETTISON (except empty drop tanks).

JUST BEFORE TOUCHDOWN

See items 4 thru 8 of Section GEAR UP LANDING, then :

During landing roll try to keep the nose wheel off the ground as long as possible and do not apply wheel brakes.

LEFT OR RIGHT MAIN GEAR UP OR UNLOCKED

Proceed according to items 1 thru 8 of the preceding paragraph, then try a smooth, nosehigh touchdown on the safe main gear using the side of runway of the safe gear.

10. While rolling, keep the unlocked gear off the ground as long as possible and counteract yawing tendency with the rudder.

    (After collapsing of unsafe gear the pylon tank or wing tip will contact ground, causing a breakout tendency which must be counteracted by strong use of opposite wheelbrake.)

11. Abandon the aircraft as soon as it stops and leave its vicinity.

FLAPS MALFUNCTION

NO FLAP LANDING

A) If the flaps cannot be lowered, increase landing speed by appr. 10 KIAS.

B) If one of the flaps cannot be lowered :

1. Flaps - immediately to UP and proceed according to NO FLAP LANDING instructions

C) If the lowered flap cannot be raised :

1. Ailerons - counteract resulting rolling moment by using ailerons and keep aircraft under control
2. Aileron trim - trim opposite resulting rolling moment
3. Speed - 10 KIAS more than usual
4. While landing, counteract yaw with rudder.

CAUTION

Once a split flap condition and controllable approach speed has been set up, return flap handle to HOLD position, to maintain conditions.

LOSS OF CANOPY

If the canopy is lost during takeoff and there is sufficient runway remaining, abort the takeoff and stop the a/c by all means. Otherwise, takeoff and immediately return for landing. It should be remembered, however, that the aircraft is fully loaded. Therefore, final approach and the landing must be executed at a speed 20 KIAS faster than usual. If possible continue flight at low altitude for some time to expend fuel. Because of the air turbulence in the cockpit, it is recommended that the aircraft be flown at a speed of less than 250 KIAS.

EMERGENCY ENTRANCE (see fig.3-6)

1. Open the EMERG. CANOPY RELEASE access door on the left hand side of the fuselage directly above the wing root.
2. Pull EMERG. CANOPY REL. handle.
3. Lift canopy.
4. Insert ejection seat safety pins (4).
5. Evacuate pilot.

NOTE

If canopy cannot be lifted, break canopy glass aft of pilot's head.

ESCAPE PROCEDURE

Escape from the aircraft in flight should be made with the ejection seat only (fig. 3-7). This is the only safe way of escaping.

BAILOUT

Proceed as follows :

1. Steer the aircraft towards unpopulated area.
2. Grasp face blind firing handle (on top of seat headrest) with both hands and hold firmly.
3. Pull handle down firmly, without hesitating, and suring that the face cover glides over the helmet and front of the face. Keep elbows as close together as possible against the body. Sit erect, head firm against the headrest.

Note

If strong positive G's make it impossible for the arms to be raised to pull the handle above the headrest, an alternate handle on the forward edge of the seat can be pulled.

Pulling either handle fires the canopy jettison cartridge, and after one second, the seat ejection cartridge. Ejection is automatic and occurs in the following sequence (fig. 3-8):

a) Opening of emergency oxygen cylinder.

b) Pulling of pilot's legs against seat.

c) Actuating of the drogue gun piston for both drogue chutes.

d) Pilot's separation from seat at altitude preset on barostatic control (16400 ft).

e) Opening of pilot's chute.

Note

When the ejection seat is fired a microswitch on the left seat rail is activated. Thereby the IFF emergency MODE is automatically energized for continuous transmissions, provided the master switch was set to LOW or NORMAL.

Note

If the canopy cannot be jettisoned, the seat can still be ejected through the canopy.

EJECTION SEAT FAILURE

If the seat fails to eject, proceed as follows:

1. Steer the aircraft toward uninhabited terrain.
2. Jettison the canopy. If it fails, unlock the canopy so that it can be torn off by the stream of air. Keep head as low as possible to keep from being hit by canopy.
3. Pull out the first D-ring fully to to separate the pilot's chute pack from the seat chutes.
4. Pull up the quick release handle on the left hand side of the seat to separate harness from the seat.
5. Bail out.

   If possible, proceed as follows:

   a) Trim the aircraft nose down.

   b) Pull up and roll the aircraft into inverted flight attitude.

   c) Push the control stick forward.

   Note

   By executing the above maneuver, negative G's are created, facilitating the escape.

6. To open the parachute, pull the second D-ring (behind the first one) which deploys the pilot chute.

WARNING

Points 3, 4, and 6 must be also executed if the automatic device for separating the pilot from the seat and for opening the parachute fails to function after ejection of the seat.

DINGHY DRILL

The following procedure should be used if ejection has taken place over water:

DESCENT OVER WATER

1. Remove oxygen mask.
2. When about 30 meters above water inflate the life vest and rotate the disc knob of the quick release fitting to OPEN (this does not release the shoulder harness) (see detail A, fig. 3-10).

3. Open both quick release fittings holding the dinghy to the harness (see detail B, fig. 3-10). Do not separate the lanyard between the life vest and dinghy. After this action the dinghy will fall away to the full extent of the lanyard.
4. When about 2 meters above the water take a deep breath, hold nose, and keep elbows well into the sides.
5. As soon as the feet touch the water remove safety clip (detail C, fig. 3-10) and strike the harness disc knob with the free hand to release the parachute from the body (see fig. 3-10, phase 2).
6. Upon surfacing, inflate the life vest (if not previously done). Secure the vest close to the chest.
7. Draw the dinghy to the body by means of the lanyard. Grasp the handle of the CO_2 cylinder and pull it. The cylinder is thus opened and the dinghy inflated (see detail D, fig. 3-10). Shake the dinghy to facilitate unfolding and inflation. When inflation takes place at low ambient temperature it is of particular importance that the CO_2 cylinder be held under water to prevent freezing of the outlet valve.
8. To board the dinghy grasp both grips on top of the forward end (narrow end) of the dinghy, pull the body up over the side of the buoyancy chamber, at the same time kicking vigorously with the legs to assist the arms. As soon as the body is balanced on the forward end of the dinghy grasp both grips near the rear and pull the body aboard (fig. 3-10, phase 3). If the stern tends to rise while boarding, push the dinghy forward so that the ballast chambers fill with water. Try to board again. Once in the dinghy turn over and sit upright.

Note

Another method of boarding is to turn over on the back, grasp the two grips on the front of the dinghy, and push the latter down and under the body. As soon as the body is almost entirely in the dinghy grasp both grips at the rear and pull the body the rest of the way. This method of boarding, however, can only be employed with a partially inflated dinghy since one that is fully inflated would offer too much resistance.

9. After boarding, settle down and connect the inflator to the valve. Check the buoyancy chamber for leaks and seal any that may be found. Remove the stabilizing drogue from its stowage in the water ballast chamber and throw it out in such manner that the stern is kept into the wind. Inflate the dinghy fully with the inflator.

DITCHING

WARNING

Avoid ditching. Jettison the seat whenever possible.

If ditching is unavoidable, proceed as follows :

1. Send out distress calls and set IFF to EMERGENCY.
2. Disconnect radio leads and anti-G suit, and open both quick-disconnect fittings for the dinghy on the harness. Loosen calf straps.
3. Oxygen — 100% OXYGEN
4. Landing gear — UP
5. Speed brakes — IN
6. Flaps — DOWN
7. Canopy — jettison immediately before ditching

8. Throttle - retard to STOP

If possible, try to touch down along wave crest in the direction the waves are breaking. If the sea is calm, it is very difficult to judge altitude.

While ditching, keep the aircraft nose very high.

AFTER DITCHING

1. After the aircraft has settled on the water, turn the disc knob of the quick release fitting to OPEN and strike the disc sharply to release the harness.
2. Abandon the aircraft.
3. Lift the dinghy pack out of the aircraft by means of the line connecting dinghy and life vest.
4. Inflate life vest immediately (if not done previously).
5. Inflate dinghy in accordance with the instructions given under DINGHY DRILL.

Note

The seat can also be ejected under water.

SPIN RECOVERY

Intentional spins are strictly prohibited!

Should, however, the aircraft enter a spin, proceed as follows :

1. Throttle	IDLE
2. Ailerons	NEUTRAL or preferably set somewhat in spin direction
3. Elevator	NEUTRAL
4. Flaps	UP
Ldg. gear	UP
Speed brakes	UP
5. Rudder	apply fully opposite to spin direction

6. After recovery, neutralize RUDDER and AILERONS immediately.

WARNING

Upon unsuccessful recovery, eject at safe altitude.

FIRE

If the fire or overheat warning lights illuminate, check for presence of fire as follows :

a. Smoke in the cockpit.

b. Engine rpm loss.

c. Fluctuating rpm.

d. Smoke trail behind the airplane.

Illumination of the overheat warning light generally results from the following :

a. Fire (generally located aft of the fire proof bulkhead).

b. A leaky exhaust pipe or connection.

c. Climbing at low airspeeds and high engine rpm.

d. Idling the engine for excessive periods when parked in a strong tailwind.

e. Improper installation of, or a short circuit.

Illumination of the red fire warning light generally results from the following :

a. Fire (forward of the fire proof bulkhead).

b. Improper installation of, or a short circuit.

If either the fire or overheat warning light illuminates and then goes out, proceed as follows :

a. Push to test each bulb individually to see if the bulbs are burned out.

b. If the bulbs are not defective, actuate the fire and overheat warning test switch to the TEST position and check for defective circuit.

Note

If the circuit is defective, remember that the wiring could have burned out from an existing fire.

c. Check for other indications of fire and land as soon as possible. If such a condition occurs before takeoff, do not fly the airplane.

ILLUMINATED FIRE OR OVERHEAT WARNING LIGHT (During Takeoff)

(Refer to the Abort Procedure Before Leaving the Ground.)

ILLUMINATED FIRE OR OVERHEAT WARNING LIGHT (After Takeoff or in Flight)

If the fire or overheat warning lights illuminate when airborne or when too late to abort takeoff, proceed as follows :

1. THROTTLE-MINIMUM PRACTICABLE POWER.
2. CHECK-FIRE, SMOKE, LOSS OF CONTROL, EXPLOSIONS, AND ENGINE INSTRUMENTS.
3. IF FIRE IS CONFIRMED - EJECT.
4. IF FIRE CANNOT BE CONFIRMED - USE MINIMUM POWER AND LAND.

Note

For extinguishing ground fires, refer to figure 3-4.

OIL SYSTEM FAILURE

The OIL LOW PRESS warning light illuminates when :

a) RPM ARE ABOVE 95%

Set required minimum RPM and land as soon as possible.

b) RPM BELOW 95%

Increase RPM until warning light goes off. Maintain RPM and land as soon as possible.

c) ANY RPM AND NEGATIVE "G"

The warning light goes on if the oil level is low, especially at the end of a flight. Oil pressure is restored to normal as soon as there is positive "G". If the warning light continues to glow, proceed as under a) or b).

Note

(For unmodified aircraft)

When the engine is running at low oil pressure, the coupling between the starter and the engine shaft tends to engage, bringing with it the danger of damage.

FUEL SYSTEM FAILURE

FUEL LOW PRESS WARNING LIGHT ON

Immediately check if FUEL BOOSTER PUMP is switched on.

Illumination of the FUEL LOW PRESS warning light indicates failure of the fuel low pressure system. Failure can be attributed to any or a combination of any of the following :

a) Fuel Booster Pump Failure

Up to 25.000 ft there will be no loss of thrust since fuel tank pressurization and gravity flow will supply fuel to the engine. Use the throttle with caution and land as soon as possible.

Above 25.000 ft loss of thrust may result. Descend as soon as possible.

b) Fuel Filter Clogged

A loss of thrust will result at any altitude. Do not vary the position of the throttle and land as soon as possible.

c) Fuel L.P. Cock Is Accidentally Closed

A rapid loss of thrust will result. Immediately move the FUEL L.P. COCK lever to OPEN. If flameout occurs anyway, proceed according to applicable air start instructions.

d) Leakage From Fuel Lines Between Fuel Booster Pump And Main Pump

The greater the leak the greater the loss of thrust. Check FIRE and OVERHEAT warning lights continuously and land as soon as possible.

e) All Fuel Expended

The fuel indicator will read ZERO. Prepare for a forced landing or to bail out.

EXTERNAL FUEL TRANSFER FAILURE

Indicated only by continuous drop of total fuel indication after the pylon tanks have been pressurized.

1. Recheck circuit breaker IN.
2. Recycle the pressurization switch.

The aircraft can be landed with one or both pylon tanks full without difficulty, however, final approach speed must be figured for the extra weight (900 lbs).

Note

Empty drop tanks may only be jettisoned while in straight and level flight at an indicated air-speed of 300 - 350 kts. These limits are not valid for full tanks.

ELECTRICAL SYSTEM FAILURE

FIRE DUE TO AN ELECTRICAL SHORT

All circuits are protected by fuses or circuit breakers. However, if a fire does occur in flight, switch off generator and battery and land or bail out as soon as possible.

GENERATOR FAILURE

Illumination of the GENERATOR OUT warning light indicates that the generator has failed thereby cutting off power to the secondary and AC busses. The primary bus can still be powered by the battery bus for a maximum of about 20 minutes (switch BATTERY to ON).

Reduce electrical load by switching off unnecessary equipment.

If flight conditions permit reduce power.

Attempt to bring the generator back into the circuit by placing the GENERATOR switch briefly to RESET and releasing it.

Return the switch to ON. If the warning light goes out, the generator has been brought back into the circuit. Observe loadmeter when reactivating electrical equipment to eventually recognize the cause of failure.

If the light remains on this indicates generator or voltage regulator failure. Therefore, set switch to OFF. No longer attempt to RESET generator. Try to land within 15-20 minutes. If it is necessary to continue the flight, switch battery to OFF and switch ON again shortly before landing.

PRIMARY INVERTER FAILURE

Primary inverter failure is indicated by illumination of the PRIM. INVERTER OUT warning light. The three-phase busses are automatically connected to the secondary inverter and at the same time the IFF is de-energized.

SECONDARY INVERTER FAILURE

Failure of the secondary inverter is indicated by the illumination of the SEC. INVERTER OUT warning light. The following equipment will be automatically disconnected: the automatic cockpit air temperature regulator.

In this case, the cockpit air temperature can be regulated manually by moving the MANUAL switch to DECR. or INCR. and then to OFF. Actuating the switch directly controls the appropriate solenoid selector valve.

NORMAL LONG'L TRIM FAILURE

In case of normal trim control failure, trimming action is accomplished through the EMERG. LONG'L TRIM switch located on the left cockpit console.. (Recheck both circuit breakers, the normal and alternate Hori. Stab. Trim, IN).

WARNING

If both trim controls fail and the horizontal stabilizer remains in an undesirable trim point, reduce the speed of the aircraft. Flight can be continued at moderate speed without difficulty.

HYDRAULIC SYSTEM FAILURE

HYDRAULIC PUMP FAILURE

If failure of the engine-driven hydraulic pump or rupture of the lines connected to the pump occurs, no pressure will be in the UTILITY HYDRAULIC SYSTEM and in the FLIGHT CONTROL SYSTEM. There is no standby hydraulic pump in this aircraft. Emergency pressure is supplied only by accumulators connected in series in the various aircraft hydraulic circuits.

WARNING

In case of hydraulic line rupture inside the engine compartment there is danger of fire due to the low flash temperature of hydraulic fluid (93.3°C). Check the FIRE warning light continuously. If this light goes on, use the procedure outlined in Section III - FIRE.

FUEL FLOW PROPORTIONER FAILURE

If the fuel flow proportioner fails, fuel will continue to flow from the forward and aft tank groups to the collect tank. However, fuel flow will not be proportioned and the aircraft center of gravity can change considerably requiring longitudinal trim more than usual.

SPEED BRAKES

If the utility hydraulic system fails, the speed brakes cannot be opened. Should failure occur while the speed brakes are open, they can be partially or completely closed by the air load when the speed brake switch is moved to IN.

WHEEL BRAKES

An accumulator and an emergency system (with a manually operated control valve) permit emergency braking in case of utility hydraulic system failure. Emergency brake is applied by using the EMERG. WHEEL BRAKE handle located on the upper right hand side of the instrument panel. Simultaneous braking action on both wheels will be proportional to the travel of the handle.

CAUTION

When depending on the Emerg. Wheel brake anticipate the necessity for directional control with the rudder in case of asymmetric braking action of the Emerg. Wheel Brake.

NOTE

Application of brake should be smoothly with increasing force to avoid sudden application of full pressure. Brakes may be applied 6 to 7 times.

LANDING GEAR

Emergency Extension

In case of utility hydraulic system failure the landing gear cannot be retracted. However, the landing gear can be lowered by doing the following (fig. 3-5):

1. Reduce speed below 185 KIAS.
2. Landing gear handle DOWN (not absolutely necessary).
3. Pull out EMERG. LDG. GR. handle (bottom left hand side of instrument panel). Hold handle extended until the gear position indicator shows nose gear down and locked.
4. Yaw the aircraft until both main gear lock.

Emergency Retraction On The Ground

If it is necessary to retract the landing gear during takeoff or after landing, depress the LDG. GR. EMERG. UP button and move the landing gear handle UP.

CAUTION

Emergency retraction on the ground usually cannot be performed when the landing gear was lowered by Emergency Extension. However, if the probable necessity for such action exists, (i.e. in a forced landing approach to a short runway) the pilot could prepare prior to touch-down (provided no hydraulic failure existing!):

1. Norm. Gear Handle - DOWN
2. Gear Indication - DOWN & LOCKED
3. Emerg. Gear Handle - IN (Handle can be unlocked and returned to the IN-position only by depressing the screw in the middle of the handgrip with a screw driver or pensil).

WARNING

After having performed step 1, 2, 3, DO **NOT** MOVE the Normal Gear Handle to the **UP**-position prior to touchdown, because emergency accumulator pressure for another emergency extension is lost.

Landing Gear Fails To Retract

Reduce speed to below 185 KIAS and repeat lowering and raising procedure. If gear fails to retract fully reduce speed even more and repeat procedure. If this attempt is also unsuccessful lower gear, maintain speed under 185 KIAS and land.

Note

If the landing gear position indicator shows either main gear unsafe lower the speed brakes for a short time. Experience has shown that this procedure will influence the microswitch in the GEAR IND. system to give a correct indication.

AILERONS

In case of NORM. HYDR. SYST. failure the aileron system will still be supplied with some reserve accumulator pressure before automatic transfer to mechanical linkage operation occurs.

When the AILERON SERVO EMERGENCY SYSTEM PRESSURE switch is set to ON, the ailerons can be actuated for a short time with reduced hydraulic pressure by way of a standby system and a standby accumulator.

Since the aircraft can be mechanically controlled easily at moderate speed (250 kts) it is recommended that the standby hydraulic system be switched on only during the final landing phase (nine full aileron deflections possible).

ELEVATOR

If the normal hydraulic system fails, hydraulic operation of the elevator is provided by an accumulator in the elevator system as long as accumulator pressure is available. ELEVATOR SERVO PRESS. switch to OFF to prevent erratic movement if the elevator servo is cutting in and out.

Note

Should the elevator and/or aileron hydraulic system fail, reduce speed below 250 KIAS to control the A/C more safely.

OXYGEN SYSTEM FAILURE

At the first sign of oxygen failure proceed as follows :

OXYGEN REGULATOR FAILURE

1. Green lever	recheck ON
2. White lever	move to 100% OXYGEN

If lack of oxygen continues :

3. Red lever	move to EMERGENCY

OXYGEN SUPPLY EXPENDED

If pressure indicator shows less than 100 psi :

1. Descend below 12.000 ft as quickly as possible.

Note

If oxygen pressure drops below 100 psi at high altitudes the bail out bottle can be used for a safe descent to below 12.000 ft. (Endurance approx. 10 min.)

AIR CONDITIONING AND PRESSURIZATION SYSTEM FAILURE

AIR CONDITIONING FAILURE

If automatic temperature control system becomes inoperative, proceed as follows :

1. Move AUTOMATIC switch to MANUAL INCR. or MANUAL DECR. until the desired temperature is reached.

Note

In case above operation is unsuccessful :

1. Descend below 12.000 ft.
2. PRESSURIZ. switch to OFF.
3. EMERG. COCKPIT VENTILATION lever to ON.

PRESSURIZATION FAILURE

If a comparison of cockpit pressure (cabin alt.) and altimeter reading indicates pressurization failure, proceed as follows :

Equal Readings On The Cabin Altimeter And The Flight Altimeter - Above 12.000 ft

1. Emerg. cockpit ventilator lever — Check OFF
2. Cockpit press. circuit breaker — Check IN
3. Cockpit press. switch — Check ON

If altimeter readings remain practically unchanged after these checks :

4. Descend below 12.000 ft.

Great Difference In Instrument Readings At Altitude Above 12.000 ft

(i.e. considerably more than 12.000 ft difference)

1. Descend below 12.000 ft.

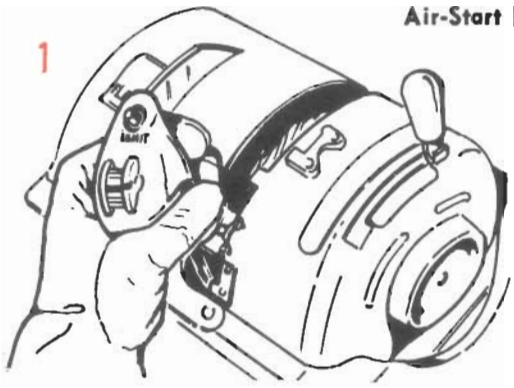
If instrument readings continue to be different :

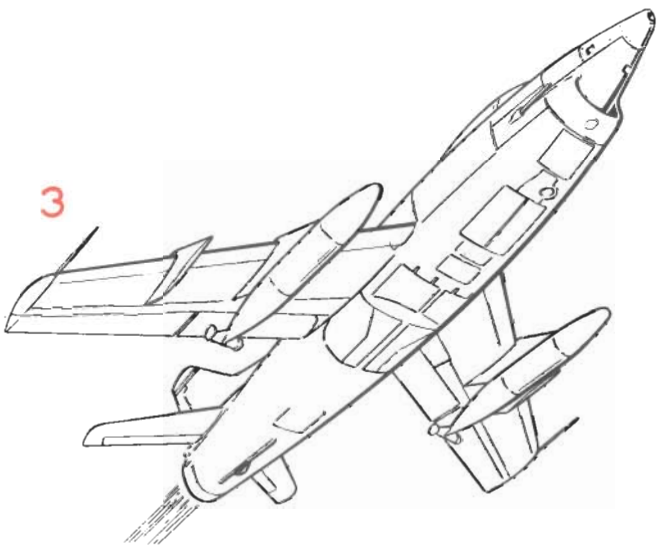
2. Emerg. cockpit ventilator lever — ON
3. Cockpit press. switch — OFF

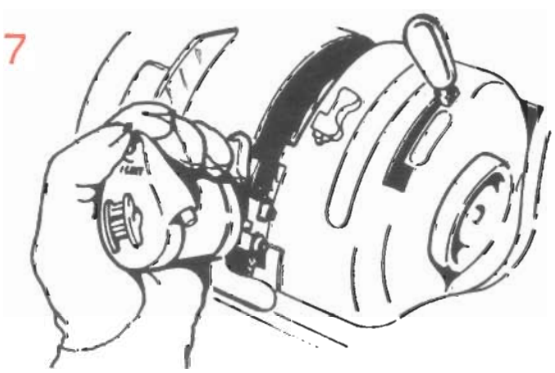
CAUTION

In case of over pressurizing of the cockpit during flight, reassure (Step 2, 3) to depressurize before unlocking the canopy to avoid damage to the hinge.

Air-Start Procedure (Cold Engine)







WARNING

CHANCES OF A SUCCESSFUL AIR-START ARE BETTER AT LOW ALTITUDES. NEVER ATTEMPT TO RESTART ABOVE 30000 FT.

1 THROTTLE - STOP

2 FUEL L.P.COCK - CHECK OPEN

3 TAIL PIPE - RAISE NOSE OF AIRCRAFT TO DRAIN ANY FUEL COLLECTED IN TAIL-PIPE

4 MAX. SPEED - 150 KT ABOVE 25000 FT
- 190 KT BELOW 25000 FT

5 RPM - APPROX. 15 % (WINDMILLING)

6 RECHECK:
- BATTERY 'ON' (BATTERY OUT, WARNING LIGHT OFF)
- FUEL L.P.COCK - OPEN
- FUEL BOOSTER PUMP - ON
- H.E.IGNITION - NORM
- IGNITION & CARTRIDGE STARTING - RED CIRCUIT BREAKER 'IN'

7 IGNIT - KEEP BUTTON DEPRESSED WHILE SLOWLY ADVANCING THROTTLE TO 'IDLE'

8 JPT-RPM - A SIMULTANEOUS RISE INDICATES A SUCCESSFUL AIR START

9 IGNIT - RELEASE BUTTON NOT BELOW 40 % RPM

10 THROTTLE - ADVANCE TO REQUIRED RPM

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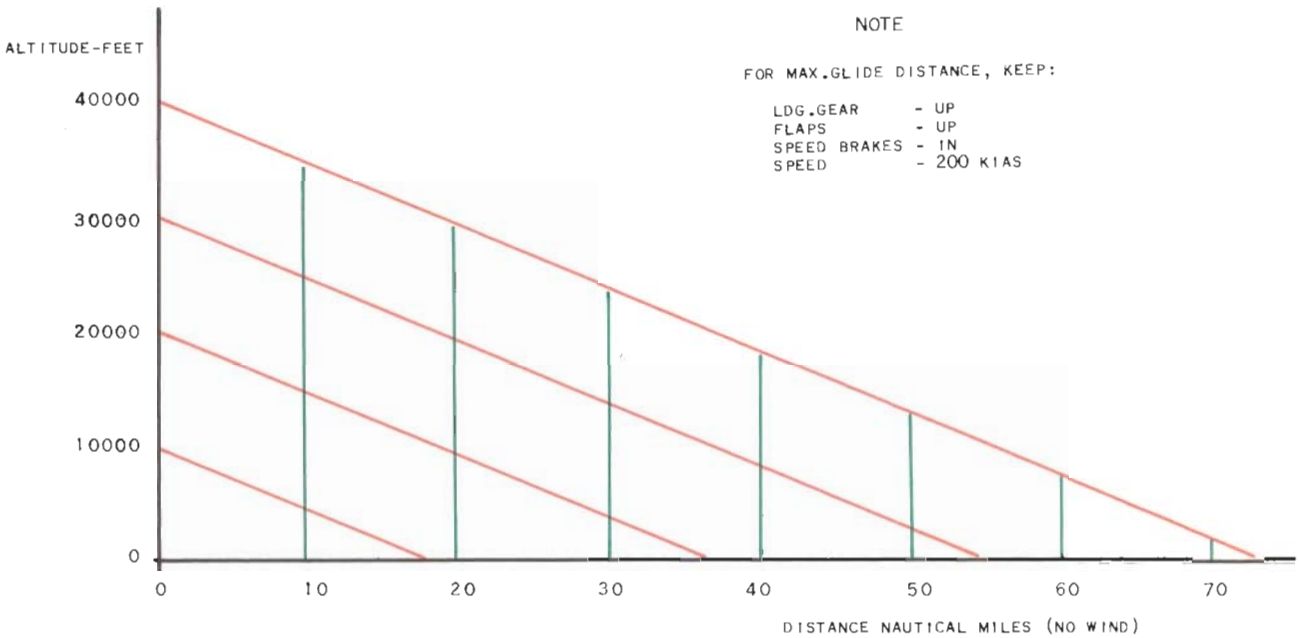
Figure 3-1

Maximum Glide Distance

NO EXTERNAL STORES



WITH TWO DROP TANKS (2 X 260 L)

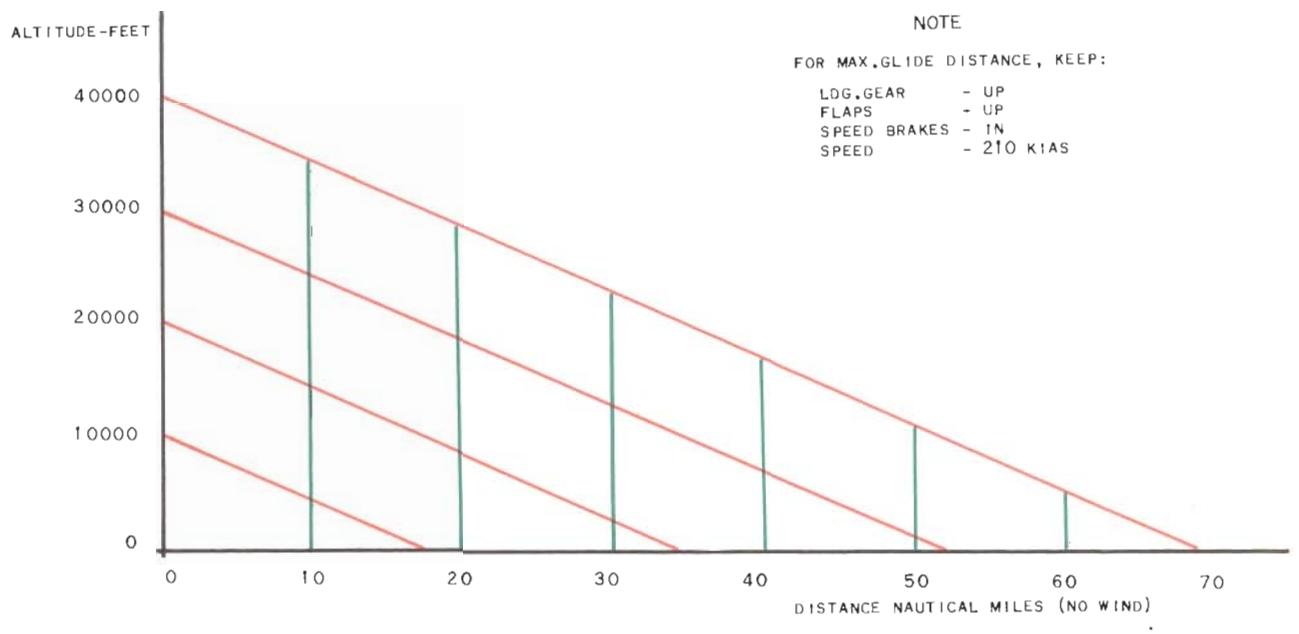


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Figure 3-2

Typical Forced Landing Pattern (Dead Engine)

WARNING

IF NO RUNWAY IS AVAILABLE DO NOT ATTEMPT A FORCED LANDING. STEER THE AIRCRAFT TOWARD UNPOPULATED AREA AND EJECT.

NOTE

BEST GLIDE RANGE TO HIGH KEY IS OBTAINED BY MAINTAINING:
200 KIAS (CLEAN AIRCRAFT)
210 KIAS (WITH EXTERNAL STORES)

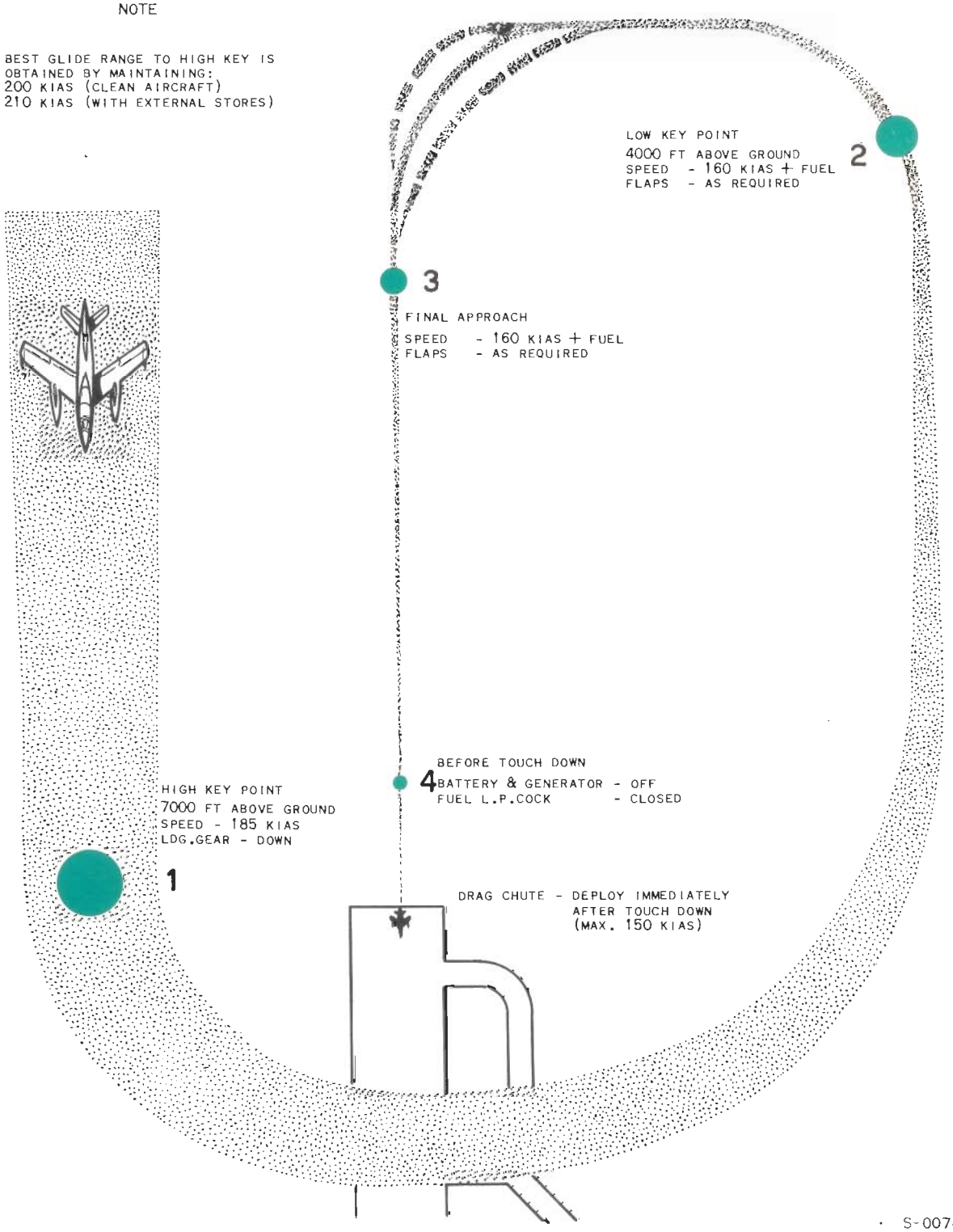

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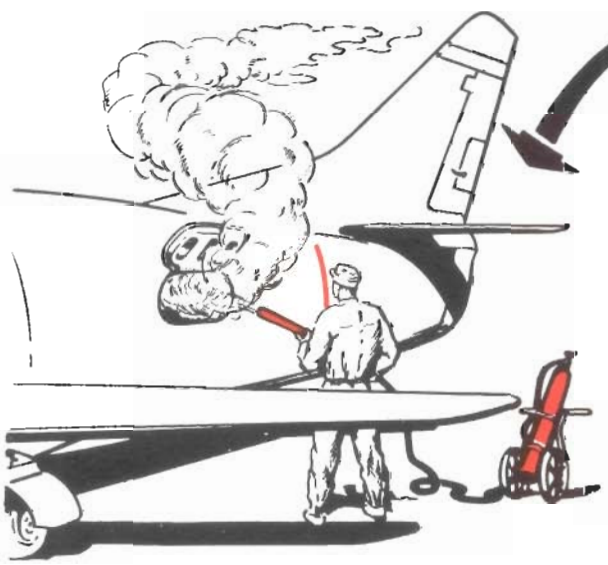
Figure 3-3

Extinguishing Ground Fires

NOTE NO FIRE EXTINGUISHING EQUIPMENT IS INSTALLED IN THE AIRPLANE.

WARNING

IN CASE OF FIRE, IMMEDIATELY RETARD THROTTLE TO STOP, FUEL L.P.COCK TO CLOSED AND TURN BOOSTER PUMP, BATTERY AND GENERATOR SWITCHES OFF ABANDON COCKPIT.

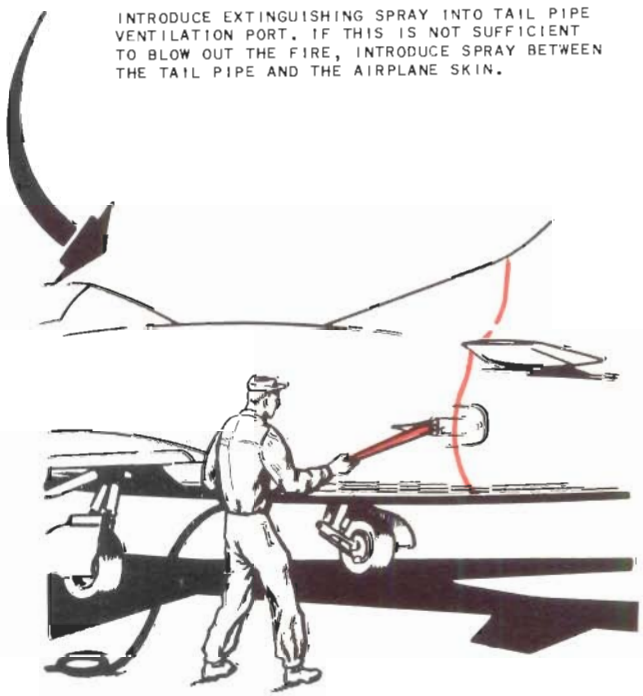


COMPRESSOR COMPARTMENT FIRE

OPEN ENGINE ACCESS DOORS AND INTRODUCE EXTINGUISHING SPRAY.

AFT FUSELAGE FIRE

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



TAIL PIPE FIRE

TURN H.E.IGNITION SWITCH TO INS AND BATTERY SWITCH ON. DEPRESS STARTER BUTTON AND TURN BATTERY SWITCH OFF AS SOON AS THE ENGINE IS STARTED. IF THE AIR FLOW IS NOT ENOUGH TO EXTINGUISH THE FIRE INTRODUCE EXTINGUISHING SPRAY INTO THE TAIL PIPE.

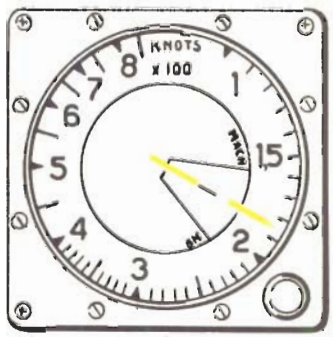
POSTFIRE PROCEDURE

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

Figure 3-4

Landing Gear Emergency Extension

1 REDUCE SPEED BELOW 185 KIAS

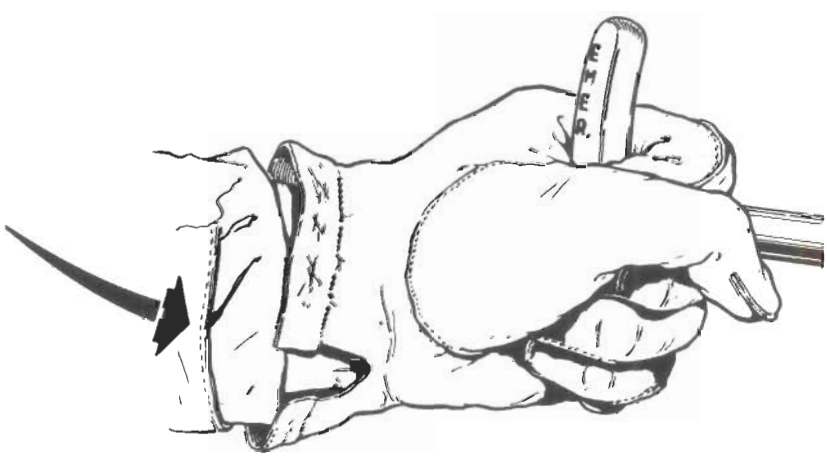


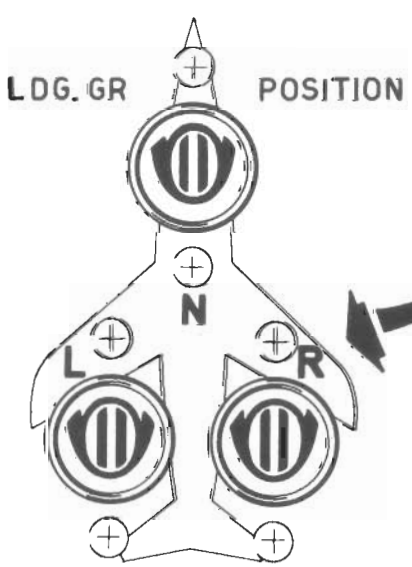
2 LANDING GEAR HANDLE 'DOWN'

NOTE

THIS STEP IS NOT ABSOLUTELY NECESSARY FOR EMERGENCY LOWERING OF THE LANDING GEAR. AS LANDING GEAR LOWERING IS INDEPENDENT OF THE POSITION OF THE LANDING GEAR CONTROL HANDLE

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



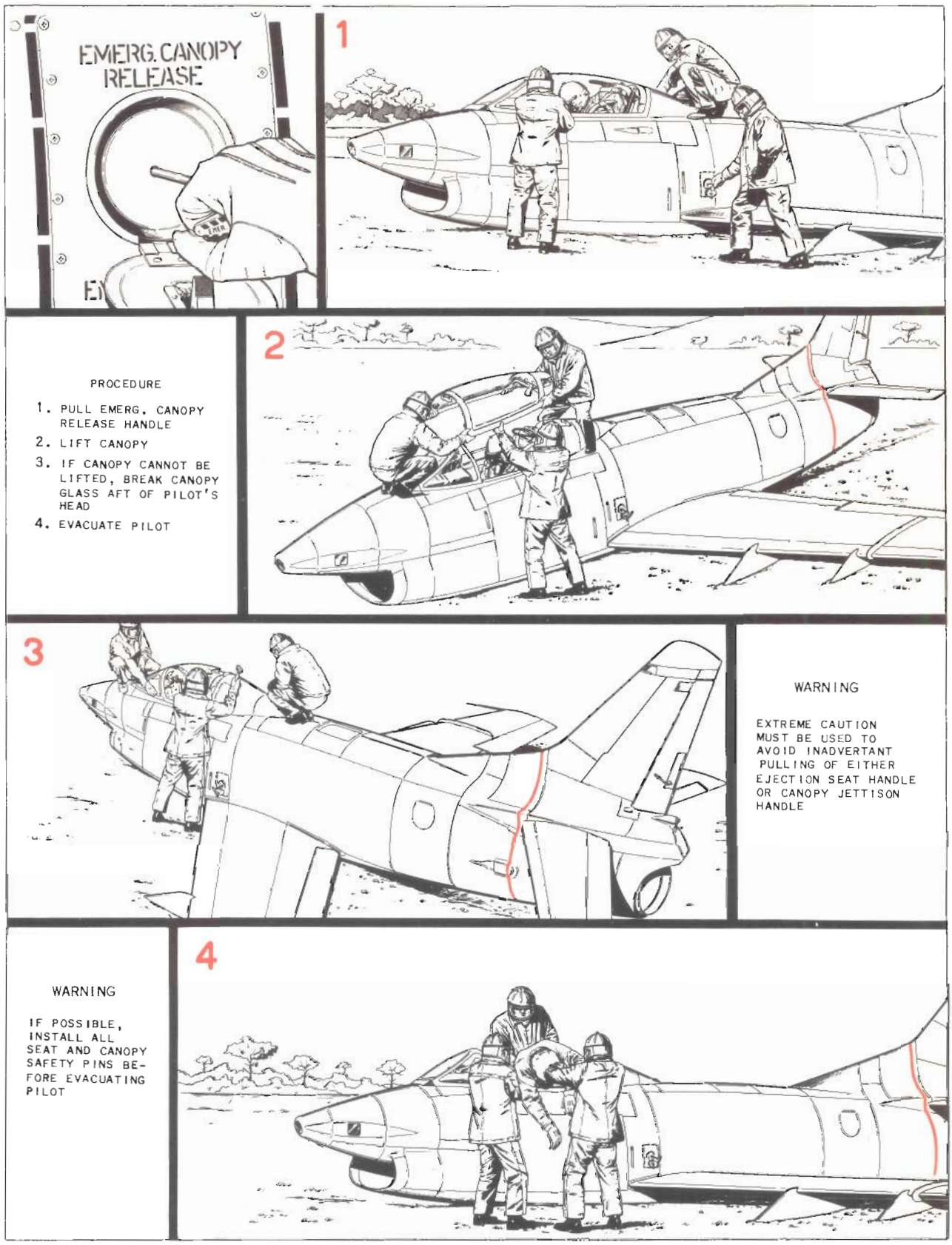


4 CHECK FOR DOWN-AND-LOCKED LANDING GEAR INDICATION, IF EITHER MAIN GEAR APPEARS TO REMAIN UNSAFE, YAW THE AIRCRAFT TO LOCK THE GEAR.

S-0009

Figure 3-5

Cockpit Emergency Entrance



S-0008/B

Figure 3-6

Seat Ejection

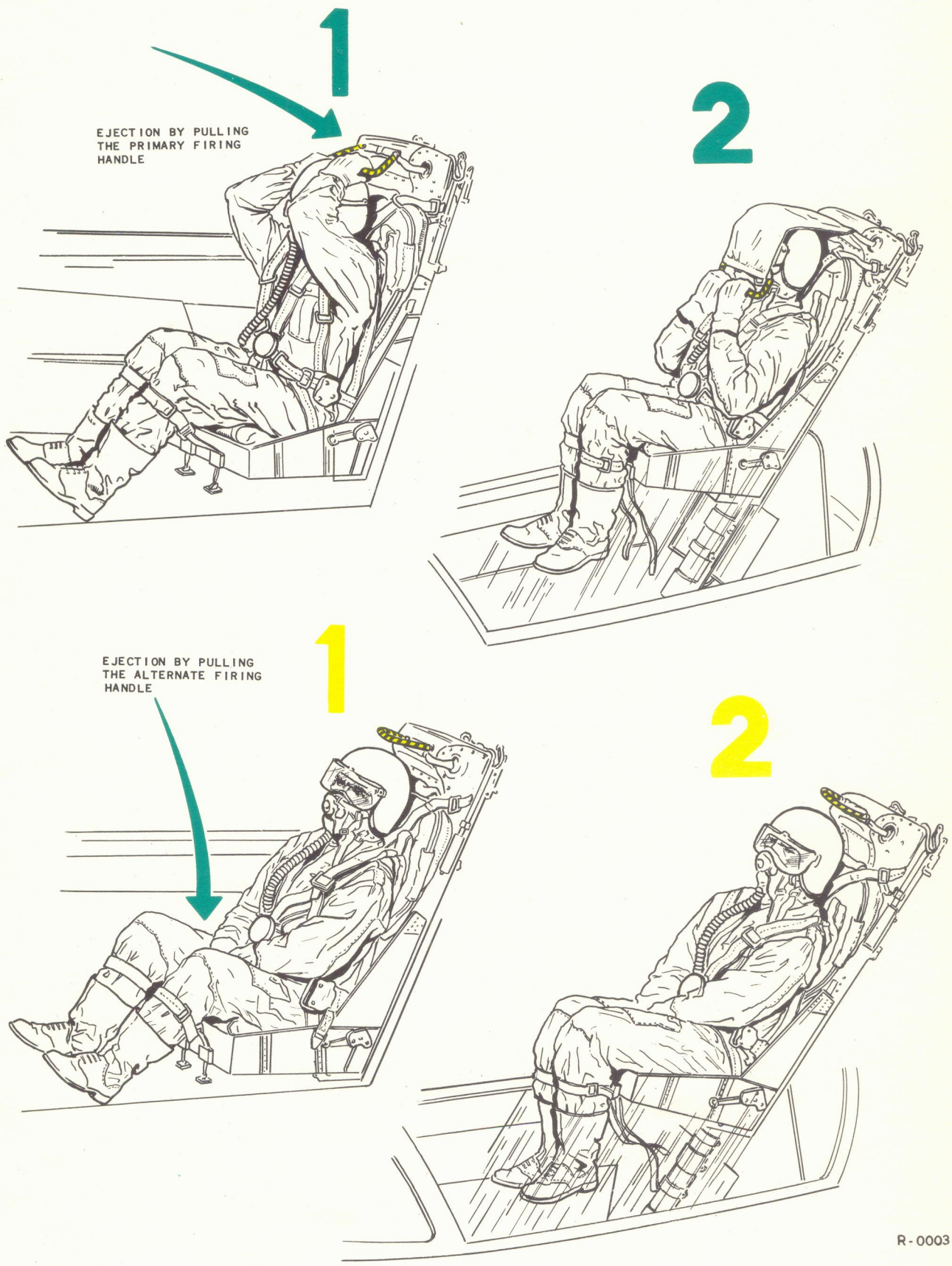


Figure 3-7

Ejection Sequence

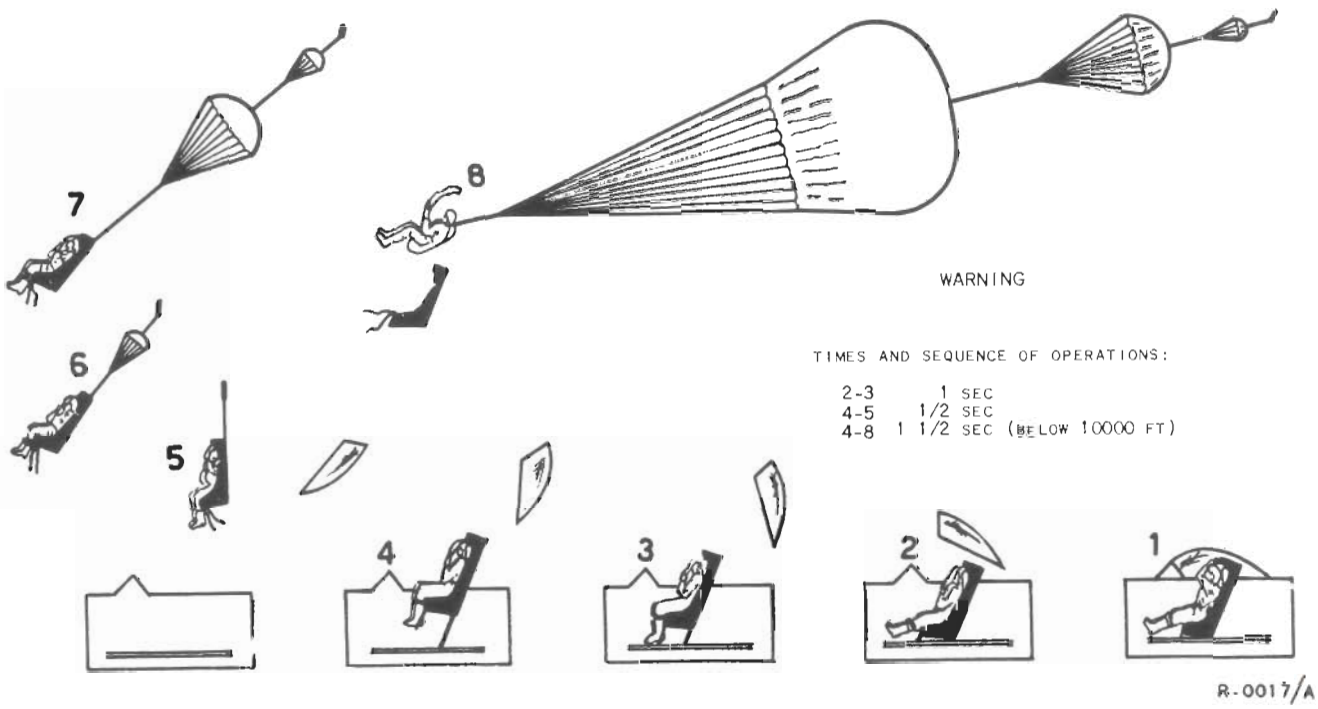


Figure 3-8

Canopy Ejection

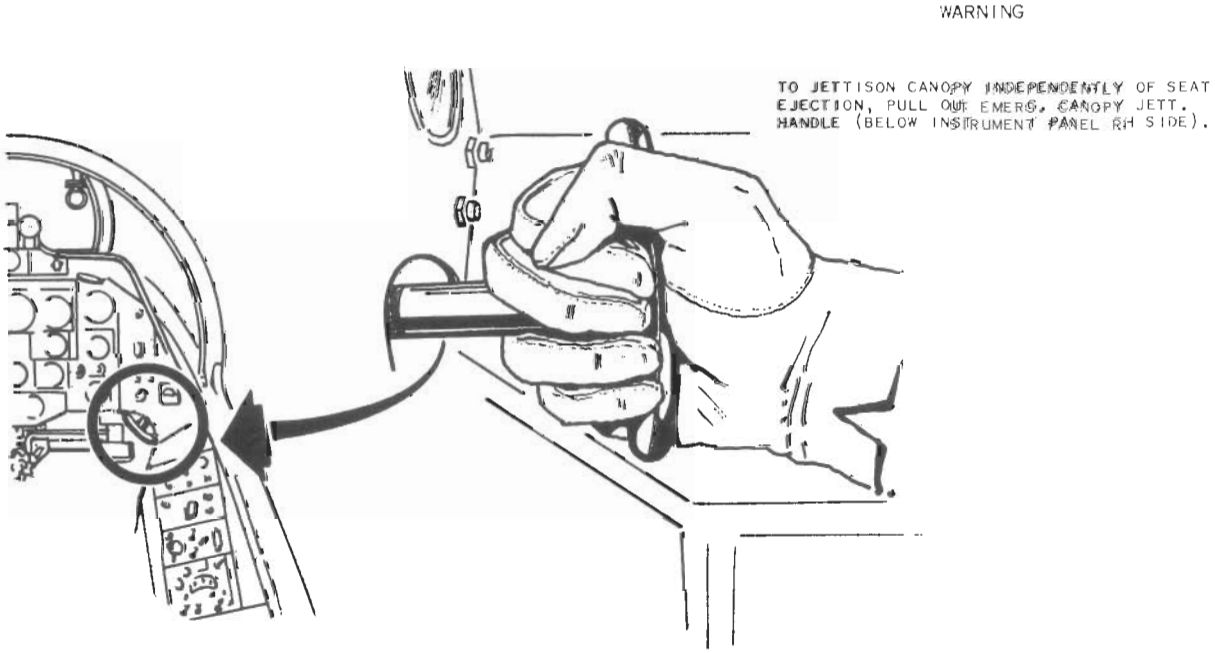


Figure 3-9

Dinghy Drill

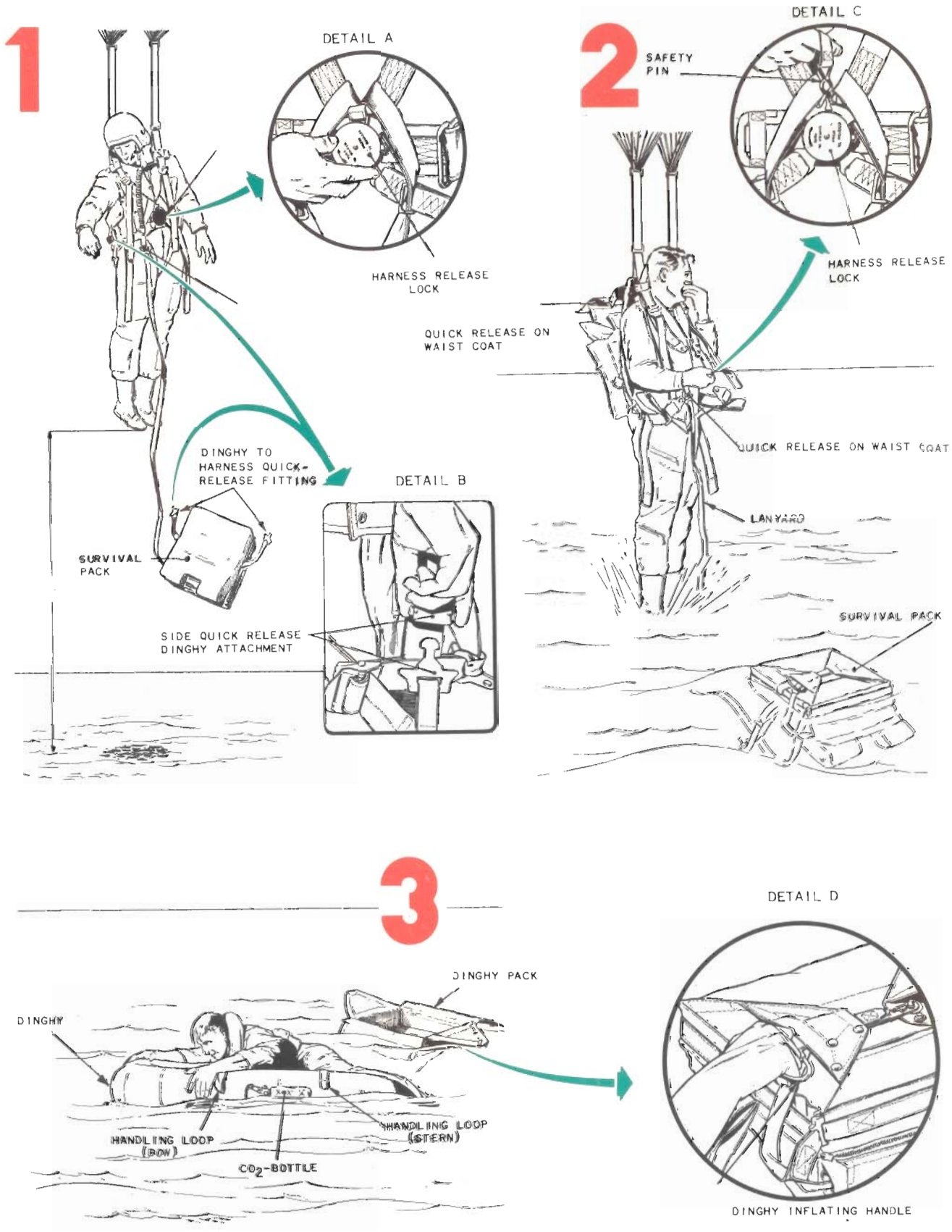


Figure 3-10

SECTION IV AUXILIARY EQUIPMENT

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COCKPIT PRESSURIZATION AND AIR CONDITIONING SYSTEM

This system (fig. 4-1) is designed for pressurization and air conditioning of the cockpit. The air required is obtained by bleeding air from the 7th stage of the engine compressor. Part of the air is passed through the cooling turbine and then mixed with the warm air that flows directly to the mixing chamber. This mixed air then enters the cockpit through the air outlets on the right hand side (adjustable) of the cockpit and just above the pedals (fixed).

A pressure regulator (fig. 4-2) maintains the correct cockpit pressure. The cockpit pressurization control panel (fig. 4-3) is located on the right hand console.

Note

The cabin altitude indicator provides a means of checking operation of the cockpit pressurization system by comparing its readings with the altimeter readings.

SYSTEM CONTROLS

Emerg. Cockpit Ventilation Lever

This lever actuates the emergency cockpit ventilation shutoff valve.

Pressurization Switch

The pressuriz. switch has two settings, ON and OFF, and serves to switch the pressurization system on and off.

Automatic Temperature Selector

Cockpit air temperature is selected by an adjustment toward INCREASE of DECREASE of the rheostat from its center position.

Automatic-Manual Selector Switch

This switch has four positions: AUTOMATIC, MANUAL INCR., MANUAL DECR. and the center position OFF. With the switch in the AUTOMATIC position, air temperature is automatically maintained at the temperature selected on the AUTOMATIC TEMP. SELECTOR rheostat. In case the cockpit air temperature electrical control system fails, the switch may be moved to either MANUAL DECR. or MANUAL INCR. until the desired temperature is reached.

DE-ICING AND DEFROSTING SYSTEM

This system (fig. 4-4) is designed to supply hot air from the engine compressor to the inside and outside of the bullet-proof windshield, the left and right windshield panels, the canopy and to the camera windows (forward, vertical, left hand and right hand).

The system is comprised of two separate circuits, one for the windshield panels, controlled by the CANOPY DEFROST-DEICE knob on the right hand console, and one for the camera windows in the nose, controlled by the CAMERA DEFROSTING lever on the right wall in the cockpit.

SYSTEM CONTROLS

Canopy Defrost De-Ice Lever

This lever can be rotated clockwise from the OFF position. When moved toward INCREASE hot air is supplied to the defrosting and de-icing air ducts.

Camera Defrosting Lever

Moving the lever to OPEN directs hot air to the outlets at the camera windows (forward, vertical, right hand and left hand side). When the lever is in the vertical position, the cutoff valve is closed.

RADIO AND RADAR EQUIPMENT

The model G91 (R/3) aircraft is equipped with the following systems :

COMMUNICATION

AN/ARC-34 UHF command radio.

NAVIGATION

PHI MARK 3B and DRA-12A Doppler Radar providing a navigational system independent of ground installations.

ADF-102 radio compass.

IDENTIFICATION

AN/APX-6B or 25 identification radar.

SOUND RECORDER

D-6B sound recorder set.

AN/ARC-34 UHF COMMAND RADIO

The UHF command radio consists of a transmitter-receiver, a control panel (fig. 4-5), an antenna (fig. 4-6), a relay, and two MIC buttons.

The system can be operated on 1750 different frequencies (frequencies spaced 0,1 megacycle). The range of frequencies lies between 225.0 and 399.9 megacycles.

WARNING

It is possible to manually set up a frequency from 225.0 to 200.0 mc with the manual frequency selector however, but as the tuning motor will continuously cycle, this will result in damage to the radio set (FIRE!).

WARNING

In any case of continuous cycling of the tuning motor, the radio set must be switched OFF.

The transmitter-receiver is comprised of a transmitter and two receivers (main and guard). Transmitter and main receiver are automatically tuned to the same operating frequency while the guard receiver is pre-tuned to the guard channel frequency. All controls are grouped on the control panel where any 20 frequencies can be preset before the flight. By rotating the channel selector any of the preset channels can be selected. The number of the selector channel appears in a small window above the selector.

In addition, four manual frequency selector knobs are provided on the panel to set up any desired operating frequency which is not preset on the channel selector.

The mode of operation of the main receiver and the transmitter is set by the MANUAL-PRESET-GUARD mode switch located directly above the channel selector. According to choise, the main receiver and the transmitter only can be selected or both receivers (main and guard) and the transmitter. These combinations can be set by the OFF - MAIN - BOTH - ADF function switch. The ADF position is inoperative. Pressing the TONE button energizes the transmitter and excites a tone oscillator which feeds the tone into the modulator. Volume is regulated by the VOLUME knob.

The MIC buttons are located on the throttle (fig. 1-10) and on the control stick grip (fig. 1-19), respectively. They permit switching from reception to transmission. Pressing one of the buttons connects the antenna to the transmitter via a relay. Releasing the buttons switches the antenna back to the receiver.

Note

When the sound recorder master switch is placed in the MIC ON position, the antenna relay circuit is opened and transmission is not possible.

The antenna, located on the top ot the vertical stabilizer, is used for both reception and transmission.

The UHF system is powered by the primary bus. The control panel is on the left hand console.

OPERATION OF THE COMMAND RADIO SYSTEM

1. Move main control switch to BOTH and allow approximately one minute for warmup of main and guard receiver.
2. Place MANUAL-PRESET-GUARD mode switch into the PRESET position.
3. Set the desired frequency with the channel selector.
4. Adjust volume.
5. In order to select a frequency not preset on the channel selector rotate the four frequency selector knobs in sequence until the desired frequency is set (the four numbers in the windows indicate the desired frequency when read from left to right). Then move the MANUAL-PRESET-GUARD switch to MANUAL.
6. Transmission and reception on the guard frequency is obtained by moving the MANUAL-PRESET-GUARD switch to GUARD. This tunes the transmitter and the receiver to the guard frequency.
7. To turn set off, rotate main switch to OFF.

MARK III B PHI NAVIGATION EQUIPMENT

The PHI MARK III B is a dead reckoning navigation system which does not require the support of ground installations to continuously display bearing and distance information in nautical miles to or from any predetermined points.

COMPONENTS OF PHI SYSTEM

Phi Station Selector

The switch of this unit, located on the right hand console (fig. 4-7/C), permits the pilot to select any of the points preset before the flight. Position 1 always corresponds to the PHI base or home station to which the other points are correlated. The selector is mounted flush in the control panel and can be removed after the RELEASE button has been pressed.

WARNING

The SEQUENCE warning light comes on when the PHI is corrected by the pilot or when the mode selector's switch is moved from HOLD to PHI position.

When light is on, no change to the control settings should be made as this may result in incorrect reading of the PHI indicator. No readings should be taken during such operational sequence change since they will be unreliable.

Doppler System

This system continuously supplies ground speed and drift information to the PHI computer.

The system consists of:

a) The RECEIVER-TRANSMITTER, located in the radio equipment bay, which radiates four frequency modulated beams (8,800 megacycles) through the antenna located on the forward bottom section of the fuselage. The signals are reflected by the ground, received by the antenna and fed to the computer which is also located in the radio equipment bay. The computer calculates ground speed and drift angle and feeds the information to the PHI system.

b) The GYROSCOPE UNIT, located aft of the armor plate under the canopy, corrects errors caused by slight deviations of the aircraft in pitch and bank. If changes in attitude are large (30° - 40° PITCH or BANK) the doppler system is cut out and information from the true airspeed transmitter and wind unit is fed to the PHI system only.

c) The CONTROL PANEL, on the right hand console provides control of the system in flight and during functional checkouts on the ground. The controls are as follows (fig. 4-7) :

- 4 position switch: OFF (system de-energized), RECVR. ONLY (receiver pre-heated and ready to operate), ON (receiver and transmitter energized), TEST (system checkout on the ground with aircraft on jacks).
- 4 position switch: INCREASE, DECREASE, RIGHT, LEFT (speed increase, decrease - drift right, left) (used only during ground checkout to apply simulated signals to the computer).
- 2 position switch: SEA - LAND (used in flight only to adapt equipment to the intensity of the ground reflections over sea or land).
- 1 warning light: ALARM (illuminates whenever the Doppler System is disconnected from the PHI system).

d) The GROUND TEST override switch permits system testing on the ground with the landing gear down.

Wind Unit (Alternate To Doppler System)

The WIND UNIT (fig. 4-7/A) is located on the left hand side on the instrument panel. It is used to feed wind information (speed and direction) into the PHI system on the ground and in flight. The PUSH TO SET-W/S knob is used to feed in the three digit wind speed data displayed on the counter. The PUSH TO SET-W/D knob is used to feed in wind direction information by rotating the azimuth card.

Note

The PUSH TO SET-W/S and PUSH TO SET-W/D knobs can only be rotated after they have been depressed. Data should be fed only when the mode selector of the PHI indicator is set at PHI.

In addition to an internal instrument light the wind unit also has a SEQUENCY warning light which goes on during computation. Wait until light goes off before taking readings or changing PHI system control settings.

Position & Homing Indicator

The PHI indicator (fig. 4-7/B) is located in the center of the instrument panel and gives continuous indication of :

- Grid bearing and distance to or from a selected station.
- Magnetic heading shown on the azimuth card against the point of the rigid miniature aircraft.

The following knobs are located on the four corners of the indicator :

a) VAR : to move lower outer dial pointer (variation/grivation setting).

b) BRG : to adjust center pointer (bearing pointer).

c) DIST : to set distance counter.

d) Mode selector : 5 positions :

- HOLD: Corrections to the PHI control settings can be made only when the selector is in this position. When in flight, the electronic memory circuit is simultaneously energized.

- PHI: The PHI indicator is energized and the system operates as an automatic dead reckoning device.
- PS (PILOT SELECT): In this mode, the system is no longer operating as dead reckoning system but merely as directional gyro. Using the BRG knob, the bearing pointer may be set to any desired heading.
- ADF: Inoperative on this aircraft.
- TCN: Inoperative on this aircraft.

Note

The distance counter begins to operate only when the airspeed is above 160 ± 5 kts.

Airspeed Integrator And Resolver

The airspeed integrator and resolver is located in the radio equipment bay and consists of a disc type speed integrator and a ball resolver to compute true airspeed distance, and bearing.

Junction Box

The junction box is located in the cockpit above the rudder pedals. The LATITUDE knob on the box is used to set latitude information. The junction box is also used as the terminal center of the entire PHI system. Besides the equipment described above, the PHI system also includes the following equipment used to automatically supply information needed for system operation :

True Airspeed Transmitter And Temperature Sensor

The true airspeed transmitter is connected to the aircraft pitotstatic system and the temperature sensor. The transmitter, therefore, produces a singal proportional to the true airspeed of the aircraft.

Gyrosyn Compass CL 11

The gyrosyn compass is a directional gyro slaved to magnetic north through an amplifier and a flux valve. The flux valve is located inside the left hand wing and senses the direction of the earth's magnetic field. Magnetic north is shown on the PHI azimuth card against the tip of the rigid miniature aircraft.

The Compass Control Panel is located on the right console. The panel has a MAG and DG two position switch, two manual synchronizing buttons L (left) and R (right) and an indicator to show alignment of the compass to magnetic north. In MAG position the compass is selfcentering if one button is depressed. When the switch is turned to DG the compass operates as a directional gyro.

The annunciator (with center zero marking) indicates whether or not the heading output and the "sensed" direction of the flux valve are the same. It provides, therefore, indication of alignment error to be corrected by manual synchronization and indicates whether the system is operating properly.

PHI SYSTEM OPERATING MODE

The pilot proceeds as follows :

(1) Before entering the cockpit ask the communications specialist whether the LATITUDE knob of the JUNCTION BOX has been properly set.

(2) Select station No. 1 on the PHI station selector for departure station (reference station in this case).

(3) Turn PHI indicator mode selector to HOLD.

(4) Set PHI indicator distance counter to "000" with DIST knob.

(5) Turn mode selector to PHI again. After the SEQUENCY light goes out, set wind speed and direction

on the WIND UNIT in accordance with meteorological information by depressing and rotating the W/D and W/S knobs. The WIND UNIT indicating light illuminates as the wind vector is set. Goes out after about 7 seconds from the moment both knobs (W/D - W/S) are released.

(6) As soon as the SEQUENCE light goes out again select destination point on the station selector. The PHI indicator will then show the direction and distance of the destination point with reference to departure point (1).

(7) With PHI indicator VAR knob set lower, outer dial pointer to magnetic variation for area where flight is to be accomplished.

Note

If GRIVATION values (variation with reference to grid north) are known, they too can be set with the VAR knob. In this case, the pilot must make certain before the flight that LATITUDE knob on the JUNCTION BOX is properly set.

Note

For flights to be accomplished in areas where considerable changes in magnetic variation are expected, or if latitude and grivation changes, instead of setting total average value divide flight into several legs and set average value for each leg (it is not necessary to place the main switch in HOLD while making these settings).

As soon as air speed has increased up to 160 ± 5 kts after takeoff, the PHI indicator continually displays flight data with reference to the selected point. According to station selected, the distance counter gives the distance in nautical miles to the selected station, and the bearing pointer presents station bearing in relation to the longitudinal axis of the aircraft and grid north.

To put the aircraft on a tracking course toward the desired station merely align bearing pointer with the grivation pointer by changing aircraft heading accordingly. When the distance counter reads "000" the aircraft has arrived at the station. The bearing pointer rotates 180 degrees, the distance counter displays miles flown from the station and the bearing pointer presents station bearing with reference to the longitudinal axis of the aircraft.

Corrections To The Indicator And Determination Of Wind Data

In fig. 4-8, it is assumed that the aircraft flies from point (2) to point (3) and that point (1) is the reference point. Since in the problem given here the departure point is not identical with the reference point the distance counter must be set at zero in the following manner:

1. Select station (2) on the PHI station selector.
2. Set the mode selector to HOLD.
3. Set the distance counter on the indicator to ZERO by means of the DIST knob.
4. Return the mode selector to PHI.
5. Set local variation with VAR knob.
6. Select station (3) for homing course to selected station.

At about half the distance to destination it is assumed that the aircraft passes a known fix "D". The exact location of "D", with reference to point (1), can be ascertained from the aeronautical charts (distance and bearing).

As soon as the aircraft is directly above "D" the pilot proceeds as follows:

1. Select station (1).
2. If the PHI information does not agree with the results obtained by using the maps, set mode selector to HOLD.

Note

Whenever the PHI indicator mode switch is set to HOLD the instrument no longer indicates. However, a mechanical MEMORY continues to store information on the track made good and feeds the data to the indicator as soon as the mode selector is returned to PHI.

3. Correct the data displayed on the indicator using the BRG and DIST knobs.
4. Depress either the W/D or W/S button of the WIND UNIT to obtain automatic correction of wind data in the PHI system concurrent with the actual position of the aircraft.

CAUTION

When the WIND UNIT warning light goes out this means that wind vector has been corrected. Therefore, wait until light goes out before making changes to control settings.

5. Return the mode selector to PHI.

CAUTION

Do not operate the MEMORY for more than 15 minutes at any one time.

6. Select the destination (no. 3 in our problem). In case the correction had been erroneous the setting can be cancelled. Before returning the mode selector switch to PHI, set wind unit to old values. The PHI indicator will automatically indicate the old data.

Mission And Return To Point Of Departure

When a mission is scheduled and no flight plans has been established or when a blank station selector box has been installed on the control panel, proceed as follows before taking off:

1. Select station No. 1 on the PHI control panel.
2. Set mode selector to HOLD.
3. Set distance counter to ZERO by means of the DIST knob.
4. Return the mode selector to PHI.

In Flight

Keep station No. 1. The PHI indicator will continually display information about the momentary position of the aircraft in terms of distance and bearing from or to the point of departure.

ADF 102 RADIO COMPASS

The ADF 102 radio compass automatically indicates relative bearing from aircraft to a station to which it is tuned.

The system consists of a receiver, an indicator, a control unit (fig. 4-9), a sense antenna, a fixed loop antenna (fig. 4-10) and a goniometer.

The system operates on power from the primary bus. Operating frequency range is from 200 to 1600 kilocycles, divided into two bands, one from 200 to 540 and the other from 520 to 1600 kilocycles. The system incorporates the functions of both automatic and manual directional finding and auto reception of modulated and nonmodulated radio signals. The controls are on the control panel located on the right hand console.

CONTROLS

Master Switch

The master switch has four positions:

a) OFF-system is inoperative.

Note

Since the instrument lighting system is independent of master switch, lighting of control panel is no indication whether or not the system is operating.

b) COMP(automatic direction finding): System functions as an automatic direction finding system using both antennas.

c) ANT-system operates as any other communications receiver using sense antenna.

d) LOOP-system operates as a direction finding system using only the loop antenna. Aural null position is obtained by manually rotating the LOOP knob.

Volume Control Knob

The volume control knob is used for adjusting audio output.

CW Switch (Non-modulated Signal)

The switch is set according to the type of station to be received, either modulated or non-modulated.

Loop L-R Control Knob

The loop L-R control knob is used to rotate the goniometer left (L) or right (R) when main switch is at LOOP.

Direction and speed of rotation are dependent upon the direction in which the knob is rotated and the magnitude of deflection. When released, the control should return to the neutral position automatically.

Tuning Crank

Tuning crank is used for precise manual tuning of the receiver to the desired station. The setting is indicated by the frequency indicator in the center of the panel.

Stations Select Buttons

When one of the five buttons is pressed a preset beacon can be selected.

Note

a) When presetting a frequency on the ground or in flight the master switch must be set to ANT. After presetting operation, the switch is to be returned to COMP.

b) When a preset beacon frequency is selected fine tuning is required. Master switch remains at COMP during this operation.

The first 4 buttons are used for beacons operating in the first frequency band and the fifth is used for a beacon in the second frequency band. The frequency of the beacon selected is indicated in the button-window.

SYSTEM OPERATION

The radio compass system can be operated in the following functions:

1. As a radio compass to obtain aircraft direction to a radio beacon.
2. To determine position of the aircraft through automatic operation or by manual aural null procedure.
3. As a communications receiver using the sense antenna.

Operation As A Bearing Indicating

1. Set mode switch to ANT.
2. Tune to desired station using the TUNING crank or press pertinent

button to receive a preset beacon.

3. Set mode selector switch to COMP. Check TUNE FOR MAX. indicator.
4. The indicator on the instrument panel shows relative position of the aircraft to station.

Communication Receiver

1. Set mode switch to ANT.
2. Set toggle switch to voice.
3. Tune to desired frequency using the TUNING crank.
4. Adjust volume.

AN/APX-6B IFF-SYSTEM

This system enables the aircraft to identify itself automatically as friendly whenever it is challenged by radar recognition equipment on the ground or in other aircraft. The AN/APX-6B consists of a transponder, a control panel (fig. 4-11) and an omnidirectional receiving and transmitting antenna (fig. 4-12).

Note

On later aircraft AN/APX-25 radar is installed.

CONTROL PANEL

Master Switch

The master switch has 5 positions: OFF, STDBY, LOW, NORM, and EMERGENCY.

a) OFF: Unit is de-energized.

Note

Since the instrument lighting system is independent from the master switch, lighting of control panel does not indicate whether or not the system is operating.

b) STDBY : All primary power is turned on, tubes are heated and ready for immediate operation. However, the transponder receiver is not sensitized, thus no replies can be transmitted.

c) LOW : The transponder receiver operates with reduced sensitivity. Replies will only be transmitted upon receipt of very strong interrogation signals, ordinarily, from nearby interrogator responders (e.g. GCA approach, if requested, and for testing of the unit on the ground).

d) NORM : The transponder receiver is fully sensitized and operates with maximum performance.

Note

It suffices to set the MASTER switch to LOW or NORM operation for MODE 1. MODE 2 and MODE 3 are selected by separate toggle switches. Setting one mode does not preclude the operation in other modes, so that the set can be operated in all three modes at once.

e) EMERGENCY : The unit operates with maximum performance but transmits emergency signals regardless of the mode of interrogation or the setting of MODE 2 or MODE 3 switch on the control panel.

Note

To set the master switch to EMERGENCY depress the red emergency dial stop on the control panel and simultaneously rotate the switch to EMERGENCY.

Note

When the ejection seat is fired a microswitch on the left seat rail is activated. Thereby the

IFF emergency MODE is automatically energized for continuous transmissions, provided the master switch was set to LOW or NORMAL.

Mode 2 - Out Toggle Switch

This switch is operative only when the MASTER switch is set at LOW or NORM. It has two positions :

a) MODE 2 : The unit receives interrogation signals in MODE 2 and transmits signals of a similar nature.

b) OUT : The unit neither transmits nor receives MODE 2 signals.

Mode 3 - Out Toggle Switch

This switch is operative only when the MASTER switch is set at LOW or NORM. It has two positions :

a) MODE 3 : The unit receives interrogation signals in MODE 3 and transmits signals of a similar nature.

b) OUT : The unit neither transmits nor receives MODE 3 signals.

I/P-Out-Mic Switch

The switch has three positions :

a) Position I/P (identification of position) is spring loaded. The unit replies in MODE 2 as long as the switch is held in I/P position, when the MODE 2 toggle switch is in the OUT position. When the switch is released it returns to OUT and the unit replies in MODE 2 to interrogating signals of a similar nature for another 30 seconds.

b) OUT : No MODE 2 interrogations are accepted therefore no replies are transmitted.

c) MIC : The MIC position causes the transponder to reply to MODE2 interrogations only when the MIC button on the throttle or on the control stick is depressed.

OPERATION OF SYSTEM

1. Set MASTER switch to NORM or LOW.
2. Set MODE 2 and MODE 3 switches to the desired position.
3. To de-energize unit, set MASTER switch to OFF.

IFF/SIF, AN/APX-25

The AN/APX-25 IFF and SIF is an airborne pulsetype transponder which enables the airplane to identify itself whenever it is challenged by either Mark X (AN/APX-6B) or selective identification feature (SIF) interrogating systems. The set does not operate simultaneously in both SIF and normal Mark X systems. This provision is included to permit continuous operation during a transitional period while the expanding network of SIF installations are replacing the older Mark X stations. A preset adjustment of the S-103 switch within the receiver-transmitter enables operation in either one or the other system. This switch cannot be set during flight, therefore, the pilot should know which system is selected by the switch. The SIF feature permits the airplane to not only reveal itself as friendly when interrogated, but also to identify itself with regard to serial number, flight number, mission, or other method previously arranged. The system is usually operated in conjunction with search radar which automatically actuates the transmission of a coded reply. A reply is received and portrayed on a plan position indicator (PPI), or letter symbol indicator, which enables selective identification and locating of the aircraft.

CONTROL PANEL (APX 25)

The control panel on the instrument sub-panel is used to select the codes in both Mode 1 and Mode 3 transponder operation. The panel contains two coaxial dials, labeled MODE 1 and

MODE 3. Their description and operation are as follows.

Mode 1 Dial

The MODE 1 dial consists of two coaxial knobs, the outer knob of which is numbered 0 through 7. The inner knob is numbered from 0 through 3. This makes possible 32 different selected responses for Mode 1 operation. The set will respond to Mode 1 interrogations according to the code set on the Mode 1 dial whenever the master switch is in the NORM or LOW positions. Mode 1 operation, as selected, will operate independently of, or concurrently with, Modes 2 and 3 operation.

Mode 2 Switch

The Mode 2 switch has two positions, OUT and MODE 2. When the switch is in the MODE 2 position (provided the master switch is in LOW or NORM) there are 400 possible reply codes available. The number and interval of these codes must be preset on the coder prior to flight.

Mode 3 Dial

The MODE 3 dial also consists of two coaxial knobs. Both the outer and inner dials are placarded from 0 through 7, making possible 64 different selected responses for Mode 3 operation. The set will respond to Mode 3 interrogations according to the code set on the Mode 3 dial, provided the master switch is in the NORM or LOW position and the Mode 3 switch is in the MODE 3 position. Mode 3 operation, as selected, will operate independently of, or concurrently with, Mode 1 and 2 operation.

RECORDER SYSTEM

The recorder is a magnetic wire type installed in the radio equipment bay. The control panel is located below the camera control panel (fig. 4-13).

(In later aircraft the recorder is installed above the left hand console below the canopy rail.)

SYSTEM CONTROLS

Main Switch

The four position main switch is located at the center of the control panel and has the following functions :

a) OFF - System is inoperative.

b) AUTOM. REC. - The system is energized and automatically records all communications transmitted and received. It is not controlled by the pilot and the pauses between communications are not recorded. (After each transmission the set continues to record for approx. 10 sec., therefore the green control light remains on for this short period.)

c) CONT. REC. - The system is energized and automatically records all communications transmitted and received for one hour. It is not operated by the pilot and the pauses between the conversations are recorded.

d) MIC.ON - The system is energized and only records the pilot's voice signals when one of the two MIC buttons (on the throttle or on the control stick) is depressed. UHF transmissions in the MIC.ON position are not possible, however, reception is provided.

Record Indicating Light

This light is green and illuminates whenever system operates and wire is feeding.

Wire Off Warning Light

This light is amber and comes on when wire is torn or nearly expended. It remains on until system is turned off.

NAVIGATION EQUIPMENT

STANDBY COMPASS

See Section I.

RADIO COMPASS

See Section IV.

PHI NAVIGATION SYSTEM

See Section IV.

LIGHTING SYSTEM

EXTERNAL LIGHTING

External lighting consists of wing tip lights, tail lights, fuselage lights and the taxi light. All external lights operate on power from the secondary bus. The position lights control panel is located on the right console (fig. 4-14) while the taxi light switch is located on the lower left hand side of the instrument panel.

Flasher Control

This switch has three positions, FLASH, OFF, and STEADY. When it is set from OFF to STEADY, position lights come ON and remain ON. When it is set to FLASH, lights go on and off intermittently.

Position Lights Intensity Control

It has two positions: BRIGHT for max. illumination and DIM for reduced intensity.

Landing & Taxi Light Switch

It has two positions: ON and OFF and is located on the lower left hand side of the instrument panel.

INTERNAL LIGHTING

Internal lighting consists of two types of lights : incandescent lights powered by the secondary bus for lighting consoles, attitude gyro and oxygen system, UHF, IFF, PHI and DOPPLER control panels. Ultraviolet lights powered by the primary bus are for instrument panel lighting.

Control rheostats are located on the right hand console.

Console Lights Rheostat

The console lights rheostat has three settings : OFF, DIM, and BRIGHT.

OXYGEN, UHF, IFF, PHI, DOPPLER CONTROL PANEL LIGHT RHEOSTAT

The panel is marked CONSOLE PANEL LIGHTS and has three settings, OFF, DIM, and BRIGHT.

INSTR. PANEL LIGHTS ULTRAVIOLET LIGHT RHEOSTAT

To switch on ultraviolet lights turn rheostat from OFF through DIM to START. Keep it at START until lights go on. Turn toward DIM to reach desired intensity.

ANTI-G SUIT SYSTEM

A hose connection located on the left hand console connects the pilot's anti-G suit to the air pressure line of the control valve, also located on the left hand console (fig. 4-15). The valve is preadjusted and opens when G-load exceeds 1.5 G. Pressure in the G-suit increases at the rate of 1.4 psi (0.098 kg/cm^2) per G. With the engine running, system operation can be checked out by depressing the button on the valve.

OXYGEN SYSTEM

The aircraft is equipped with a low pressure oxygen system (fig. 4-16) with two type D-2 cylinders and an emergency oxygen bottle located on the right hand side of the ejection seat and connected directly to the

oxygen mask hose. For safety of operation, especially under combat conditions, pressure lines from the cylinders to demand type oxygen regulator are independent and have check valves installed. In the diluter demand regulator (fig. 4-17) air is mixed with oxygen in proper proportion for given flight altitude. The regulator is equipped with a pressure gage, a flow meter, a bulb for lighting dials and system controls.

CAUTION

For long range missions (drop tanks installed), observe following limitations :

a) NORMAL LOW ALTITUDE MISSIONS - No limitations as oxygen supply is adequate.

b) SPECIAL HIGH ALTITUDE MISSIONS - Oxygen may not be adequate to cover duration of flight. When establishing the flight plan, following table must be taken into consideration :

OXYGEN DURATION
MODEL G 91
IN HOURS
2 TYPE D-2
CYLINDERS

- Figures not in brackets represent oxygen duration in hours when the white diluter lever is at NORMAL OXYGEN.
- Figures in brackets represent oxygen duration when the diluter lever is at 100 % OXYGEN.

Cabin altitude in feet	Gage pressure in psi (kg/cm^2)						
	400(28,1)	350(24,6)	300(21,1)	250(17,6)	200(14,1)	150(10,5)	100(7,0)
30.000	2.1 (2.1)	1.8 (1.8)	1.5 (1.5)	1.2 (1.2)	0.9 (0.9)	0.6 (0.6)	0.4 (0.4)
25.000	1.9 (1.5)	1.6 (1.3)	1.4 (1.1)	1.1 (0.9)	0.8 (0.7)	0.6 (0.5)	0.5 (0.3)
20.000	2.2 (1.1)	1.9 (0.9)	1.6 (0.8)	1.3 (0.6)	1.0 (0.4)	0.7 (0.3)	0.4 (0.2)
15.000	2.7 (0.9)	2.3 (0.7)	2.0 (0.6)	1.6 (0.5)	1.2 (0.4)	0.9 (0.3)	0.6 (0.2)
10.000	3.6 (0.7)	3.1 (0.6)	2.7 (0.5)	2.2 (0.4)	1.7 (0.3)	1.2 (0.2)	0.8 (0.1)

- When gage pressure drops below 100 psi, descend to altitude not requiring oxygen.

SYSTEM CONTROLS

Supply Control

The green supply control lever marked SUPPLY has two positions, ON and OFF.

Diluter Lever

The diluter lever is white and has two positions, 100% OXYGEN and NORMAL OXYGEN. When the lever is moved to NORMAL OXYGEN an air-oxygen mixture is provided by the regulator for the altitude at which the aircraft is flying. When the lever is moved to 100& OXYGEN, pure oxygen is delivered.

Emergency Lever

This is a red lever having three positions : EMERGENCY, NORMAL, and TEST MASK. It is kept at NORMAL during normal operation. When the lever is moved to TEST MASK the system can be checked to see that oxygen is flowing freely through the flexible hose into the mask. When the lever is set to EMERGENCY, pure oxygen under pressure (from the pressure reduce valve 37 - 42 psi) is supplied to the mask independent of the regulator.

NORMAL OPERATION

1. Check pressure in cylinder on gage. It should read 400 psi (28, 1 kg/cm^2). If it does not, have the cylinders refilled.
2. Delivery control (green lever) SUPPLY to ON.
3. Diluter demand lever (white) to NORMAL OXYGEN.
4. Emergency control (red lever) to NORMAL.

EMERGENCY OPERATION

If pilot experiences hypoxia due to improper operation of regulator, move white lever to 100% OXYGEN. If supply is still unsatisfactory, by-pass regulator by moving red lever to EMERGENCY.

RECONNAISSANCE EQUIPMENT

The system includes three Vinten F 95 MK3 cameras with related control panel and a D6B magnetic recorder.

CAMERAS

The cameras are located in the aircraft nose (fig. 4-18) and have the following functions :

- The first fixed camera (front) is arranged at a 15° downward angle (forward) from the longitudinal axis for forward oblique photography.
- The second camera (center) may be installed in either one of two positions. Its normal position is at a 15° downward angle to the horizontal and at a 90° angle to the longitudinal axis for left oblique photography. When the camera is pivoted downward it can be used for vertical shots as well.
- The third fixed camera (aft), whose optical axis is also at a 15° downward angle to the horizontal and at 90° angles to the longitudinal axis serves for laterally oblique photography on the right hand side.

The cameras can be operated simultaneously or individually according to the posision of the switches on the

control panel below the instrument panel (fig. 4-13).

The control button which activates the cameras is located on the lower left hand side of the control stick grip (fig. 1-17).

The control panel includes :

Film Counter

There are three counters, one for each camera, marked PORT or VERTICAL, FORWARD, STARBOARD and indicate the quantity of film remaining through positions F (full) to 0 (empty) with intermediate position 3/4, 1/2, and 1/4.

Selector Switches

There are three selector switches marked P or V, F, S. They are used to switch on the individual cameras and to select the camera film speed. The P or V switch for the center camera has the following positions: OFF (power off), "4" (power on, 4 frames per second), "8" (power on, 8 frames per second), and S.S. (power on, single shots).

F and S switches for front and rear cameras respectively, have the following positions: OFF (power off), "4" (power on, 4 frames per second), and "8" (power on, 8 frames per second).

Camera Heater Switch

The HEATER switch has two positions: ON and OFF.

Frequency Switch

It serves to set camera film speed when the P or V selector switch is set at S.S. (single shot). There are four positions: "1/2", "1", "2", and "3" to give intervals of 1/2, 1, 2 or 3 seconds respectively.

Aperture Switch

The aperture is mechanically preset on the ground in accordance with the lighting conditions predicted for the target area. The APERTURE switch with its three positions (3, 2 and OPEN) enables the pilot to select one of the three preset apertures depending on actual light conditions encountered on arrival in the target area.

CAMERA OPERATION

Oblique Photography

1. Push in the following circuit breakers :
   - CAMERAS HEATER
   - CAMERAS - PORT OR VERTICAL
   - FORWARD
   - STARBOARD.
2. Turn HEATER switch ON (if necessary).
3. According to which camera is to be operated, select film speed by placing P or V, F and S switch to "4" or "8".
4. Select aperture according to light conditions, placing APERTURE switch on 3, 2 or OPEN.
5. Press button on control stick grip. After photographic run has been completed set selector switches and CAMERAS HEATER switch to OFF.

If the pilot needs to record an observation report during photographic mission, he will proceed as follows:

1. Recorder circuit breaker - IN.
2. Turn recorder switch to MIC ON if only pilot's report is to be recorded.
3. Press one of the MIC buttons and talk. After recording turn switch OFF.

Note

If all calls transmitted or received are to be recorded, turn switch to CONT. REC. or AUTOM. REC., according to whether the intervals between the calls are to be recorded or not.

Vertical Photography

Note

The P or V camera must be tilted on the ground for vertical photography.

1. Push in the following circuit breakers:
   - CAMERAS HEATER
   - CAMERAS - PORT OR VERTICAL.
2. Turn HEATER switch ON (if necessary).
3. Turn P or V switch to "4" or "8" for shooting at 4 or 8 frames per second (operation similar to oblique cameras) or to S.S. (single shot). In the latter case, select interval between each frame with FREQUENCY switch.
4. Adjust diaphragm aperture with APERTURE switch.
5. Press control button on control stick grip.

Note

If P or V switch is turned to SS, single shooting can be performed by turning FREQUENCY switch to "3" and momentarily pressing

If recording is to be made in addition to vertical photography, use procedure as described in preceding paragraph. After completion, turn P or V and HEATER switches OFF.

ARMAMENT SYSTEM

GENERAL

The armament system consists of a control panel, firing, launching and release controls, missile control, gun sight, gun camera, basic armament, and additional armament on inboard and outboard pylons.

CONTROL PANEL

Located on the left hand console (fig. 4-19), it consists of the following switches and indicators :

Bombs Arming Switch

This three position switch has the following functions :

a) ARMS NOSE & TAIL - Bomb nose and tail arming wires are retained by the solenoids in the bomb racks and bombs are armed upon release.

b) SAFE - Bombs are released safe with arming wires attached.

c) TAIL ONLY - Tail arming wire is pulled and bombs are dropped with nose fuze unarmed.

Bombs Selectors

Two bomb selectors, one for the OUTBOARD wing racks and the other for the INBOARD wing racks, have three positions each and function as follows :

a) ALL - All bombs are released simultaneously when the control button is pressed.

b) OFF - Bomb release circuit is cut off.

c) SINGLE - Bombs are released singly when the bomb release button is pressed. Sequence is outboard L-R, then inboard R-L.

Sight Rec. Switch

(Gun camera only when the DERVEAUX gunsight is installed.)

It has two positions, ON and OFF. When at ON, pictures of the target can be made with the gun camera mounted on the DERVEAUX gunsight (reticle on target).

Camera Switch

This four position switch has the following functions :

a) OFF 1 - System is de-energized.

b) DULL 2 - System is energized. Lens aperture is set for dull light conditions.

c) HAZY 3 - System is energized. Lens aperture is set for hazy conditions.

d) BRIGHT 4 - System is energized. Lens aperture is set for bright light.

Rocket Counters

One of the dual rocket counters is connected to the outboard and the other to the inboard launcher. The counter shows the number of rockets remaining on each of the launchers. A desired number can be set on each of the control windows by means of a lever.

Rockets Selectors

There are two rocket selector switches, one for OUTBOARD ROCKETS and the other for INBOARD ROCKETS. They have three positions with the following functions :

a) SINGLE - One rocket is fired at a time, alternately left and right, whenever, the trigger button is pressed.

b) AUTO - Rockets are fired until the trigger button is released, alternately left and right.

c) "4" - Clusters of four left and four right rockets are launched whenever button is pressed.

Rockets Jettison Ready Switches

There are two switches, one for outboard rockets and one for inboard rockets, that have two positions, JETTISON READY and OFF and are used to close or to open the rocket firing circuits.

Fuze Delay Rockets Switch

It has three positions :

a) FUZE DELAY - Rockets will explode a short time after impact.

b) OFF - Function as in FUZE DELAY. Does not deactivate the system but merely reminds the pilot to select the desired setting in time.

c) INSTANT - Rocket explodes on impact.

Guns & Camera Switch

a) GUNS & CAMERA position: Gun camera will operate when control stick trigger is depressed to the first detent and gun will fire when trigger is completely depressed.

b) OFF - Gun camera and guns are de-energized.

c) CAMERA ONLY - Only gun camera operates when trigger is pressed. Guns do not fire.

Ground Fire Switch

The ground fire switch overrides the micro switch on the landing gear left leg shock absorber which de-energizes and renders the armament system safe when the weight of the aircraft rests on the wheels. The armament system (except the external stores firing circuit) is thus re-energized.

Missiles Selector Switch

It has five positions: 0, 1, 2, 3, and 4. Positions 1, 2, 3, and 4 serve to launch missiles in the following order :

1 = outboard left, 2 = outboard right, 3 = inboard left, 4 = inboard right. Position 0 cuts off power supply.

Missiles Ready Switch

Has two positions, ON and OFF, to open or to close the firing circuit.

Power Supply Switch

Has two positions, ON and OFF, and serves to open or to close the missile power circuit.

Power Supply Warning Light

Is an amber colored light which comes on when the missile system is energized.

RELEASE, LAUNCHING AND FIRING CONTROLS

Normal controls consist of a trigger and a push button located on the control stick grip (fig. 1-9). Emergency controls consist of a SALVO switch, located on the armament control panel, and an EMER.EXT. STORES REL. handle above the main instrument panel.

Trigger

The trigger is on the front of the control stick grip. When trigger is pressed to the first detent only the gun camera is started. At a fully depressed position the guns, too, start firing.

Launching and Release Control Button

Is located on the forward side of the control stick grip. According to setting of the switches on the armament control panel this button serves to launch rockets or missiles, or to release bombs or drop tanks.

Salvo Switch

This switch serves to jettison all external stores in case of emergency. Rockets, missiles, and bombs are released safe.

Emerg. Ext. Stores Rel. Handle

This handle is located above the instrument panel. It is used for manual jettison of external stores regardless of the position of control panel switches.

MISSILE GUIDANCE SYSTEM

The missile guidance system is located on the right hand side of the cockpit and consists (among others) of a control lever to enable steering of the missile to the target over radio. To put the pilot at ease during missile guidance operation, the system is provided with an adjustable armrest.

Transmitter On Warning Light

This green warning light is located on the missile guidance control lever support. It comes on about 20 seconds after the POWER SUPPLY switch is turned ON, to indicate that the transmitter is energized and ready for operation.

GUN SIGHT

This is a reflective type fixed reticle sight with vertical adjustment for any type of air to ground attack.

Locking Lever

This lever is located on the side of the gratuated drum. By loosening it the sight is unlocked and can be adjusted upward and downward with the aid of the knob.

Elevator Control Knob

When the locking lever is loosened the sight can be adjusted by rotating the knurled knob with the gratuated dial. One complete turn corresponds to a 10° change in elevation.

Reticle Lighting Rheostat

Adjusts brightness of sight reticle and is located on the instrument panel below the sight. It is marked GUN SIGHT LIGHT.

Adjustment is obtained by rotating from DIM to BRIGHT or vice versa.

GUN CAMERA

The gun camera is located on the anti-glare shield to the right of the sight. It is controlled electrically by the trigger located on the control stick grip. Pushing the trigger down to the first detent starts the gun camera, moving it fully down fires the guns. The camera motor is energized only when GUNS & CAMERA switch is set to GUNS & CAMERA or to CAMERA ONLY and the CAMERA master switch is in any other but the OFF 1 position.

BASIC ARMAMENT

Consists of two DEFA 552, 30 mm guns located in the gun compartments on the left and right hand sides of the fuselage outside of the cockpit. The drum-type guns are automatically recharged by gases and electrically fired. Ammunition is fed from the side, the firing rate is 1200-1400 rounds per minute. Feeding is automatic, requiring no attention on the part of the pilot. Ammunition is fed from the ammunition box on a link belt containing 125 rounds. Shell cases and links are collected below the gun in the stowage compartment, from where they are removed through a quick access door.

Bullet Counter

Two electrically operated (primary bus) counters indicate the number of rounds left for firing. The two scales are located above the instrument panel just right of the EMERG. WHEEL BRAKE handle, the upper scale counting for the right, the lower one for the left gun.

Prior to gunnery flight each scale must be set manually to the amount of rounds loaded, which can be done by turning two adjustment knobs left on the frame of the counter.

ADDITIONAL ARMAMENT

Outboard Pylons

Following arms can optionally be attached :

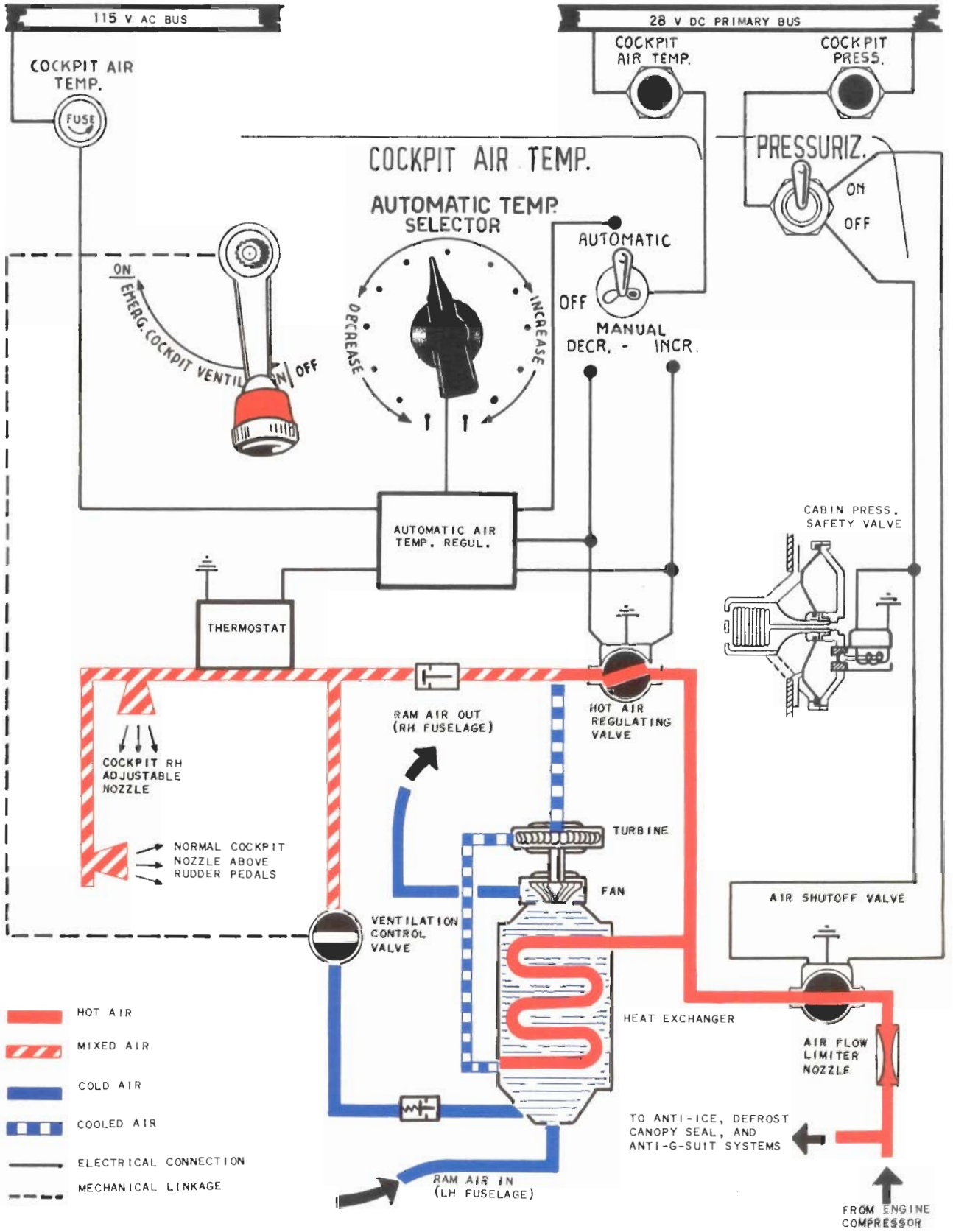
a) bombs	two 250 lb bombs
b) rockets	two rocket launchers carrying six 3" rockets each
c) missiles	two AS 20 missiles.

Inboard Pylons

Instead of fuel drop tanks, following arms may optionally be attached to the inboard pylons :

a) bombs	two 500 lb bombs
b) bombs	two 250 lb bombs
c) rockets	two rocket launchers carrying six 3" rockets each
d) missiles	two AS 20 missiles
	two 500 lb napalm bombs.

Cockpit Air Conditioning Pressurization And Ventilation System



M-0000/A

Figure 4-1

Cockpit Pressure Schedule

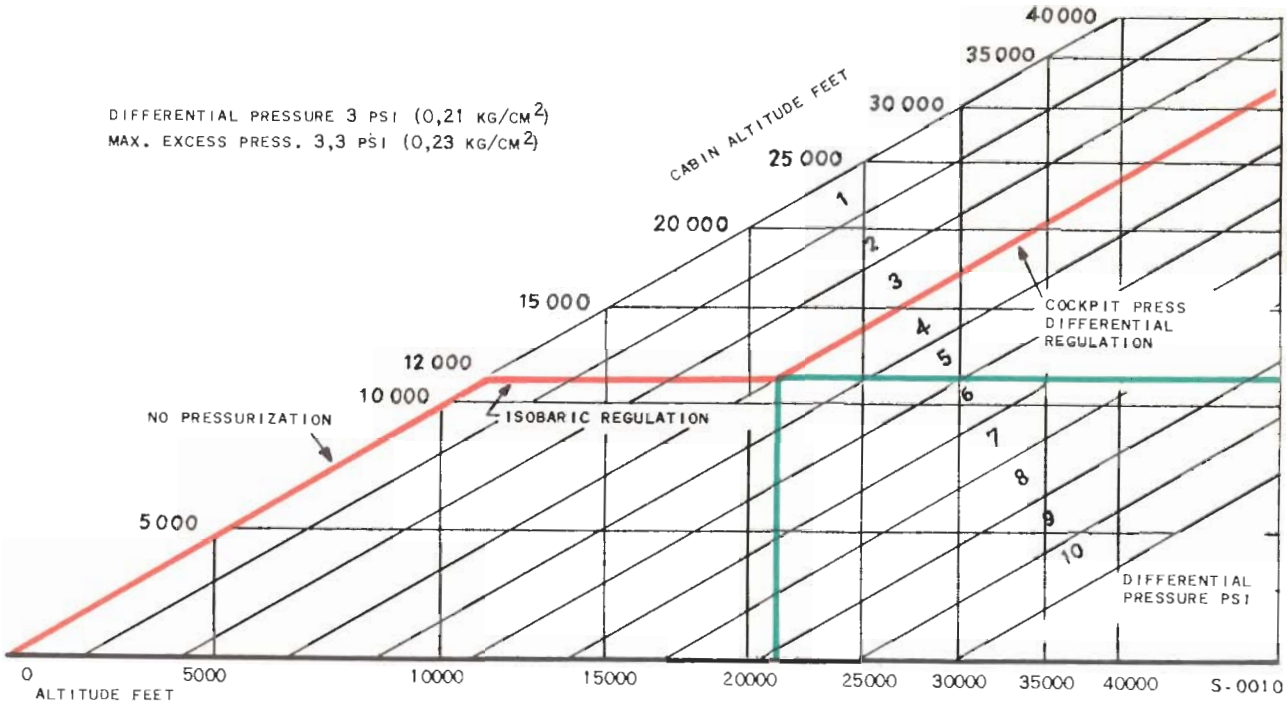


Figure 4-2

Cockpit Air Conditioning, Ventilation, And Pressurization Control Panel

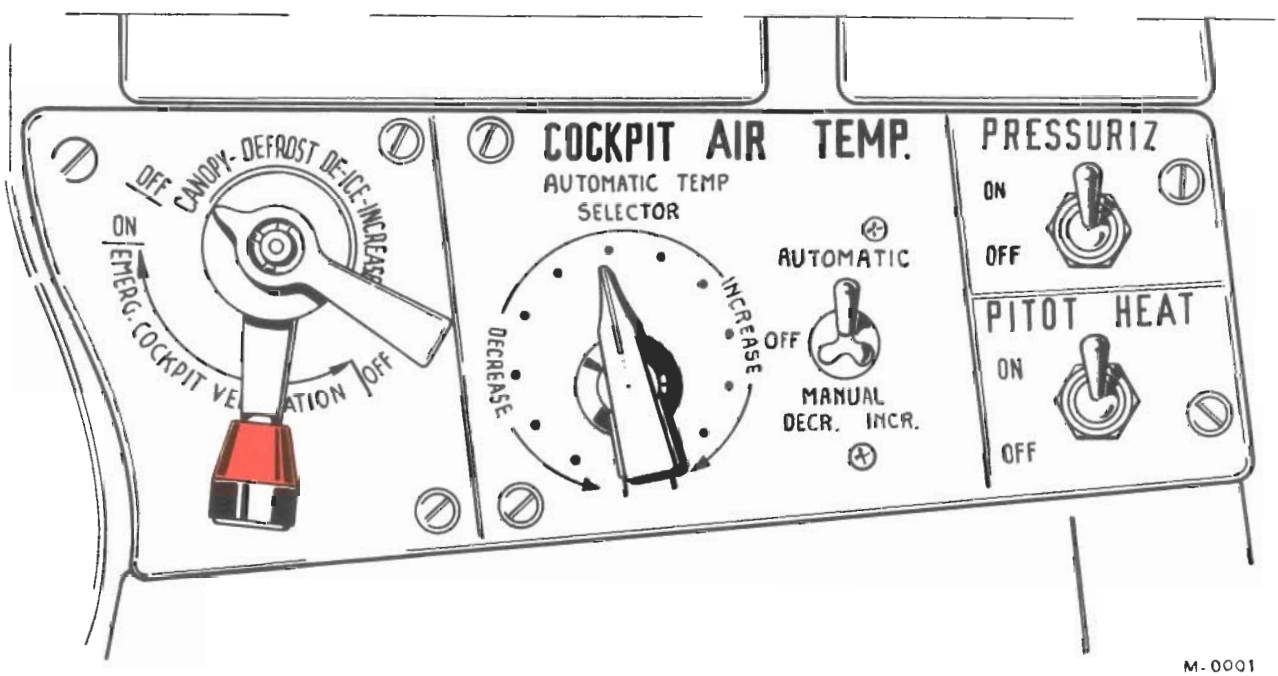
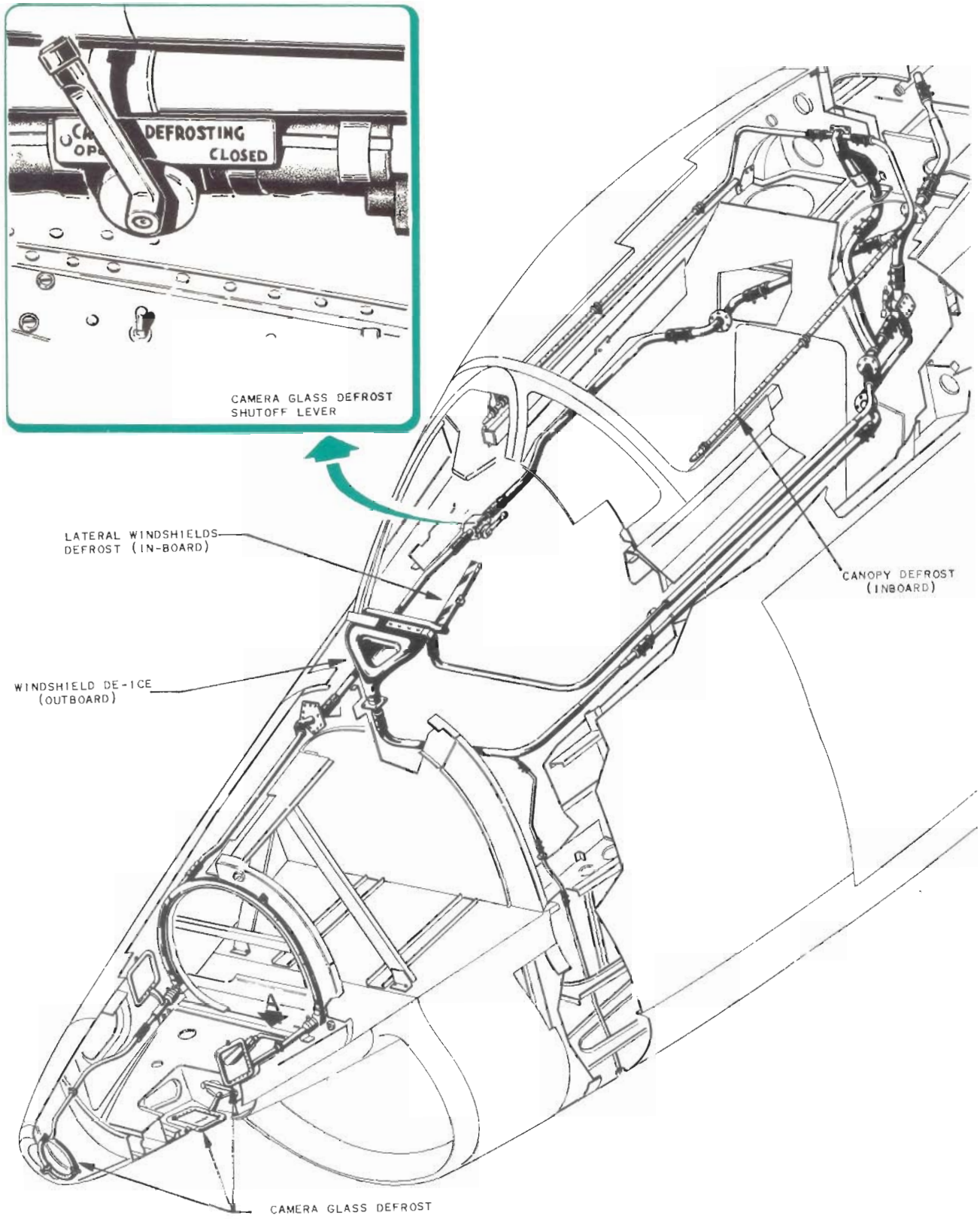


Figure 4-3

Defrost And De-Ice System



M-0002/2

Figure 4-4

Control Panel AN/ARC-34 UHF

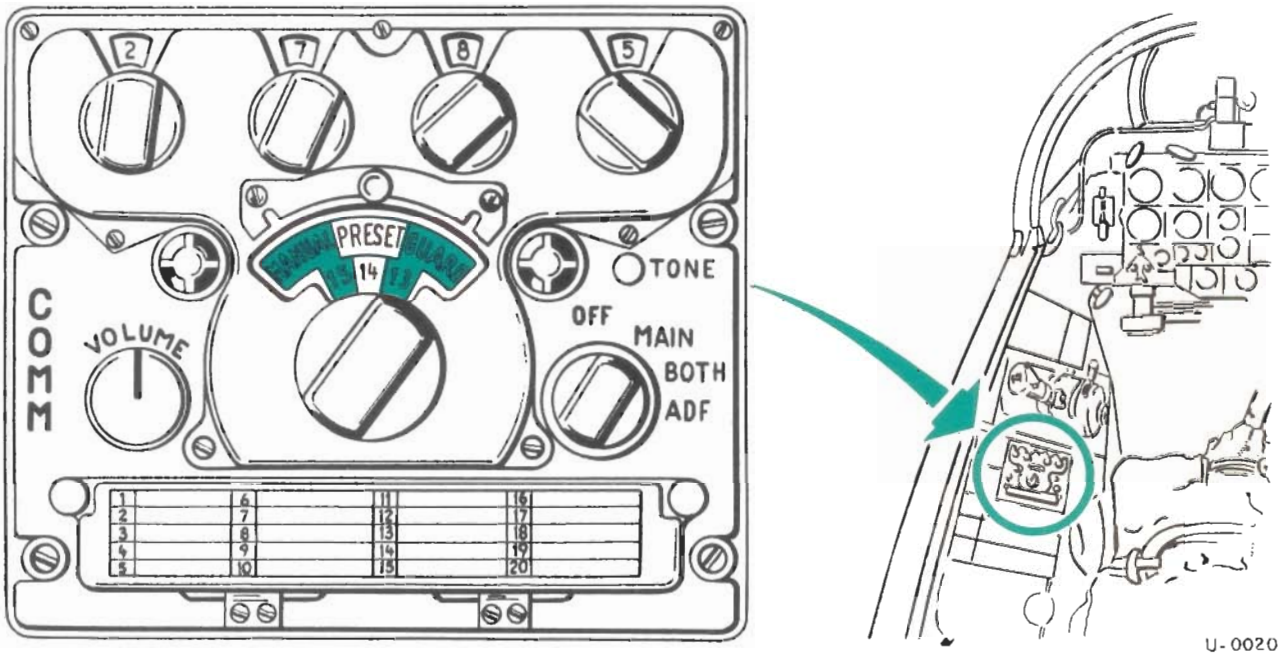


Figure 4-5

UHF Antenna Location

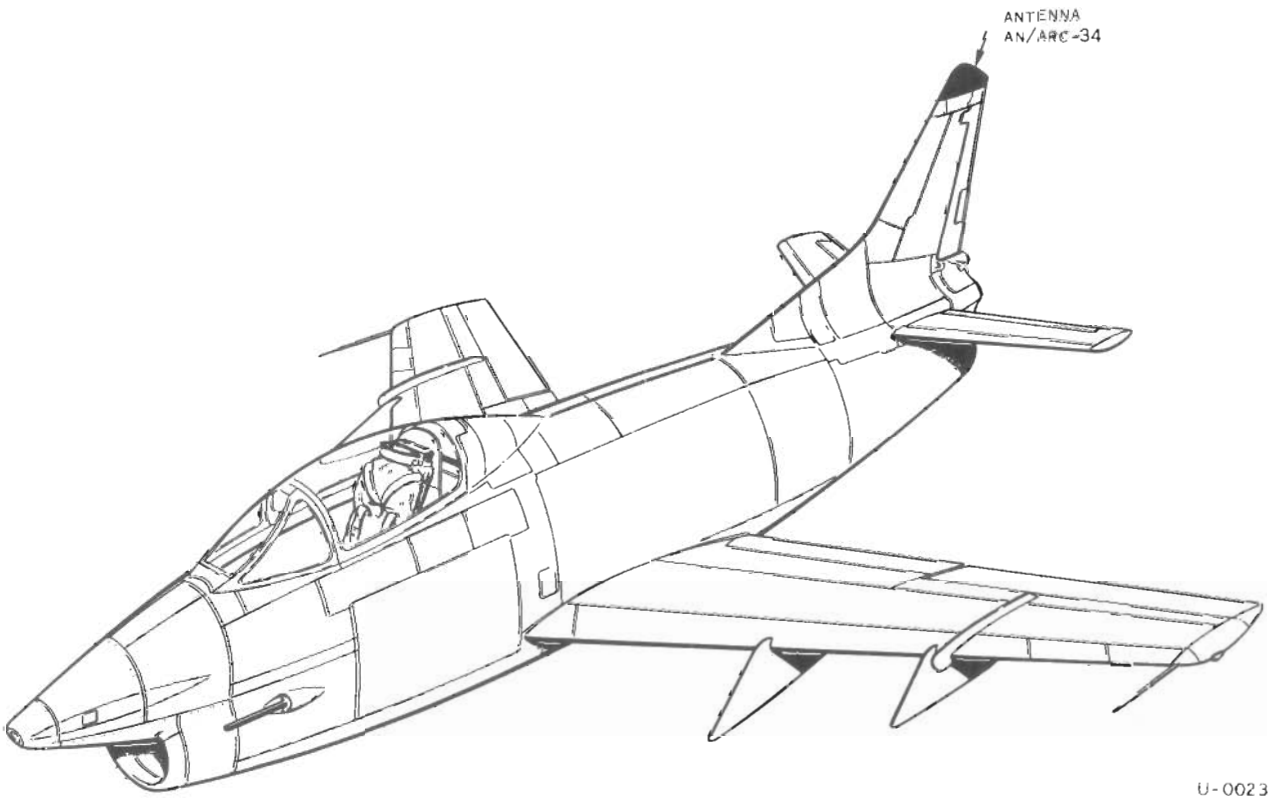


Figure 4-6

PHI Control Panel And Indicators

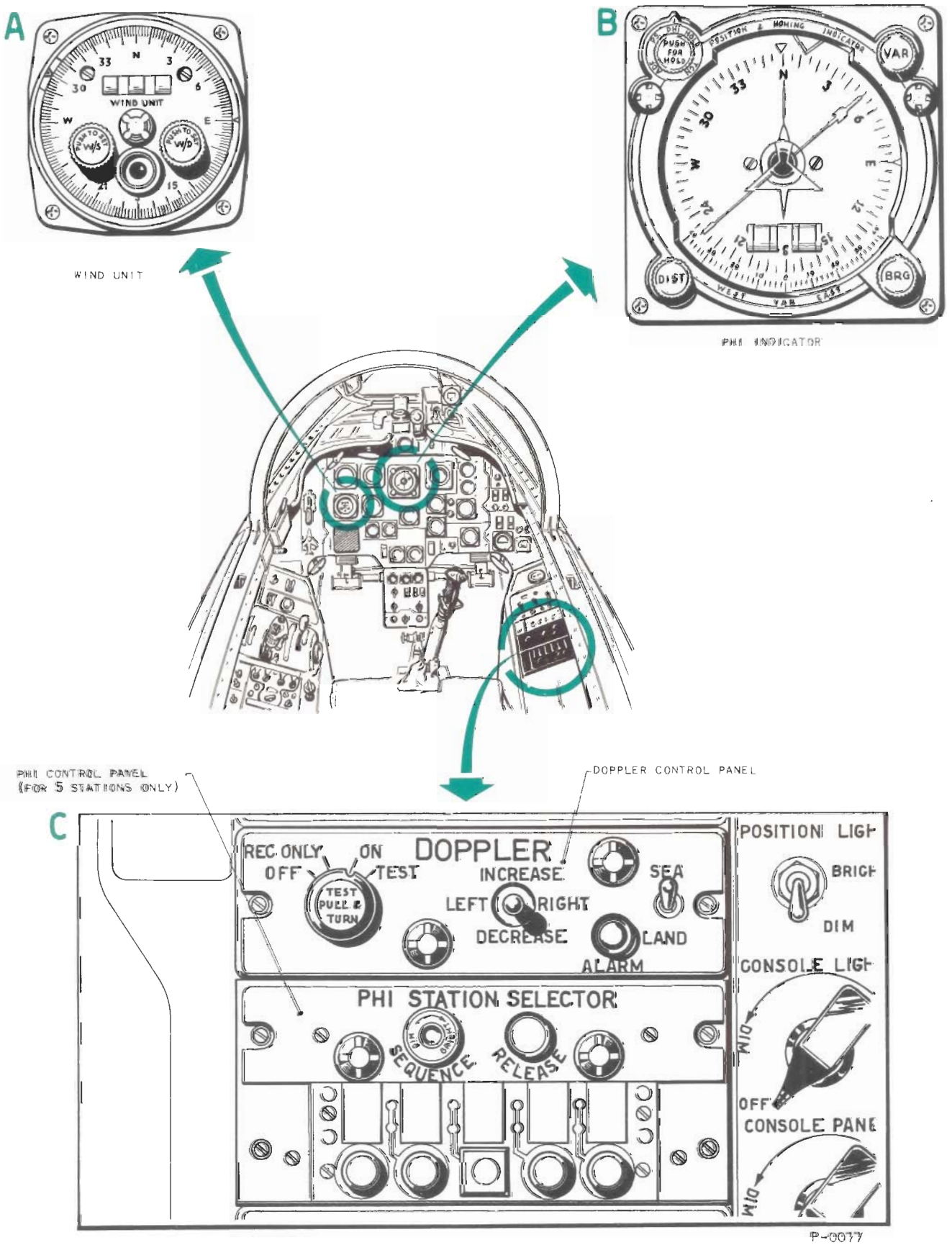
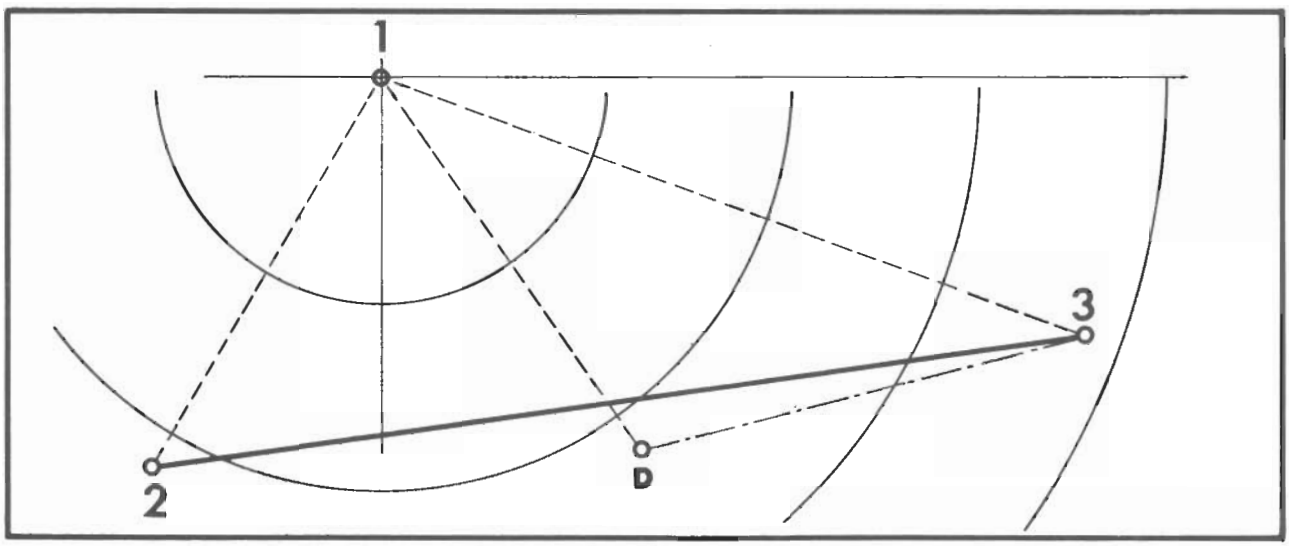


Figure 4-7



S-0076/B

Figure 4-8

ADF-102 Radio Compass Control Panel

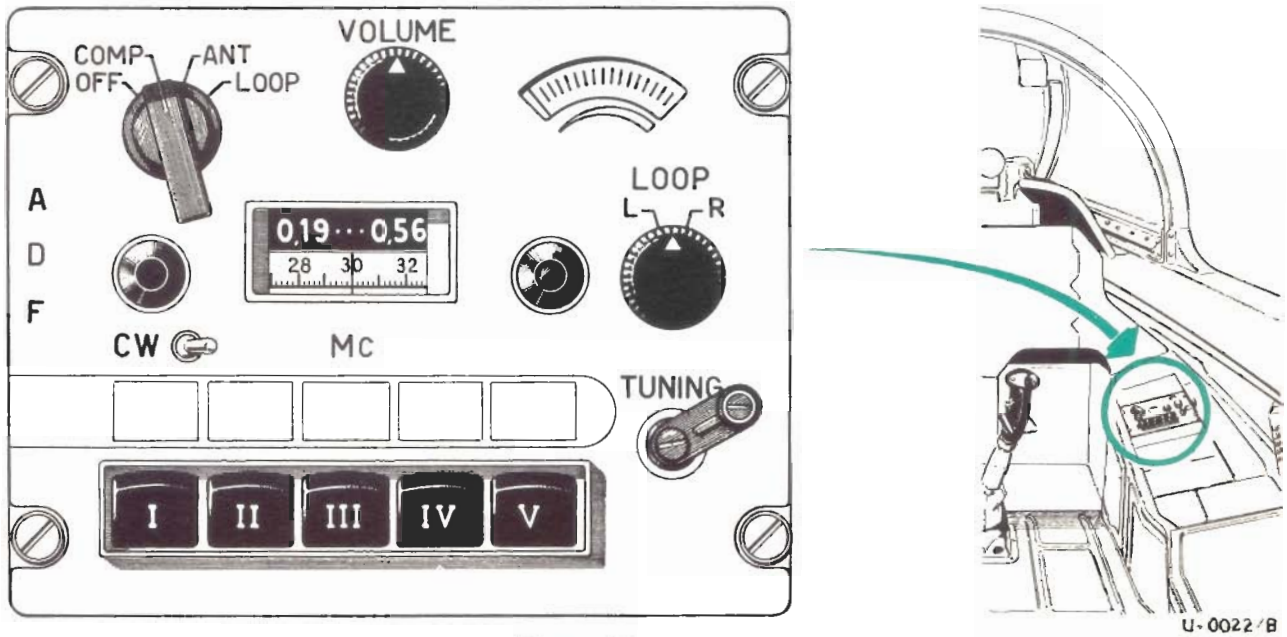


Figure 4-9

Radio Compass Antenna Location

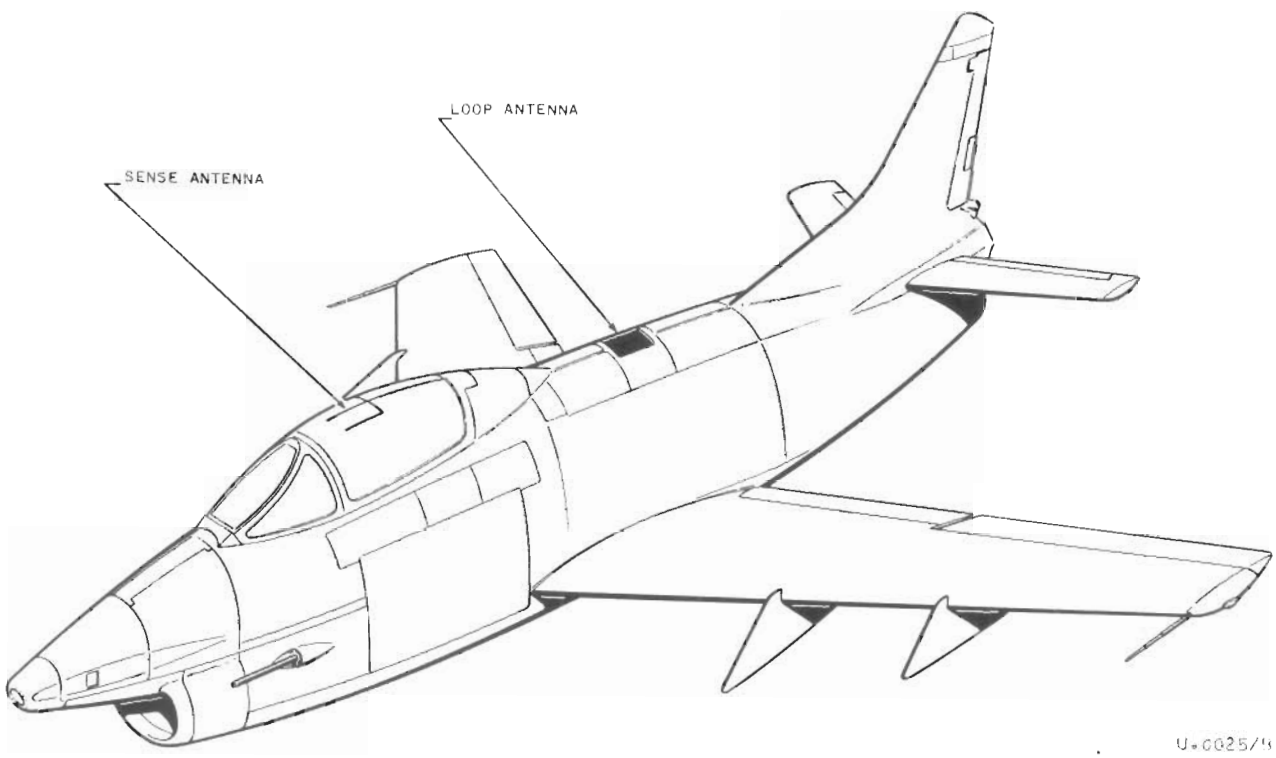
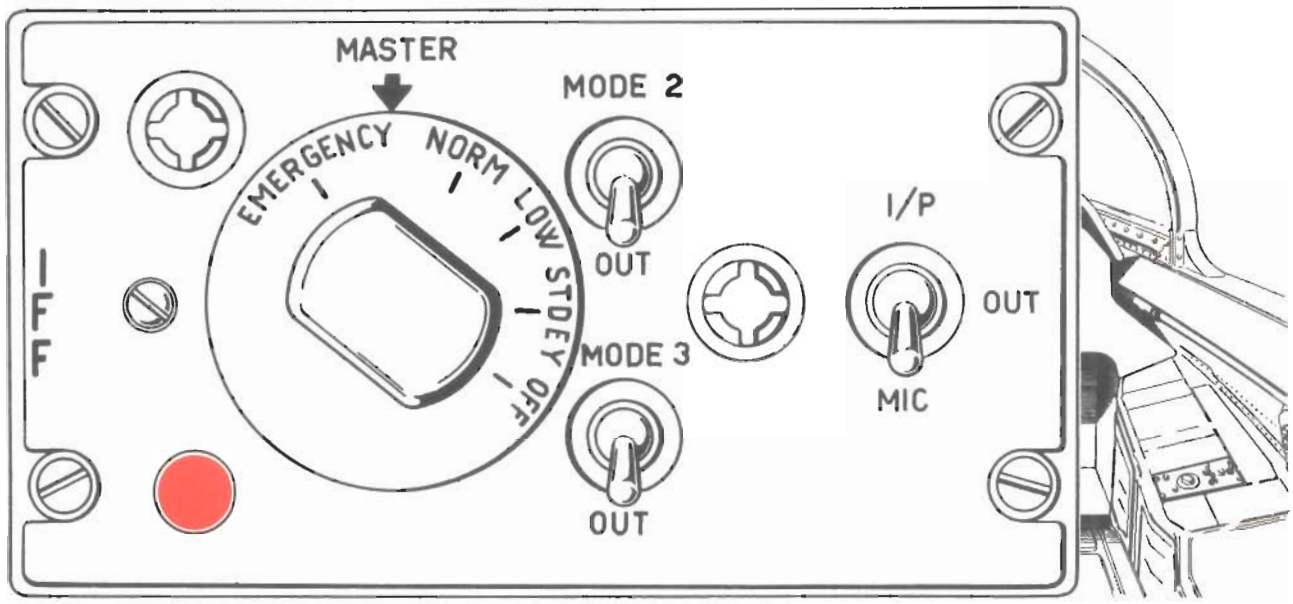


Figure 4-10

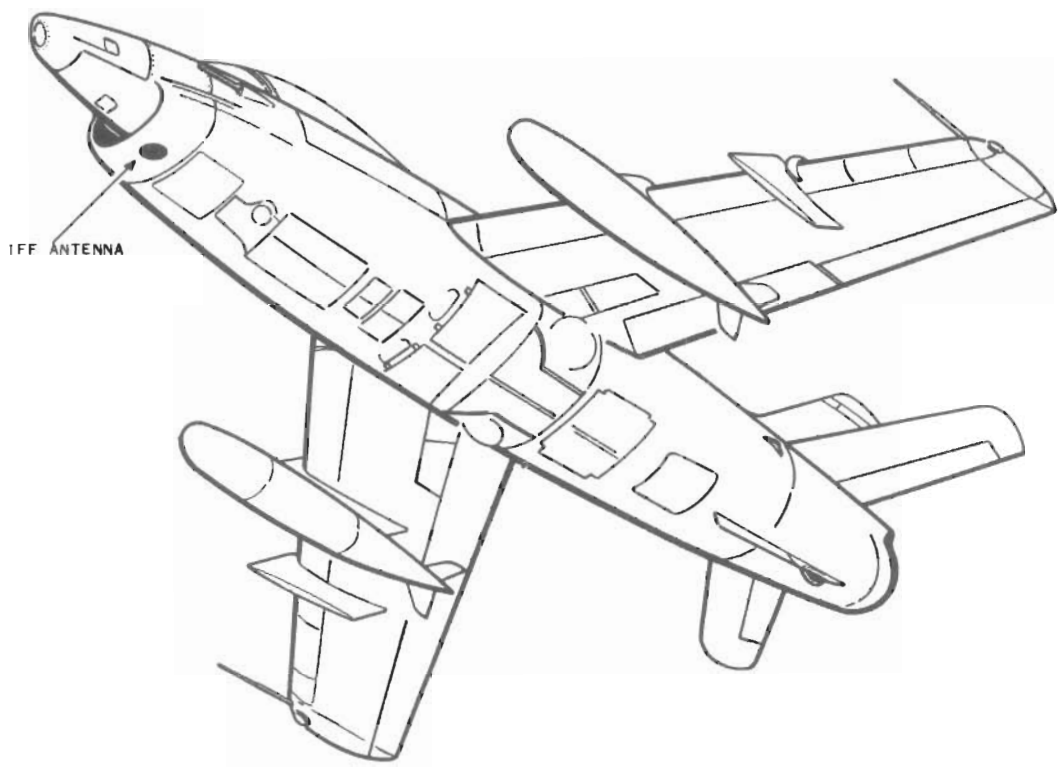
IFF-AN/APX-6B Radar Control



U-0021/B

Figure 4-11

IFF-Antenna Location



U-0024/B

Figure 4-12

Cameras And Sound Recorder Control Panels

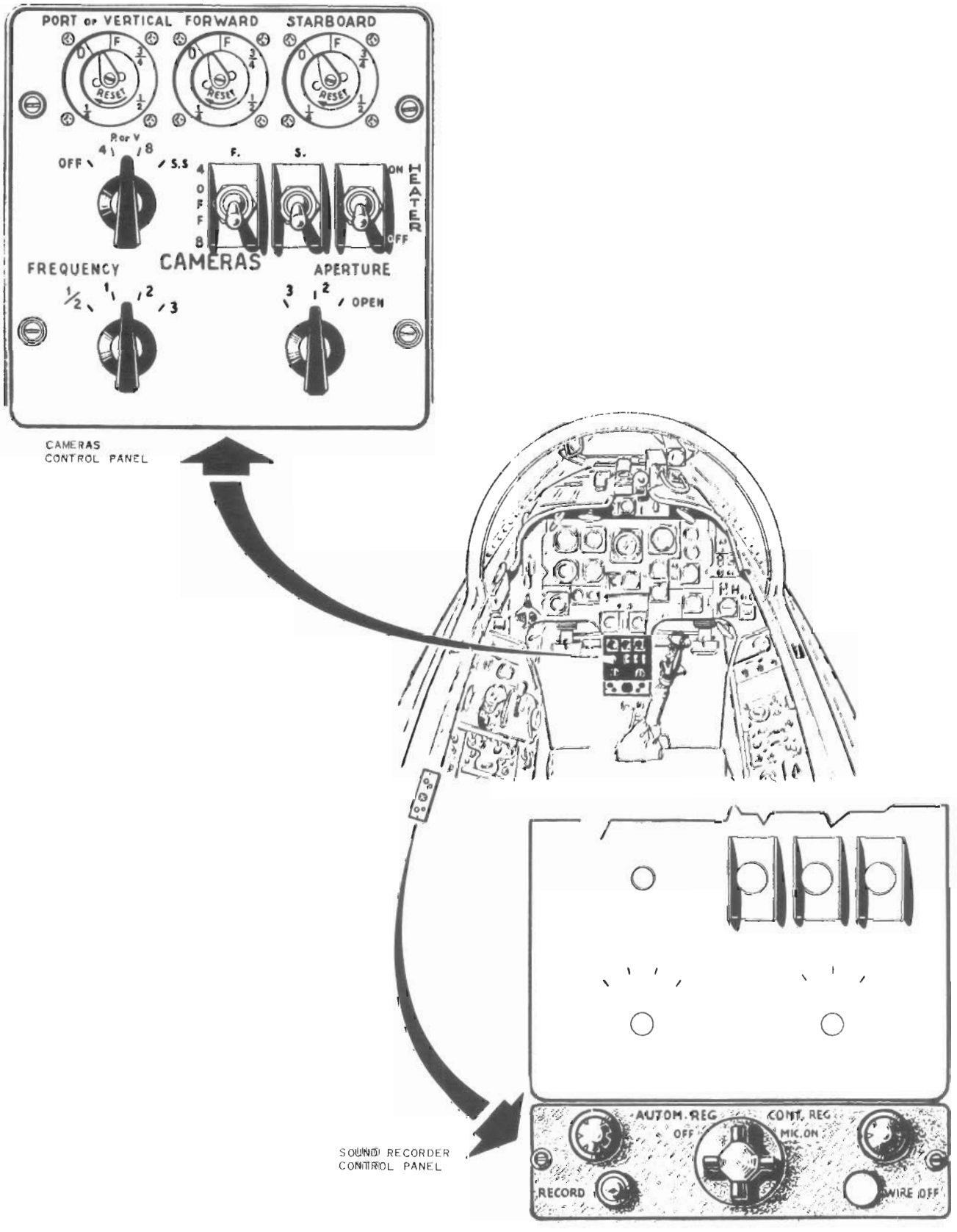


Figure 4-13

Lighting Control Panel

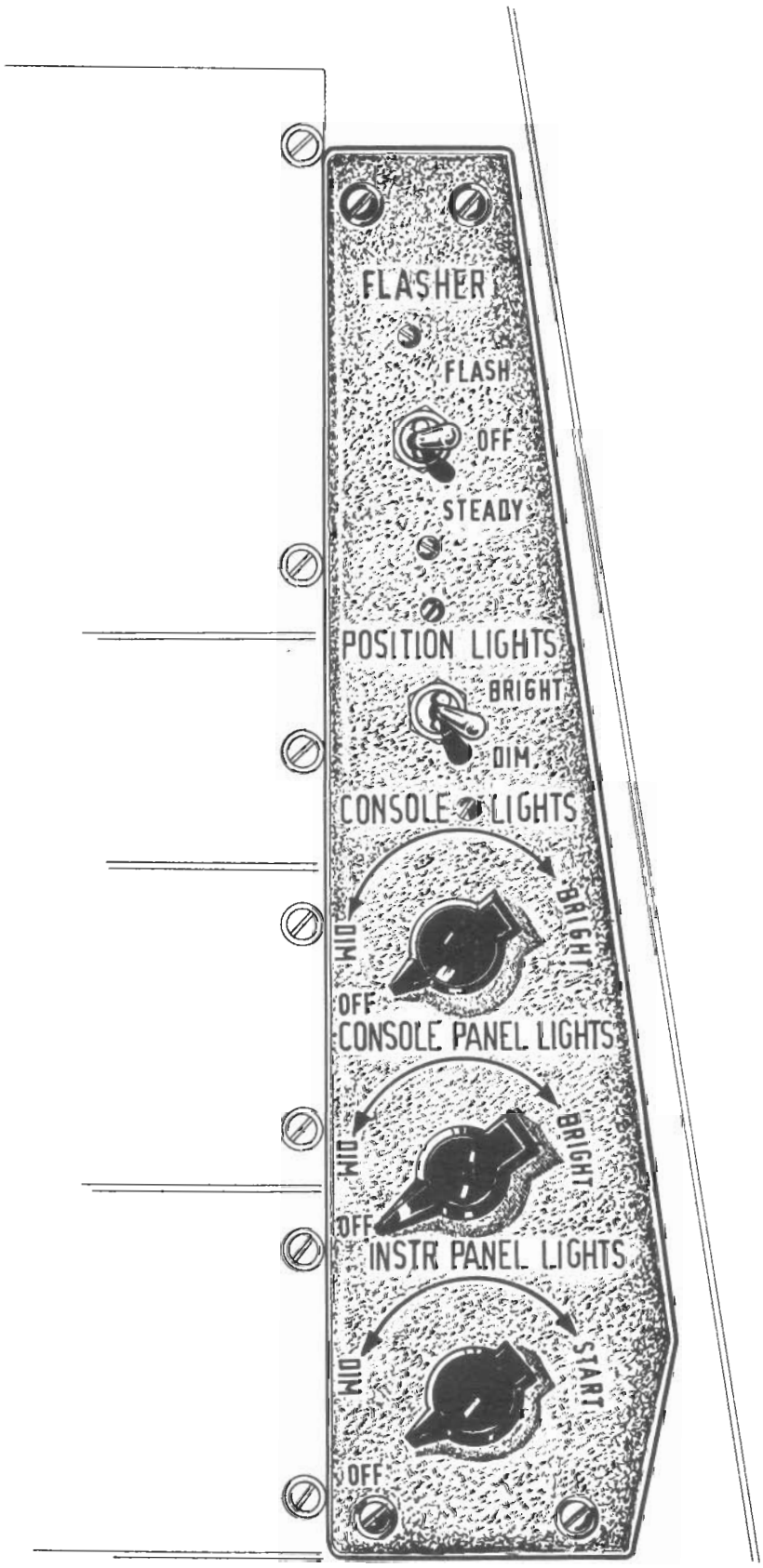


Figure 4-14

Anti-G-Suit System

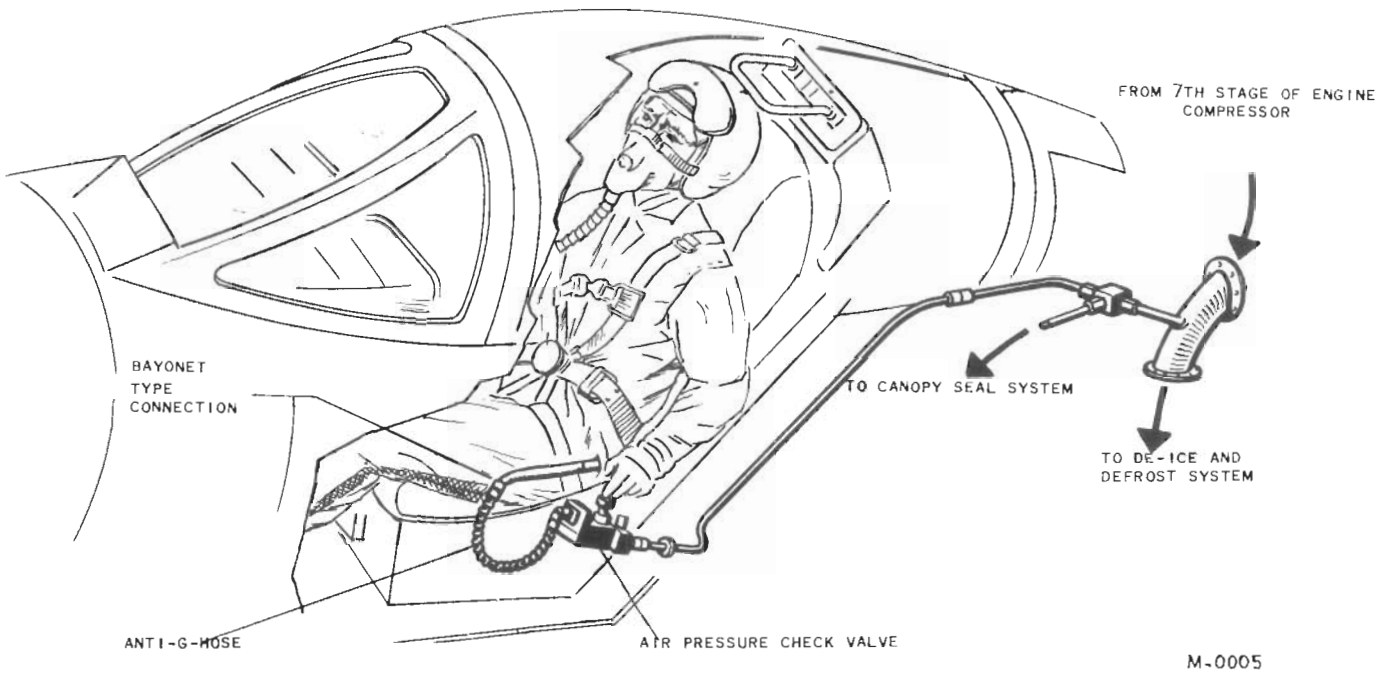


Figure 4-15

Oxygen Supply System

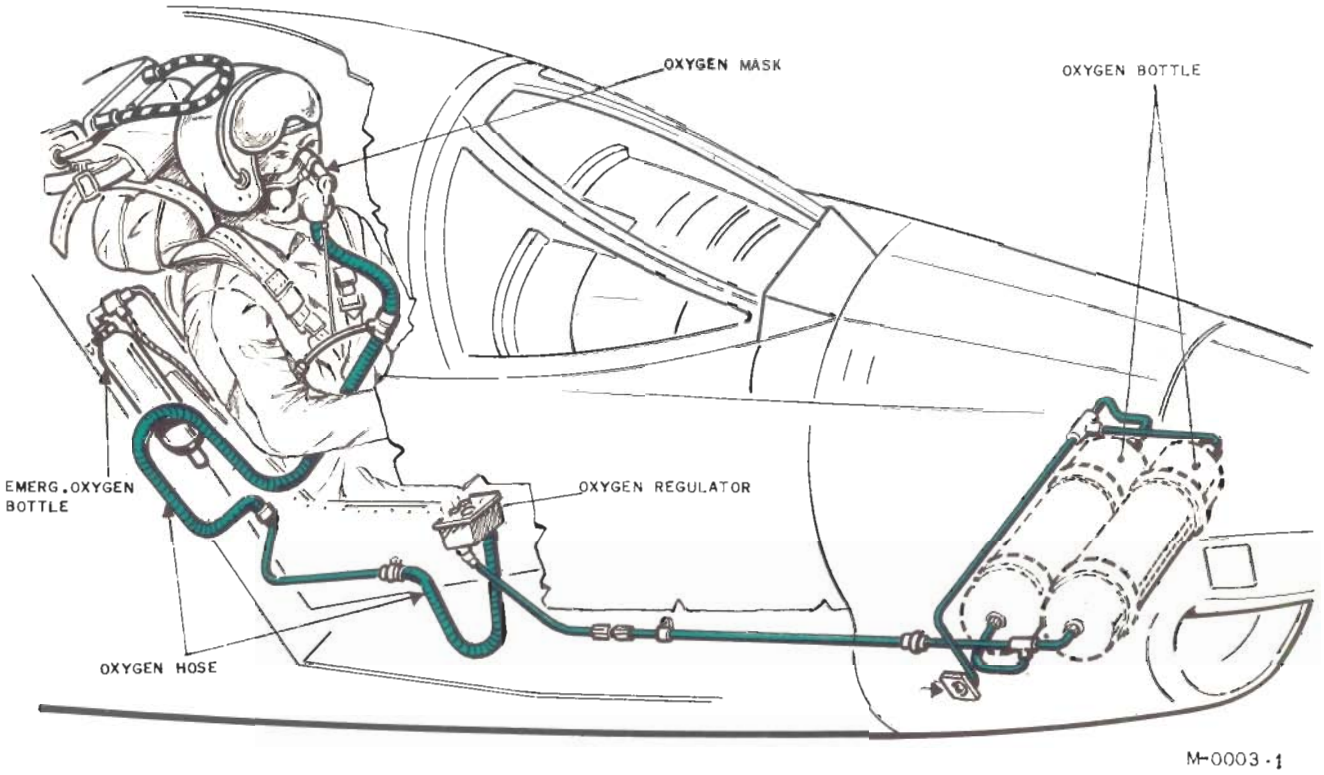


Figure 4-16

Oxygen Regulator

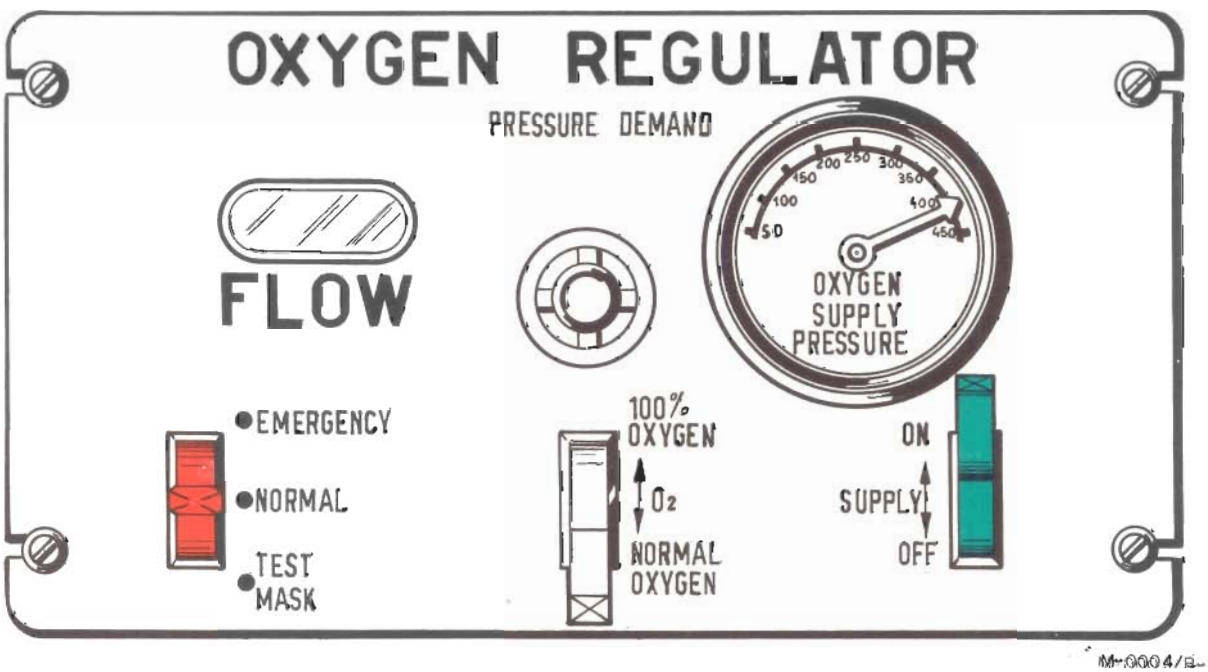
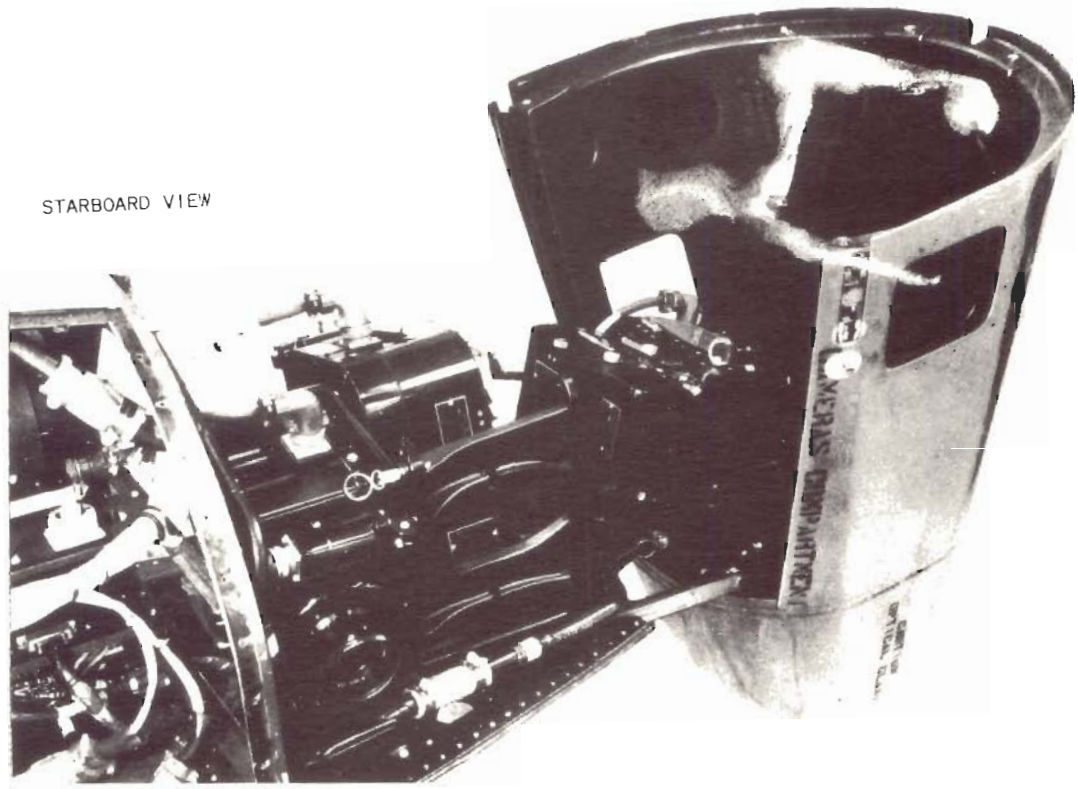


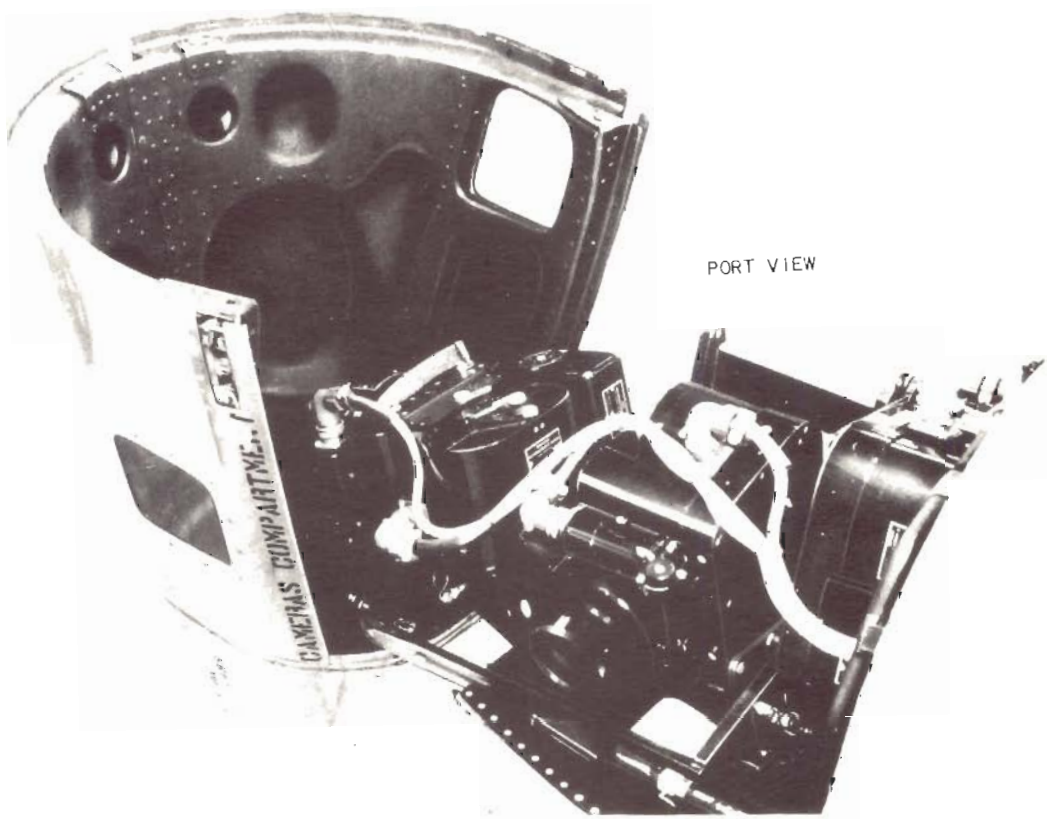
Figure 4-17

Camera Installation

STARBOARD VIEW



PORT VIEW



V-0001

Figure 4-18

Armament Control Panel

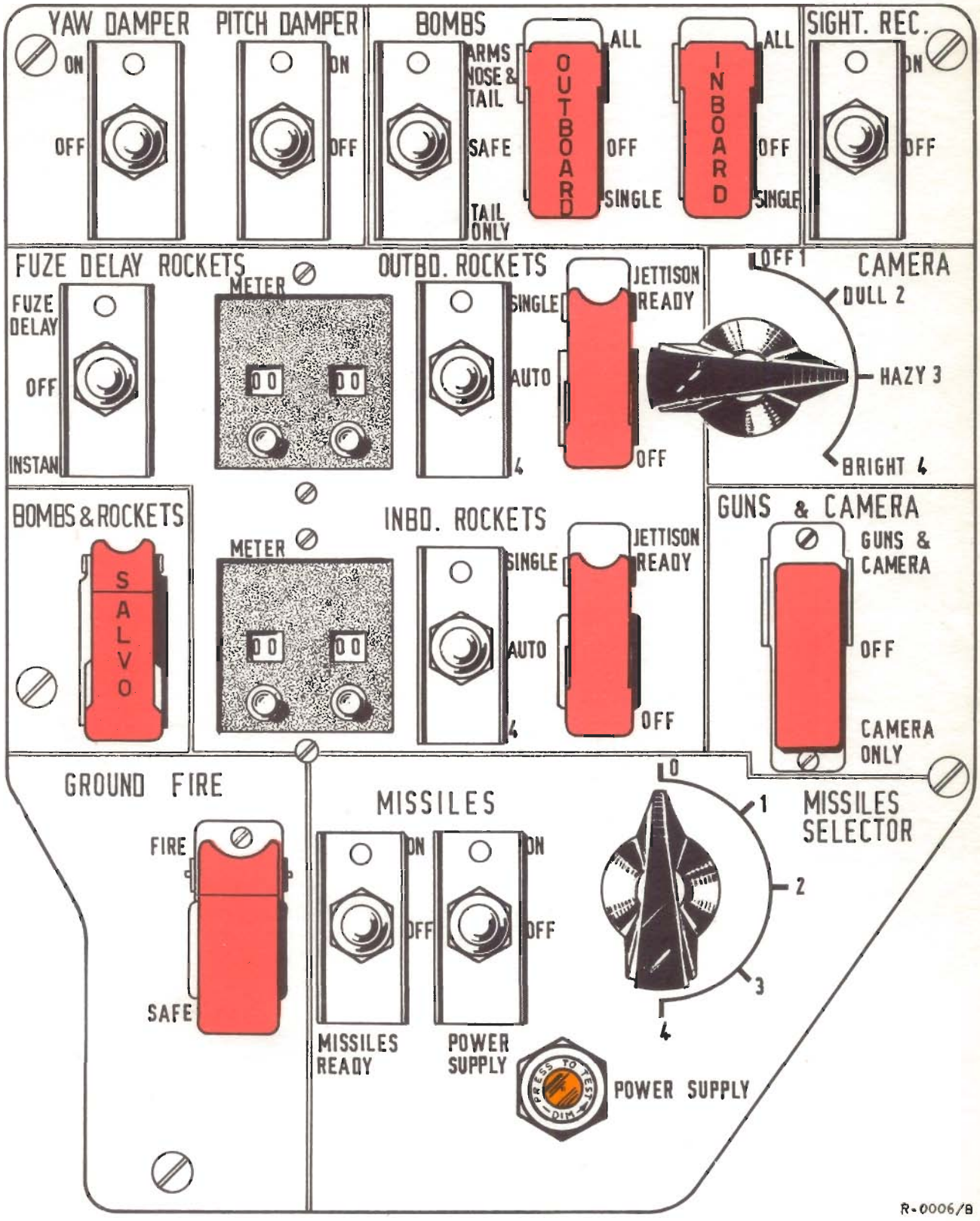


Figure 4-19

SECTION V OPERATING LIMITATIONS

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ENGINE OPERATING LIMITATIONS

GENERAL

OPERATING CONDITIONS	TIME LIMIT IN MINUTES FOR EACH FLIGHT	RPM IN % NOMINAL RATING	JPT MAX °C	THRUST (POUNDS) (KP)
TAKEOFF	15 MIN. TOTAL	100	730	5000 (2275)
MAX. IN FLIGHT		101 (1)	(2)	
INTERMEDIATE	30 MIN. TOTAL	99	685	4570 (2080)
MAXIMUM CONTINUOUS	NO LIMITATION	97	655	4200 (1910)
DESCENT AND APPROACH	NO LIMITATION	40 MINIMUM (3)	MAX. 655	
			MIN. 200	
GROUND IDLE	NO LIMITATION	35 MINIMUM (4)	655	
OVERSPEED	20 SECONDS 10 " 5 "	103 104 105		

Note

The following adjustments are to be made on the ground :

ADJUSTMENTS ON THE GROUND

Overspeed Governor (1)

The overspeed governor is set to limit engine speed to 100% RPM on the ground. This ensures maximum thrust at takeoff. It may be necessary to retard the throttle somewhat during climb in order to avoid exceeding 100% RPM (due to pump creeping).

JPT Limiter (2)

The JPT LIMITER is set so that JPT does not exceed 715 - 720°C from the ground up to approx. 15.000 ft.

Air Fuel Ratio Control (3)

The control is set so that when the throttle is slammed fully open the acceleration times from 40% RPM to 100% $^{+\ 0}_{-\ 2}$% remain within the prescribed limits.

WARNING

In flight, slamming the throttle should always be avoided.

Ground Idle (4)

The minimum RPM on the ground is a function of barometric pressure as shown in the following table :

BAROMETRIC PRESSURE		% RPM
INCHES Hg	Millibar	
29.9	1018	35.0
29.0	983	36.0
28.0	949	37.5
27.0	915	38.5
26.0	881	40.5
25.0	849	41.0

JPT TEMPERATURES DURING ENGINE START

The JPT during engine start shall not exceed 700°C. If this limit is exceeded, make following entries on DD FORM 781/2 :

a) Peak temperature reached.

b) Duration of peak temperature.

Based on the peak temperatures recorded and depending on types of blades installed a decision must be made as to whether the engine is to be removed or whether the minimum clearance between blade tips and turbine housing is to be checked to see if the engine is still in operational condition.

LUBRICATING OIL OPERATING PRESSURE

Minimum Operating Pressure

The minimum oil pressure must be 25 ± 2 psi (1,75 ± 0,14 kg/cm2).

When pressure is below this figure the OIL LOW PRESS warning light comes on. It should normally be out at 40 % RPM and above.

Permissible Temperatures For Starting

The permissible minimum ambient temperature (engine not pre-heated) for starting and throttle opening is unlimited, provided that the temperature of the oil and of the engine are not lower than -26°C. The minimum temperature of alternate engine oils must not be below -5°C.

Foggy Weather and Icing Conditions

GROUND CHECK

Prolonged engine operation on the ground is to be avoided when ambient temperature is 3°C or less, the weather is foggy, visibility is less than 500 yards or relative humidity is 95% or more. If necessary, normal pre-flight engine warmup runs can be executed for a limited time.

In Flight

Whenever possible, areas wherein icing conditions have been predicted are to be avoided.

Any abnormal engine behaviour operation (RPM or JPT) ascertained in flight is to be reported. If post-flight inspection reveals that engine icing was the cause of the malfunction, consult the technical representatives of the maintenance contractor for further decisions.

Negative G-Loads

If the warning light comes on during a negative G-load maneuver, restore positive G immediately.

Aerobatics

Aerobatics involving negative G-loads result in increased oil consumption.

Oil Consumption Per Hours

At maximum continuous RPM, oil consumption is :

minimum : 1 1/2 Imp. pint (0.85 l)

maximum: 2 Imp. pints (1.14 l).

Fuel Pressure

The FUEL LOW PRESSURE warning light comes on when the pressure falls below 5 ± 0.5 psi. This light should always be out when the engine is running and the fuel booster pump is operating (FUEL BOOSTER PUMP switch at ON).

FUEL SPECIFICATIONS

NORMAL FUEL GRADES

SPECIFICATION			
U.S.	BRITISH	INTERSERVICE	NATO
	DERD 2494 ISSUE 1	AVTUR 50	F-34
MIL-F-5616C GRADE JP-1	DERD 2482 ISSUE 3	AVTUR 40	F-30
MIL-J-5624E GRADE JP-4	DERD 2486 ISSUE 3 - AM. 1	AVTAG	F-40

ALTERNATE FUEL GRADES

Note

In order not to impair engine service life, operation on emergency fuels is limited to 10 hours maximum between each engine overhaul.

SPECIFICATION			
U .S.	BRITISH	INTERSERVICE	NATO
	DERD 2485 GRADE 73	73 AVGAS	F-13
MIL-F-5572A GRADE 80	DERD 2485 GRADE 80	80 AVGAS	F-14
MIL-G-5572B GRADE 91/96	DERD 2485 GRADE 91/96 ISSUE 3 - AM 1	91/96 AVGAS	F-15
MIL-G-5572B GRADE 100/130	DERD 2485 GRADE 100/130 ISSUE 3 - AM. 1	100/130 AVGAS	F-18
MIL-G-3056A	DEF 2401 - A 80 N. O.	80 MTGAS	F-46
MIL-G-3056 AMI, TYPE C		80/Z MTGAS	F-48
	DEF 2401-A 70 N. O.	MTGAS	F-50

WARNING

When using highly volatile fuels, the engine must not be operated with the fuel booster pump OFF (set FUEL BOOSTER PUMP switch to ON).

Every instance of FUEL LOW PRESS warning light illumination during engine run must be recorded.

Operation of engine at fuel pressure below 10 psi reduces main fuel pump service life and adversely affects aircraft ceiling.

WARNING

Before starting a hot engine operating on highly volatile fuel a dry motoring cycle is necessary. (Consult section II : Failure of engine to start.)

PRECAUTIONS WHEN CHANGING FUEL GRADES

Resetting of the fuel pump governor and the AFRC may be necessary, when using alternate fuel grades.

Therefore, before flight check :

a) Governor setting and reset as necessary.

b) AFRC setting and reset as necessary.

Both settings should be in accordance with operating limits given in the paragraph ADJUSTMENTS ON THE GROUND, this section.

OIL SPECIFICATIONS

NORMAL LUBRICATING OILS

SPECIFICATION					
U.S.	BRITISH	INTER-SERVICE	NATO	SUPPLIER & REF. NO.	
				G.B.	USA
	DERD 2487	OX-38	0-149	ESSO AVIATION TURBO-OIL 35 (EATO 35)	ESSO TURBO OIL 35 (ETO 35) ENCO 35
	DERD 2493 ISSUE 1 CLAUSE 5 ITEM 1			ESSO AVIATION TURBO-OIL 35 (DALTONS)	
					ENCO TURBO-OIL 35 ENCO AVIATION TURBO-OIL 35
MIL-L-7808C			0-148	AEROSHELL TURBINE OIL 300	ESSO TURBO-OIL 15 (ETO 15) ENCO TURBO-OIL 15 CALTEX 1823 SYNTHETIC AIRCRAFT TURBINE OIL 15 TEXACO SYN-THETIC AIR-CRAFT TUR-BINE OIL 15
MIL-L-7808D AM. 1				AEROSHELL TURBINE OIL 301	

CAUTION

Oil specifications MIL-L-7808C and D must not be used in engines equipped with QT 29 FORM B1 turbostarters.

Following oils may be mixed :

DERD 2487 and DERD 2493

MIL-L-7808C and MIL-L-7808D

ESSO (GB) EATO 35 and ESSO (USA) ETO 35

ESSO TURBO-OIL 15 and CALTEX/TEXACO SYNTHETIC TURBINE OIL 15.

Following specifications may not be mixed :

TURBO-OIL 15 and TURBO-OIL 35

0-149 and 0-148

Minimum oil temperature for starting and opening up (with engine running and OIL LOW PRESS warning light OUT) using normal oils is -26°C.

OILS FOR EMERGENCY USE

SPECIFICATION			
USA	BRITISH	INTERSERVICE	NATO
	DERD 2479/1 AM. 1	OEP-71	0-136

CAUTION

Emergency oils must not be mixed with normal oils. Minimum oil temperature for starting and opening up (with engine running and OIL LOW PRESS warning light out) using emergency oils is -5°C.

STARTING CARTRIDGES

Starter cartridges, type I.C.I., No. 17/419, 600 gram, are used.

MAXIMUM AIRSPEED LIMITATIONS

(See figures 5-1/1, 5-1/2 and 5-1/3).

MANEUVERING FLIGHT LIMITATIONS (No External Load)

Note

Values are given in KIAS and TMN. Depending on whichever value is encountered first, airspeed limit is either KIAS or TMN value.

PITCH MANEUVERS

See fig. 5-2.

ROLL MANEUVERS

Roll maneuvers with full aileron deflection are permissible up to the following limits :

Hc = 20.000 ft
KIAS = 540 kts
TMN = 0.9

At higher altitudes and at greater speeds roll rates are limited to 150°/sec.

YAW MANEUVERS

Yaw maneuvers are permissible to a lateral acceleration of 1.1 G.

MANEUVERING FLIGHT LIMITATIONS (With External Load)

Note

Configurations 1, 2, 3 and 5 are understood to be as follows :

- two 260 l external tanks (500 lbs) or
- two 500 lb bombs or
- two AS-20 missiles or
- four AS-20 missiles.

The 500 lbs bombs must be of the USA AN-N 64A1 or SAMP 2-250 kg (267 kg) type or a similar type which has been accepted for the same or greater speeds and load factors.

WEIGHT AND CENTER OF GRAVITY

See fig. 5-3 - Configurations 1, 2, 3, and 5.

PITCH MANEUVERS

See fig. 5-4.

ROLL MANEUVERS

Roll rates are permissible up to 150°/sec.

YAW MANEUVERS

Yaw maneuvers are permissible to a lateral acceleration of 0.9 G.

MANEUVERING FLIGHT LIMITATIONS (With External Load)

Note

Configuration 1 is understood to be as follows :

- four 250 lbs bombs.

The 250 lbs bombs must be of the USA-GP 250 lbs AN-M57-A1 type or a similar type which has been accepted for the same or greater speeds and load factors.

Maneuvering flight limitations for the G 91 R3 when carrying four 250 lbs bombs are more severe as compared to a two 500 lbs bomb load since only USA-GP 250 lbs AN-M57-A1 bombs have been tested in flight to date. The The results of flight testing do not permit a lowering of these limitations.

WEIGHT AND CENTER OF GRAVITY

See fig. 5-3, configuration 4.

PITCH MANEUVERS

See fig. 5-5.

ROLL MANEUVERS

Roll rates are permissible up to 150°/sec.

YAW MANEUVERS

Yaw maneuvers are permissible to a lateral acceleration of 0.9 G.

MANEUVERING FLIGHT LIMITATIONS AT HIGHER ALTITUDES

In addition to the restrictions imposed on the aircraft depending on the configuration, flight maneuvers at 30.000 ft and up to 40.000 ft are limited to course corrections.

PROHIBITED MANEUVERS

INVERTED FLIGHT

Prolonged inverted flight is prohibited. Inverted flight restrictions are due to two factors:

Oil system operational limitations

Fuel system operational limitations

For oil system operation, comply with instructions given in Section V - OIL SPECIFICATIONS (negative G-AEROBATICS).

Fuel supply is assured for 2 to 3 minutes during inverted flight with engine at full power. However, it is not advisable to prolong inverted flight for more than 20 seconds since the fuel flow proportioner would run dry and might be damaged.

SPINS

Intentional spins are prohibited. In case of accidental spins, proceed according to instructions given under SPIN RECOVERY.

AIRSPEED LIMITATIONS

SPEED BRAKE EXTENSION

No limitations. However, at very great speeds it is possible that the speed brakes might extend only partially.

JETTISON EXTERNAL FUEL TANKS

Empty fuel tanks may only be jettisoned in horizontal flight at a speed not less than 300 and not greater than 350 KIAS. There are no limitations for full tanks.

LANDING GEAR EXTENSION AND RECTRACTION

The maximum limiting airspeed for extending and retracting the landing gear is 185 KIAS. At any greater speed the landing gear doors and the operating mechanism might be damaged due to the air load.

WING FLAP EXTENSION AND RETRACTION

The maximum limiting airspeed for lowering and raising the wind flaps or for flight with flaps lowered is 185 KIAS.

MINIMUM LANDING AIRSPEED

The minimum touchdown speeds are given in fig. 5-6. They are shown as functions of the weight and load factors of the aircraft with wing flaps and landing gear lowered.

DRAG CHUTE DEPLOYMENT SPEED

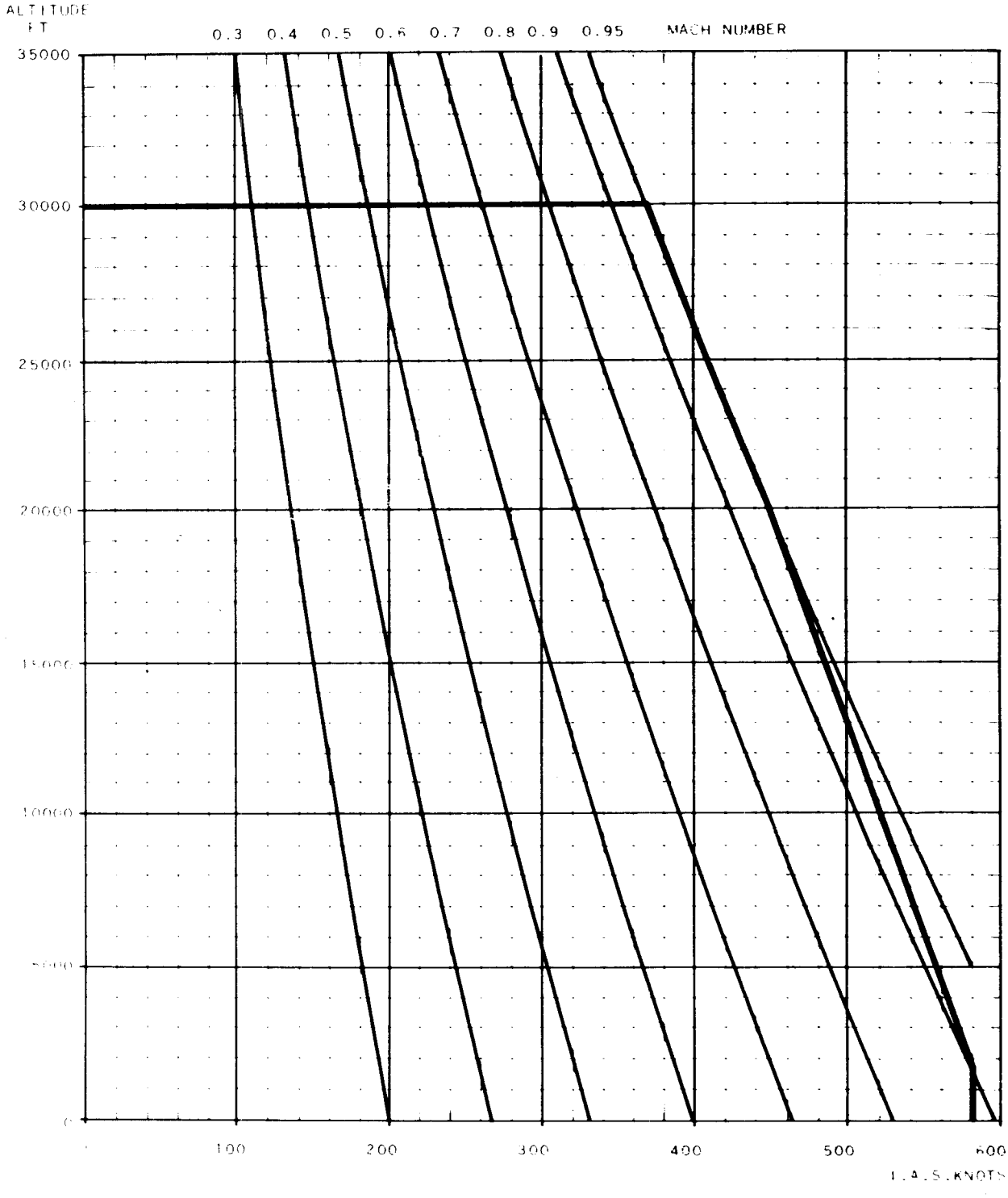
The limiting airspeed for drag chute deployment is 150 KIAS. If deployed at greater speeds the drag chute is automatically separated from the aircraft by the breakaway fitting.

CANOPY OPENING SPEED

The canopy must never be opened in flight. While taxiing, the canopy may be operated (to the part open position) at speeds not exceeding 50 KIAS. Canopy and operating mechanism may be damaged if operated at higher speeds.

AIRPLANE MODEL:	MAX ALLOWED I. A S. ENVELOPE	ENGINE MODEL:
FIAT G 91 R 3	*LOAD FACTOR APPROX +1 G (from 0 to +2 G.s)*	B.Or. 803 D 11

NO EXTERNAL LOADS



Date: NOV. 14, 1963	Data basis: ESTIMATED

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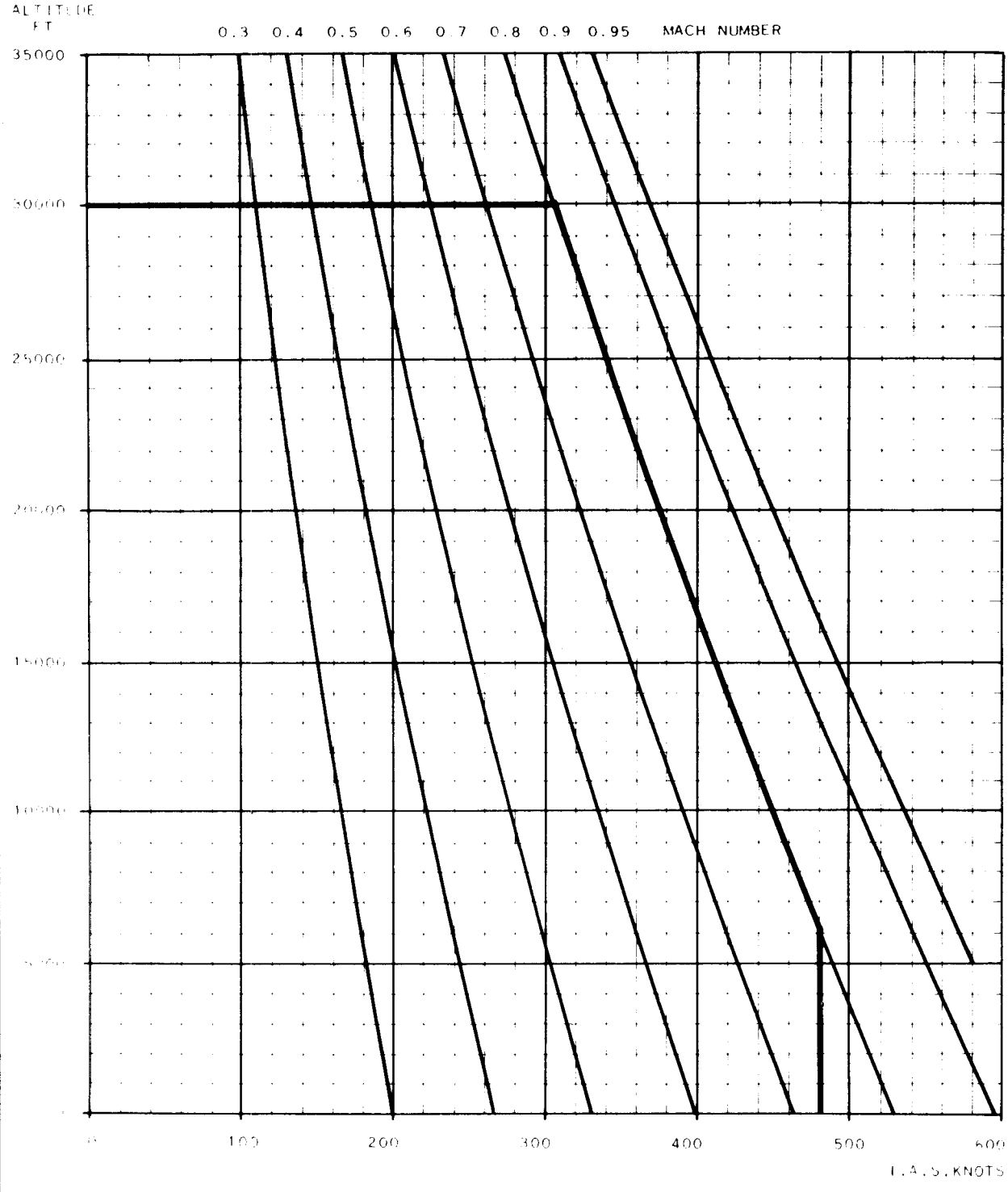
Figure 5-1/1

AIRPLANE MODEL:	MAX ALLOWED I. A. S. ENVELOPE	ENGINE MODEL:
FIAT G 91 R 3	*LOAD FACTOR APPROX + 1 G (from 0 to + 2 G.s)*	B.Or. 803 D 11

WITH EXTERNAL LOAD: 4 x 250 lbs bombs



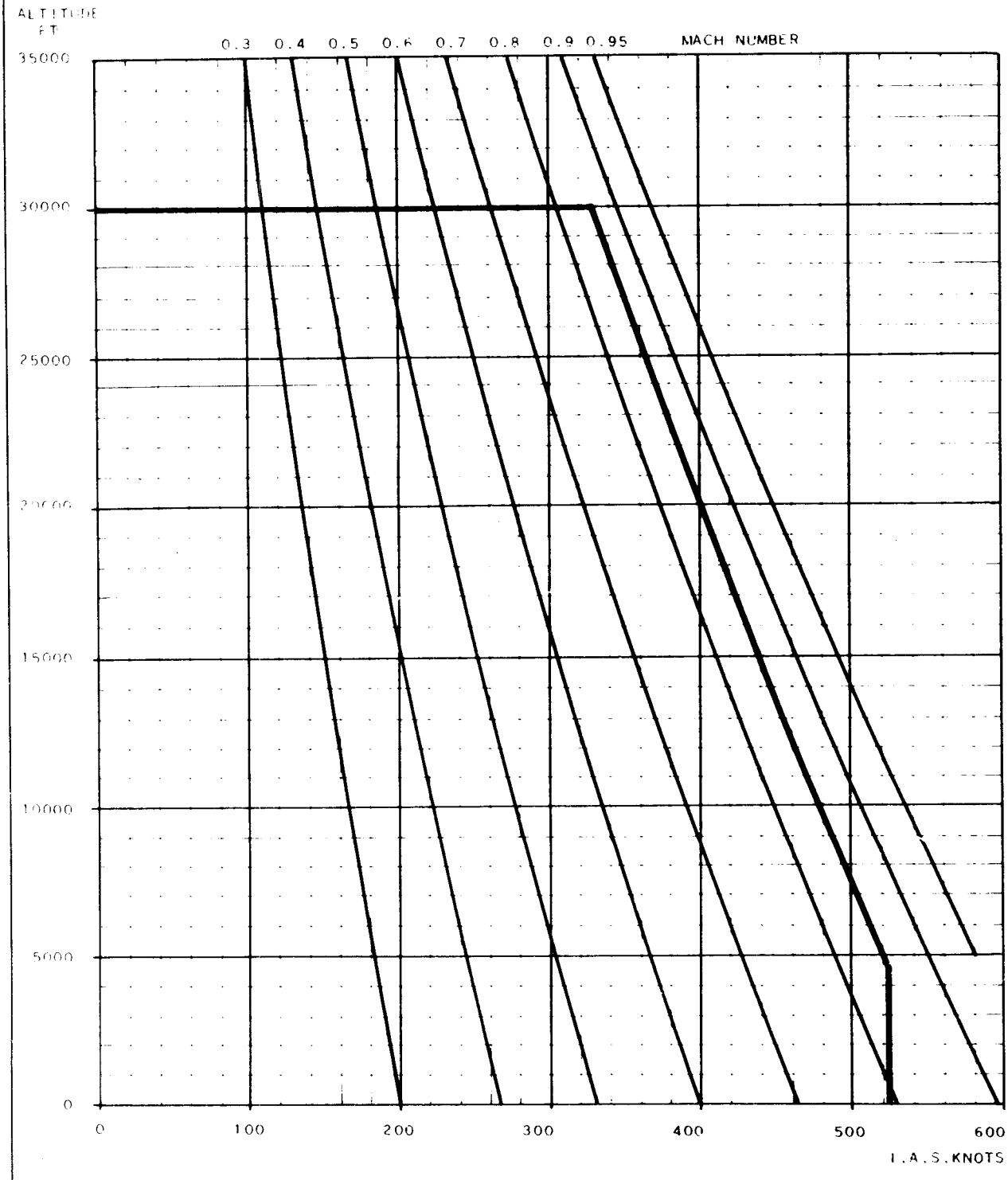
Date: NOV. 14. 1963	Data basis: ESTIMATED

S-0146

Figure 5-1/2

AIRPLANE MODEL:	MAX ALLOWED I.A.S. ENVELOPE	ENGINE MODEL
FIAT G 91 R 3	*LOAD FACTOR APPROX + 1 G (from 0 to+ 2 G.s)*	B.Or. 803 D 11

WITH EXTERNAL LOAD: 2 x 500 lbs fuel tanks
2 x 500 lbs bombs
2 AS20 missiles
4 AS20 missiles



Date: NOV. 14, 1963	Data basis: ESTIMATED

S-0145

Figure 5-1/3

Flight Strength Diagram (No Ext. Load)

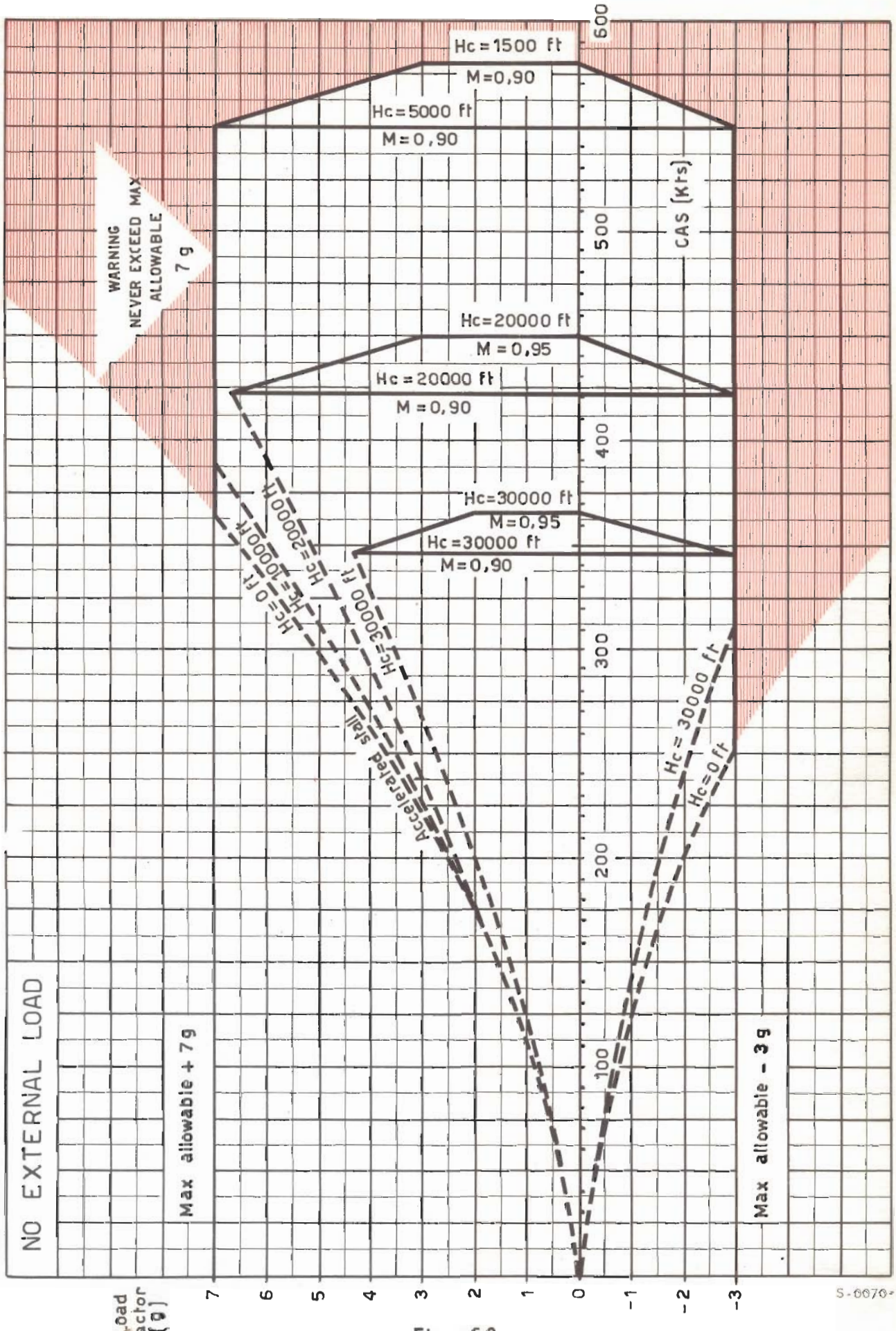


Figure 5-2

TYPICAL CONFIGURATIONS		RECONNAISSANCE	FIGHTER-BOMBER			
		1	2	3	4	5
SPECIAL EQUIPMENT AND ARMAMENT		Rec. Cameras	Provisions for Cameras and Sound Recorder			
		Provisions for Missiles firing and guidance system		Missiles firing and guidance system	Provisions for missiles firing and guidance system	Missiles firing and guidance system
		2 Inbd. Pylons	2 Inbd. Pylons		4 Pylons	
		2 Drop Tanks (2 x 260 l)	2 Bombs (500 lbs)	2 Missiles AS-20 NORD 5103	4 Bombs (250 lbs)	4 Missiles AS-20 NORD 5103
		1 Gun (30 mm Cal.)	2 Guns (30 mm Cal.)	1 Gun (30 mm Cal.)	2 Guns (30 mm Cal.)	1 Gun (30 mm Cal.)
		125 rounds (30 mm Cal.)	250 rounds (30 mm Cal.)	125 rounds (30 mm Cal.)	250 rounds (30 mm Cal.)	125 rounds (30 mm Cal.)
Empty weight	kg	3130	3130	3116	3152	3138
Useful load	kg	1688	1803	1713	1803	1713
Basic weight	kg	3511	3511	3511	3511	3511
Take off Gross weight - No ext. Stor. external Stores	kg % MAC	4818 22,93 %	4933 21,14 %	4829 23,57 %	4955 21,34 %	4851 23,77 %
External Stores	kg	457	454	328	454	656
Take off Gross weight - with ext. Stor. CG	kg % MAC	5275 22,38 %	5387 20,89 %	5157 22,08 %	5409 22,53 %	5507 23,13 %
Landing Gross weight CG	kg % MAC	3703 24,02 %	3730 22,53 %	3702 25,01 %	3752 22,78 %	3764 25,61 %
CG Aft Limit	kg % MAC	3713 24,17 %	3740 22,68 %	3712 25,11 %	3762 22,93 %	3774 25,76 %

Figure 5-3

Flight Strength Diagram (With Ext. Load)

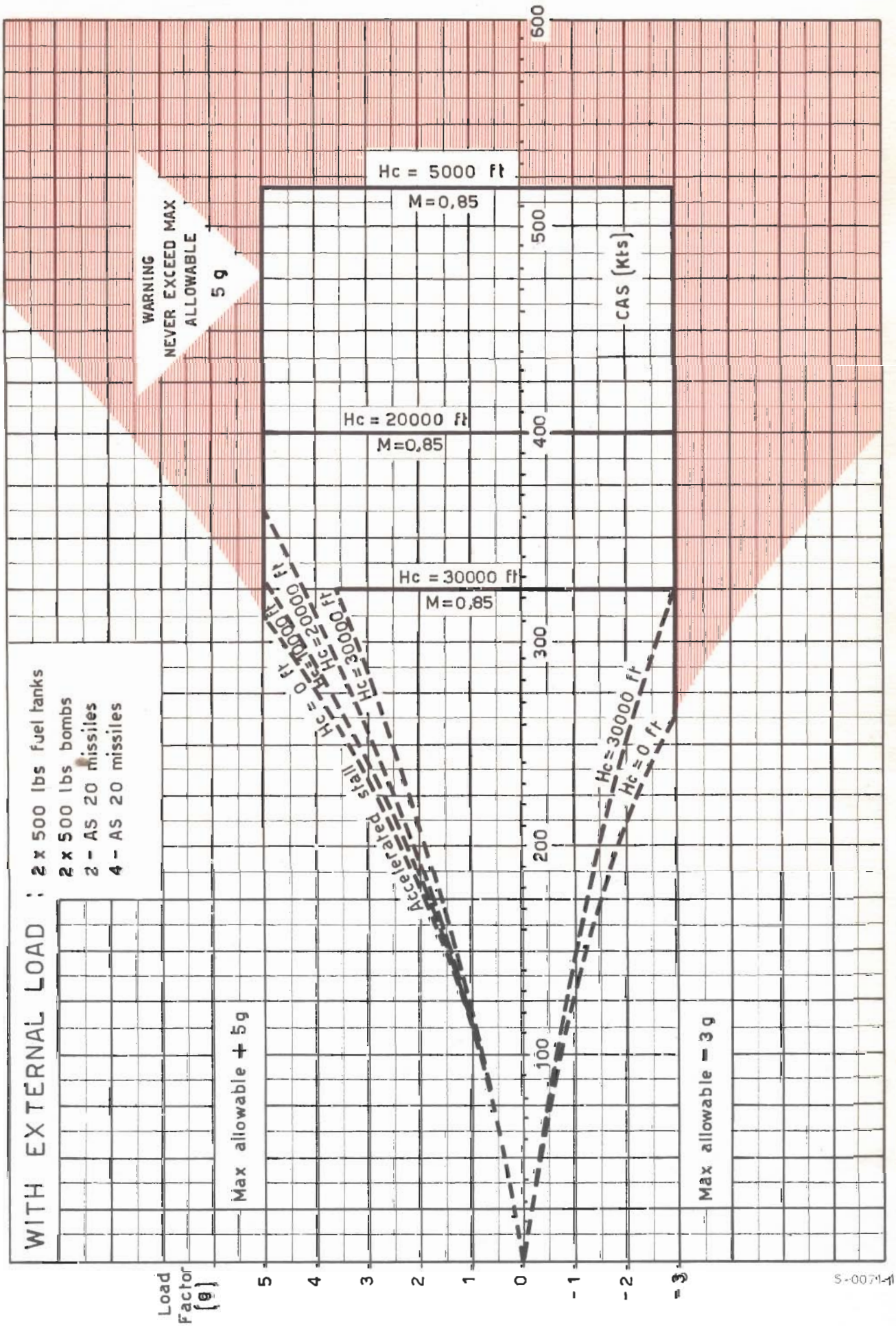


Figure 5-4

Flight Strength Diagram (With Ext. Load)

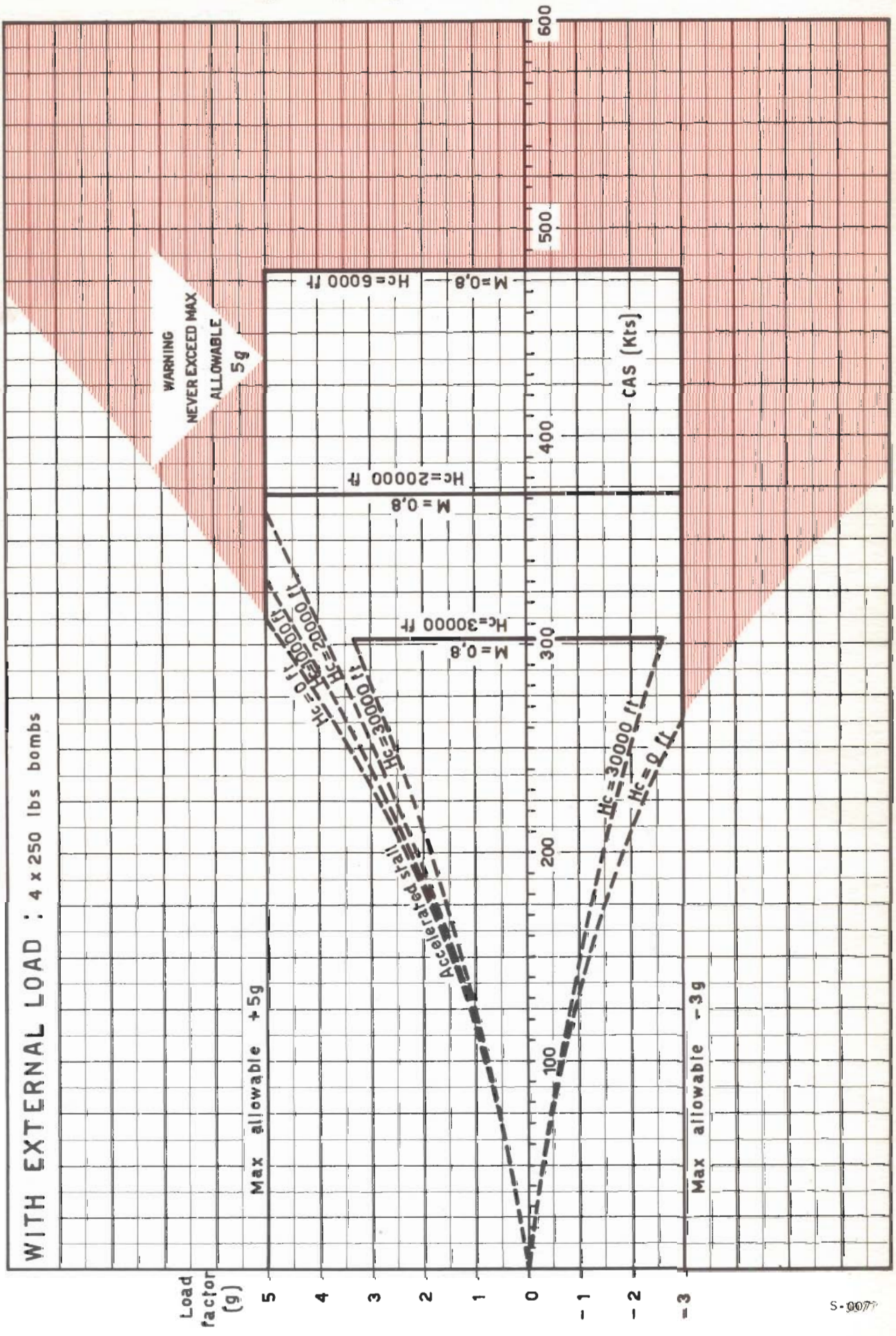
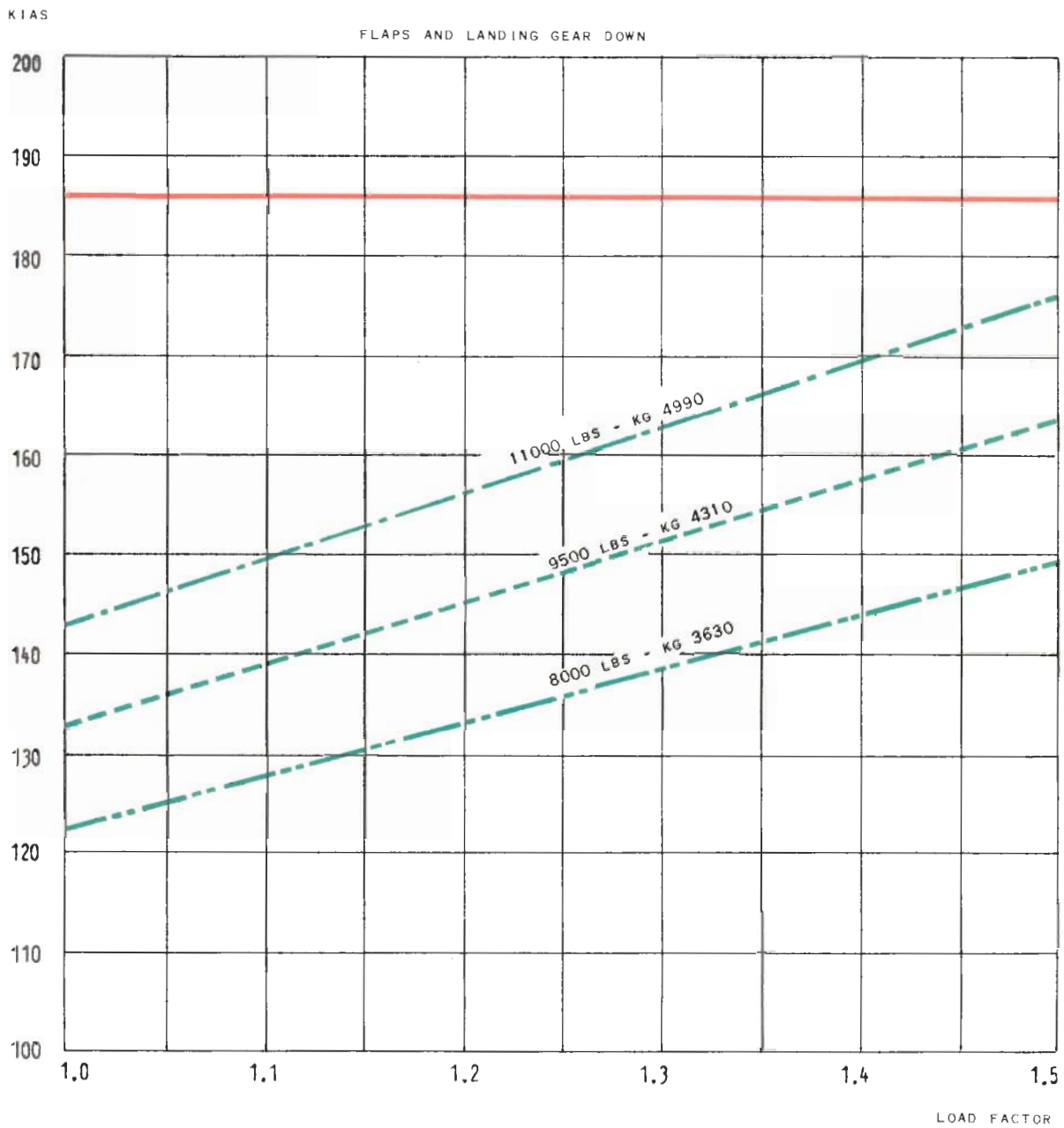


Figure 5-5

Touch Down Speed At Landing



MIN. KIAS BEI G = 11000 LBS (4990 KG)

MIN. KIAS BEI G = 9500 LBS (4310 KG)

MIN. KIAS BEI G = 8000 LBS (3630 KG)

MAX. KIAS FOR FLAP AND GEAR EXTENDING

S-G91-5-1

Figure 5-6

SECTION VI FLIGHT CHARACTERISTICS

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FLIGHT CONTROLS

ELEVATOR

The elevator is actuated by the control stick via an irreversible hydraulic servo assembly. Stick feel is provided to the pilot by an artificial feel system which consists of a spring-loaded bungee and a bobweight incorporated in the control linkage.

The spring-loaded bungee provides stick feel in relation to elevator travel and stick displacement. When the stick is moved the yaw spring on the control valve of the hydraulic assembly is compressed. Since the travel of this valve is proportional to the deflection of the elevator the force applied to the stick, too, is proportional to the displacement of the stick.

A control rod in the flight control linkage provides bobweight effect and is spring-balanced to 1 G. It responds to G-loads acting on the aircraft resulting in stick forces proportional to G-loads.

In case of hydraulic system failure, automatic changeover to manual operation occurs. To maintain good control in this event airspeed must be decreased below 250 KIAS. In the lower speed range the pilot notices practically no difference between mechanical actuation and hydraulic power control. At higher speeds, however, mechanical actuation requires much greater effort to move the stick.

AILERONS

The ailerons are actuated by the control stick via two irreversible hydraulic servos. Stick feel is provided to the pilot by an artificial feel system, whereby reaction forces are proportional to deflection of the ailerons.

The ailerons are very effective and produce considerable roll rates. For this reason, the pilot must actuate the ailerons very carefully at high speeds and at high altitudes.

In case of hydraulic system failure, automatic changeover to manual operation occurs. Since mechanical operation requires considerable effort - also because of friction in the booster system - it is recommended that airspeed be reduced below 250 kt.

For landing approaches comply with EMERGENCY PROCEDURES.

RUDDER

The rudder is connected directly to the pedals and is actuated mechanically.

As air speed increases, the aircraft tends to skid to the left. However, this tendency can be counteracted easily by trimming the rudder.

SPEED BRAKES

Extending the speed brakes creates a nose-up tendency which can be counteracted by the stick or by elevator trim. As the brakes are being retracted a nose-down moment is brought about.

Strong vibrations are felt while flying with the speed brakes extended but no significant disturbances are created (except for slight instability in the longitudinal and vertical axes). At very high speeds, the speed brakes will only partly extend due to air load.

FLIGHT WITH EXTERNAL STORES

External stores do not impair flight characteristics to any appreciable degree.

When flying with external stores the limitations given under Section V are to be observed.

HIGH ALTITUDE OPERATION

The G 91 was not designed for flight at high altitudes. The controls, therefore, are to be carefully operated to avoid stalling.

HIGH SPEED OPERATION

At high speeds of about Mach 0.9 and no external stores slight buffeting is felt. Buffeting increases steadily above Mach 0.9 and the aircraft shows a wing heavy tendency usually accompanied by a slight tendency to skid to the left. This can be counteracted easily by using the ailerons.

To reduce skidding of the aircraft to a minimum, spoilers are mounted on the fuselage sides above the elevator assembly. They have been provides to prevent air from stagnating in the empennage area thus increasing the stability of the aircraft in the vertical axis.

LANDING PROCEDURE (see fig. 2-5)

Maintain proper airspeed until touch down to avoid abrupt round tail section touching the ground.

AEROBATICS

Acrobatics are permissible within the prescribed speed limits for this aircraft.

The aircraft's controls handle easily and are well coordinated, and the stick feel bungee springs are lightly preloaded so that the stick automatically returns to center position.

The trim surfaces are very effective und they increase in effectiveness with increasing speed. Greater trimming is required shortly after takeoff whereas slight deflection of the trim surfaces at high speeds are sufficient.

STALLS

CLEAN STALL (Landing Gear, Flaps, And Speed Brakes IN)

At 150 KIAS a light buffeting is noticeable, which increases as speed decreases.

At the first signs of stalling (according to load) the aircraft begins to drop at a rate of about 1000 ft/min. However, all control surfaces remain effective.

Recovery is accomplished by pushing the control stick slowly forward and advancing the throttle to 100%.

LANDING CONFIGURATION STALL

Instability in the vertical and longitudinal axes becomes somewhat more pronounced from about 135 to 130 KIAS.

Stalling is noticeable by severe buffeting and decrease of stick feel.

Recovery is accomplished by relaxing pressure on control stick, advancing throttle to 100%, and retracting landing gear and flaps.

It is possible, while flying a turn, that the aircraft will begin to roll and, according to the attitude at the moment, will wing over inward or outward.

Recovery

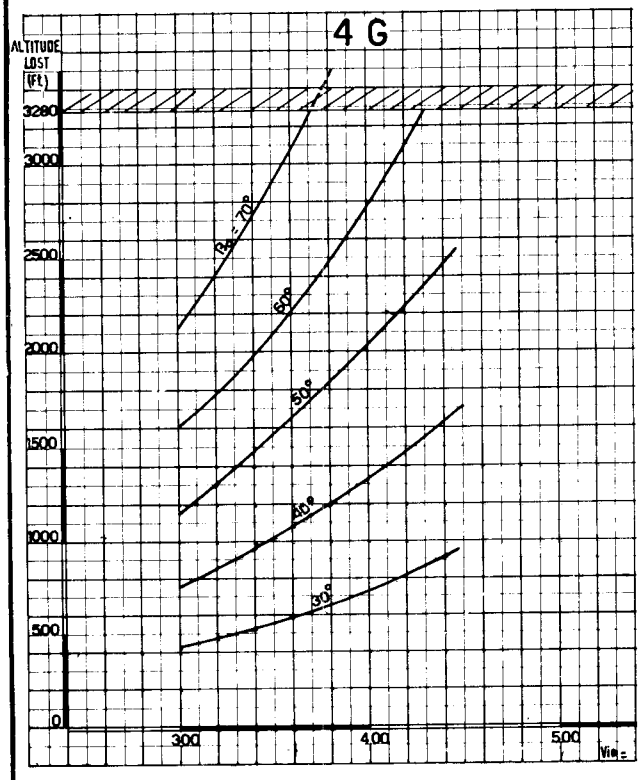
To recover from a stall while flying a turn just release pressure.

ERECT SPIN

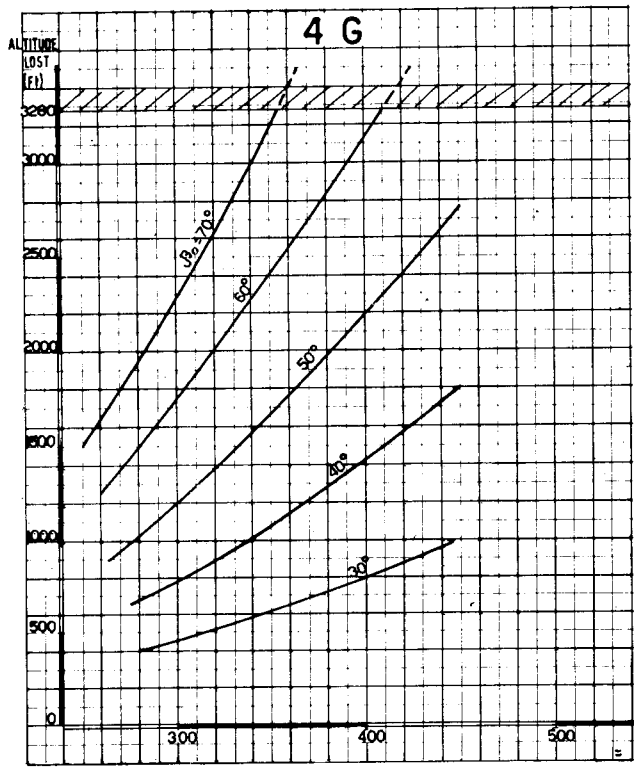
See SPIN RECOVERY in Section III, page 3-10.

AIRPLANE MODEL:	ALTITUDE LOST IN A PULL-OUT FROM DIVES	ENGINE MODEL:
FIAT G 91 R/3		B.Or. 803 D 11

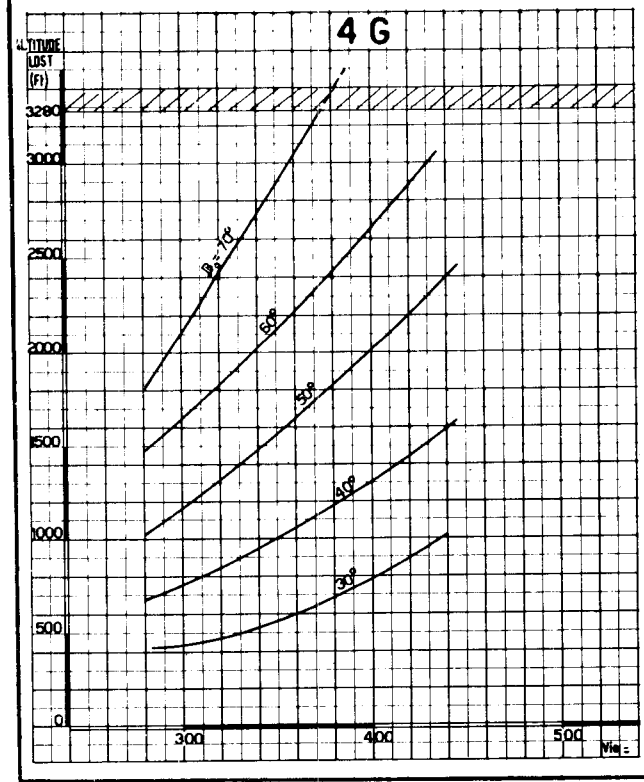
A/C: CLEAN (4200 Kg)
RPM: IDLE



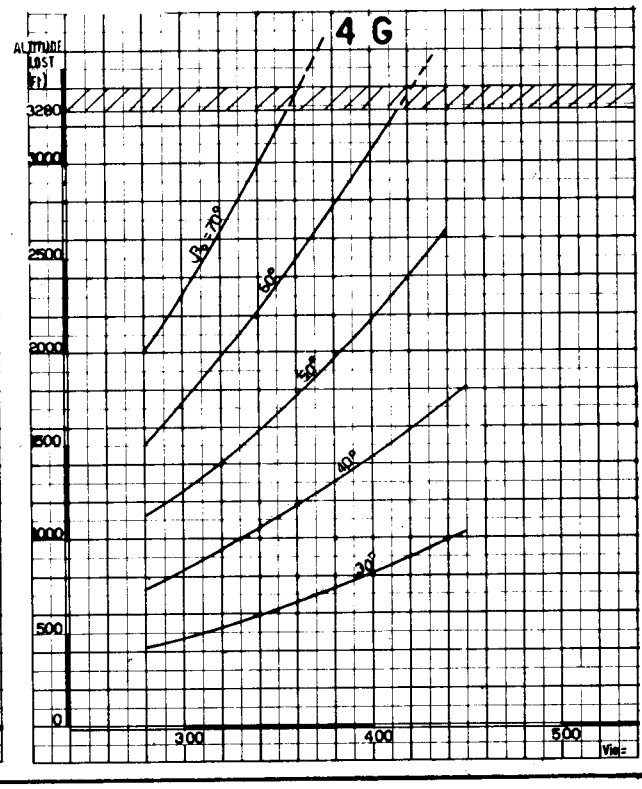
A/C: CLEAN (4200 Kg)
RPM: CRUISING



A/C: 2x500 lbs BOMBS (4800 Kg)
RPM: IDLE



A/C: 2x500 lbs BOMBS (4800 Kg)
RPM: CRUISING



REMARKS: INITIAL CONDITIONS - ZO ALTITUDE AT BEGINNING OF PULL-OUT 3280 FT; O ANGLE OF DIVE; Vio INDICATED AIR SPEED AT BEGINNING OF PULL-OUT

Date: JAN 10, 1959	Data basis: R.S.V. Test Flights

S-0050

Figure 6-1

SECTION VII SYSTEMS OPERATION

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STARTING THE ENGINE

Starting the engine is very simple. It is quickly accomplished by means of an electrically ignited cartridge and a starter driven by the cartridge gas.

The engine should LIGHT UP within 4-6 seconds and the starting cycle completed in 30 seconds.

CAUTION

If the first cartridge ignites normally but the engine does not LIGHT UP investigate the cause before igniting the second cartridge.

CAUTION

The maximum starting JPT is 700°C. If the JPT rises rapidly above 650°C during the engine start procedure, shut down the engine immediately. If the JPT exceeds 700°C after SHUT DOWN note the JPT. Investigate the cause for the malfunction before attempting another start and if the observed JPT after SHUT DOWN exceeds 800°C special turbine checks are required.

RPM AND JPT CONTRL

OVERSPEED GOVERNOR

The maximum RPM is controlled by an Overspeed Governor incorporated within the fuel pump. It is set that normally it is not possible to exceed 100% RPM on the ground and 101% in flight. Should the overspeed governor develop a fault the max. permissible overspeed is 103% for 20 seconds, 104% for 10 seconds or 105% for 5 seconds. The overspeed Governor is not affected by variations in O.A.T. or fuel density.

JPT LIMITER

In order to maintain the JPT within limitations (730°C), an automatic limiter is installed in the Jet Pipe. The BPC, incorporated in the CCU, senses P1 pressure and the JPTL functions in conjunction with a venturi on the BPC capsule chamber. By allowing P2 to flow through the venturi thus influencing the capsule position controlling the BPC half ball valve and therefore the fuel pump output.

The JPT limiter does not respond to rapid changes in throttle settings. In this case, the AFRC controls the engine.

The JPT limiter will only control the JPT within limitations up to about 15000 ft. Above this altitude it may be necessary to retard the throttle in order to maintain the JPT within limitations.

PRESSURE RATIO LIMITER

The engine fuel system incorporates a device which automatically controls the compressor pressure ratio. It reduces the fuel flow and engine RPM permitted by the BPC so that the compressor pressure ratio does not exceed the maximum design limit, thus preventing possible compressor surging under all flight conditions.

The unit will control at any altitude depending upon OAT and pressure however normally the unit will not commence reducing the RPM until an altitude of about 20000 ft is achieved.

ENGINE OPERATION

AFRC

When the throttle is rapidly opened, the rate of fuel delivery to the combustion chamber is controlled by the AFRC to prevent compressor stalling and excessive JPT. The AFRC is effective up to 30000 ft. It is adjusted on the ground to allow the engine to be

accelerated from 40% to 98% within 5 to 7 seconds. The acceleration time varies directly with OAT.

If the acceleration time is below 5 seconds and the throttle is opened rapidly, compressor stalling may be encountered accompanied by excessive JPT. Avoid this condition by retracting the throttle to START AND FLIGHT IDLE quickly if the compressor stalls or the JPT rises rapidly. The AFRC should be immediately reset to within the limitation 5-7 seconds.

When the acceleration time is more than 7 seconds, there is a possibility of AFRC interference occuring, particularly during overshoots. The characteristic of AFRC interference is that it is not possible to accelerate the engine above 65 - 70%. Should an acceleration time of more than 7 seconds be noted, the AFRC should be immediately adjusted within 5-7 seconds.

COMPRESSOR STALL

The AFRC is provided to prevent compressor stall by regulating fuel flow to the combustion chambers during acceleration. Nevertheless slamming the throttle is to be avoided. Only in emergencies at altitudes below 30.000 ft the throttle may be advanced rapidly.

Combustion of this excess fuel increases pressure in the combustion chambers which creates back pressure at the compressor outlet and leads to a reduction in air mass flow through the compressor. This condition is characterized by banging sounds and is noticeable before the instruments indicate engine malfunction. Further indications are: Rapid increase in JPT, reduced thrust and severe vibrations.

Should the above indications be noticed after opening the throttle rapidly retard the throttle immediately to avoid the dangerous condition of compressor stall. If the stall is not cleared, JPT may rise drastically resulting in serious damage to the turbine and to components in the hot section and may eventually lead to complete engine failure.

If JPT decreases and stabilizes at a normal value when the throttle is retarded to minimum RPM the throttle may be again advanced very carefully. RPM and JPT must increase simultaneously. However, if RPM and JPT continue to decrease below the normal value, this indicates that a flameout has occured. In this case, an air start must be attempted.

FLAMEOUT

Slamming or chopping the throttle may cause a flameout.

Flameout may occur due to throttle slam because more fuel is fed into the combustion chambers than is necessary for the RPM selected by the throttle. Mixture becomes so rich that it cannot be entirely burned. This holds true in the case of compressor stall so that flameout may be brought about.

Flameout may also occur due to too rapid throttle retardation because too little fuel is fed to the combustion chambers in relation to given RPM. Combustion cannot be maintained and flameout occurs (mixture too lean).

Indications of flameout are complete loss of thrust, decreasing JPT and reducing RPM. Any time a flameout occurs an air start may be attempted.

ENGINE NOISES

During flight, unusual noises due to thermal expansion or to pressure surge in the cockpit pressurizing system may occasionally occur.

Usually, noises can be eliminated by varying the RPM, but if they occur at all engine speeds, it points to some mechanical failure.

ENGINE ICING

See Section V, page 5-3).

PROPORTIONER

The fuel flow proportioner consists of two pumps, driven by hydraulic pressure. Coordinated feeding from the two fuel tank groups results in only negligible shifting of the aircraft center of gravity. For this reason, the shafts of the two pumps are off center in the pump housing so that the output ofeach pump is proportional to the capacity of the associated tank group.

In case of mechanical of hydraulic failure of the fuel flow proportioner, fuel will flow freely through the proportioner without affecting the fuel supply to the engine.

BRAKE SYSTEM

FUNCTIONAL CHECK

To check brake effectiveness merely jam the brakes briefly before leaving the parking area.

TAXIING

It is recommended that special care be taken to place the feet properly on the pedals so that the brakes are not accidentally applied while taxiing. Dragging brakes cause considerable heat buildup and airstream does not provide adequate cooling. Consequently, the thermal limit might be exceeded, the brake linings char, the discs might bend, and the tires blow out and burn.

The brakes may only be applied for brief intervals while taxiing for steering purposes.

HOLDING THE AIRCRAFT AT 100 % RPM

On A Runway

When the throttle is advanced to 100% RPM and the parking brake is applied prior to the takeoff run the aircraft must not move.

Excessively worn brake linings must be replaced. When new brake linings have been installed it suffices to apply the brakes in short intervals to obtain greatest braking power.

On A Grass Runway

The wheels may creep even though the brakes are applied. If the brakes do not hold, do not apply them any longer in order to avoid overheating the brake assemblies, or, if the wheels skid, to avoid excessive tire wear.

PRECAUTIONS WHILE RAISING AND LOWERING THE LANDING GEAR

CAUTION

Never apply the brakes while raising or lowering the landing gear to avoid rupturing the hoses.

TAKEOFF ABORT

After an aborted takeoff it may be necessary to bring the aircraft to a stop within the shortest distance. Deploy the drag chute immediately and apply the brakes intermittently but firmly. Brake effectiveness will be greater than when the brakes are applied continuously and progressively.

WHILE LANDING

In the normal landing procedure pull out the drag chute handle at the moment of touch-down, since the chute braking effect is greater at higher speed. For this same reason it is recommended that the wheel brakes be not applied immediately to obtain as much braking effect as possible from the chute.

The brakes should be applied powerfully but only in brief intervals. This procedure will provide the shortest stopping distance possible without overloading the brakes and ensures full utilization of braking effect of chute, aerodynamic drag of the aircraft and frictional forces of wheel brakes.

During touch-and-go landings the brakes must not be used to avoid heating up the brake assemblies and the wheels for the next landing.

EMERGENCY BRAKE SYSTEM (PARKING BRAKE)

In contrast to normal braking operation it is recommended that the emergency brake be applied in a continuous but moderate application so as not to expend the pressure from the emergency brake system accumulator too quickly. Pressure reserves in the accumulator permit 6-7 complete braking operations.

PARKING BRAKE

The parking brake must never be set as long as the brake assemblies are still hot. Instead, have wheel chocks put in place.

BRAKE OVERHEATING

If the brakes are excessively overheated comply with the instructions given in T.O. 4B-1-1.

Engine Controls

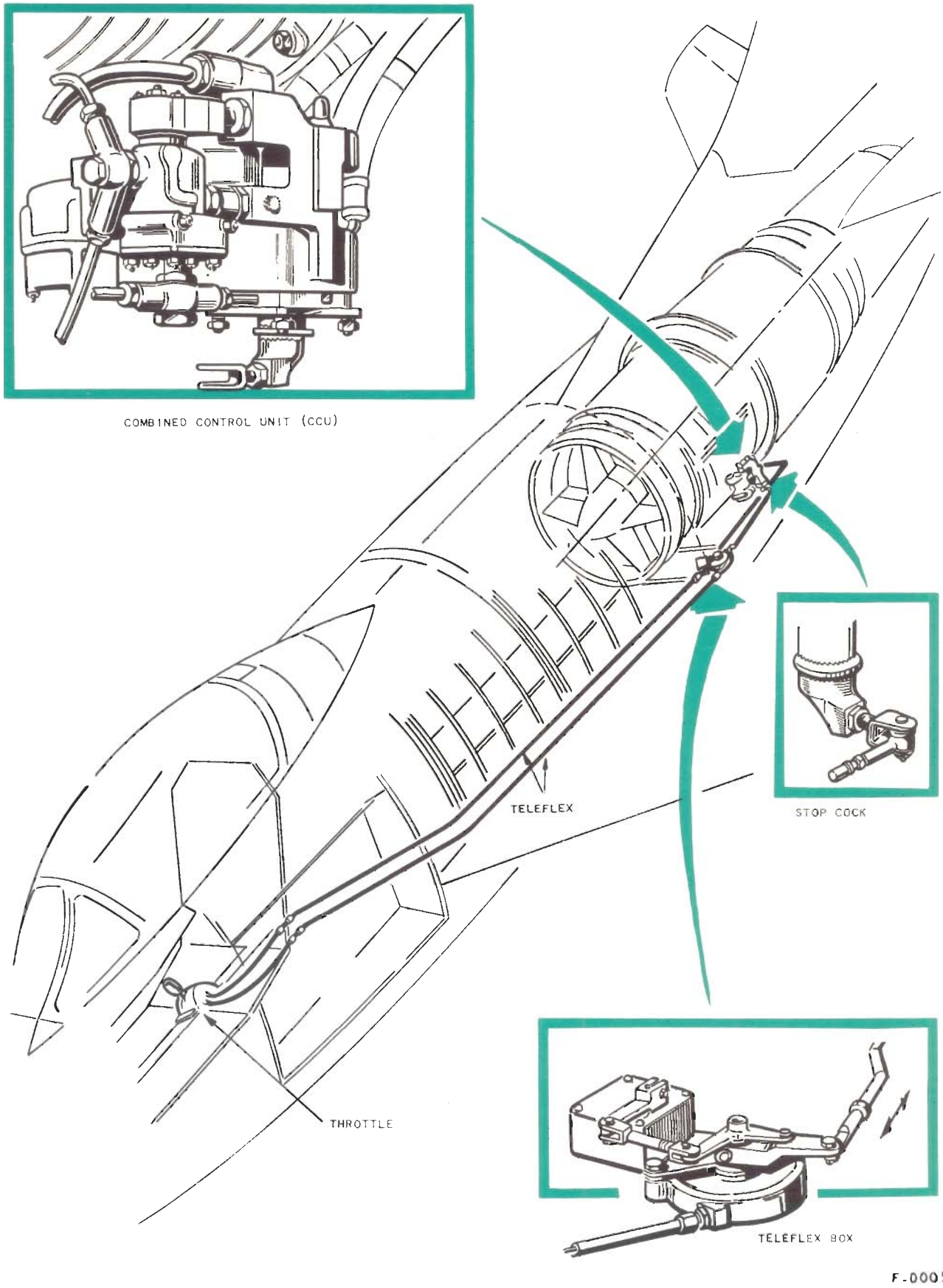

Figure 7-1

SECTION VIII CREW DUTIES

Not applicable to this aircraft.

SECTION IX ALL WEATHER OPERATION

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INTRODUCTION

Aside from several repetitions, operations are described in this section which differ from or supplement the normal operating procedures presented in Section II of this flight manual.

INSTRUMENT FLIGHT PROCEDURES

Flight with this aircraft requires constant attention to the flight instruments, paying particular attention to the attitude indicator.

The aircraft is very sensitive to changes of control pressures. For best results, make all changes smoothly. When entering or recovering from a turn do not control too abruptly and keep the aircraft properly trimmed.

The following techniques are recommended from takeoff to GCA landing under instrument and/or night flying conditions.

PRE-FLIGHT CHECK

1. Drain the PITOT system.

BEFORE TAXIING

In addition to routine pre-flight checks the following must be done after starting the engine :

1. Set the navigation lights, as required to either FLASH or STEADY and to BRIGHT or DIM.

If instrument flight must be executed at night or under adverse light conditions :

2. Have a flashlight with you.
3. Check cockpit lighting und set rheostats to required light intensity so that the instruments may be easily read.
4. Check taxi light and switch on, if necessary.

TAXI

1. Make sure the attitude indicator is functioning properly.
2. Make sure that the HEADING INDICATOR corresponds to the indication of the standby compass.
3. Check the turn-and-bank indicator and the standby turn-and-bank indicator while turning on the ground.
4. Make sure that the rate-of-climb indicator is set at ZERO.
5. Select local beacon frequency on the radio compass and check for proper operation while taxiing to the runway.
6. Make sure that the pitot heater is operating perfectly (when the heater is switched on, the needle of the ammeter must deflect momentarily).

LINE-UP CHECK

1. Align the aircraft visually with the runway and switch off the taxi light, if not needed.
2. Check HEADING INDICATOR against runway heading.
3. Check the attitude indicator again as soon as the aircraft is aligned with the runway and ready for takeoff. The miniature aircraft must be aligned with the horizon bar (neutral position).
4. Switch on the pitot heater, if necessary.
5. Switch on the DEFROST-DEICE SYSTEM, if necessary.
6. Perform runup check.

INSTRUMENT TAKEOFF AND INITIAL CLIMB

1. Release the brakes.
2. Maintain directional control using the wheel brakes until the rudder becomes effective.

3. At 95 KIAS reduce weight of nose wheel, at 125 KIAS (without external stores) or at 130 KIAS (with external stores) apply back pressure to the stick to establish a takeoff attitude. Takeoff attitude is established by increasing the pitch attitude three horizon bar widths on the attitude indicator. The aircraft will eventually lift off in this attitude.
4. Maintain this attitude and monitor the attitude indicator.
5. When altimeter and rate-of-climb indicator show that a definite rate of climb has been established, retract the landing gear before IAS reaches 185 KIAS.
6. Establish and maintain a 1000-1500 ft/min. climb.
7. Raise the wing flaps between 160 and 185 KIAS.

CRUISE

1. After levelling off from a climb and after establishing cruising, trim the aircraft. It is recommended that the attitude indicator be reset to the neutral position only if visual reference to the actual horizon permits exact level flight.
2. In normal turns, the amount of bank must not exceed 30° (maintain 1/2 standard rate turn = 1°30' per sec.).
3. After roll out from a turn constant flight instrument cross-check is necessary to maintain level attitude during brief periods of gyro unreliability due to precession error.

Note

Errors of up to 5° in bank and pitch may be present upon return to straight and level flight. The erection mechanism in the G.T.A. attitude indicator corrects such errors automatically within several minutes.

If the PULL TO CAGE knob is used to quickly erect the gyro, pull out the knob gently so as not to damage the instrument.

Always keep in mind that the attitude indicator cages to the attitude of the aircraft rather than to the true vertical. Therefore, the aircraft must be in straight and level flight.

DESCENT

When the speed brakes are lowered during descent the aircraft will pitch up more or less (according to speed).

Counteract this tendency by trimming.

Proceed as follows for instrument descent :

a) 10 minutes before penetration :
   1. Check fuel quantity.
   2. Switch on pitot heat.
   3. Switch on defrost-deice system.
   4. Set cockpit heating at maximum (if essential).
   5. Position lights: As required.

b) During penetration:
   1. Retard throttle to 78% RPM.
   2. Lower the nose to establish a descent attitude.
   3. Extend speed brakes.
   4. Maintain penetration speed at 280 KIAS (Pitch Control).
   5. Do not exceed 30° bank in turns.

CAUTION

Recommended speed for penetration of turbulent air is 260 KIAS.

Use Of The Radio Compass

The ADF-102 radio compass is very susceptible to precipitation static, particularly at high airspeeds.

If reception becomes too weak when the mode selector is at COMP or ANT, it is recommended that the mode selector be set to LOOP and that the AURAL-NULL procedure be employed.

When penetration is made with the aid of the radio compass the instructions given under DESCENT of this section (page 9-3) are applicable.

EMERGENCY DESCENT

RADAR RECOVERY

When flying under IFR conditions, radar aided descent and landing approach is the most favorable procedure to save fuel (Fig. 9-1).

GCA STANDARD PROCEDURE (see fig. 9-2)

a) Downwind Leg

- Altitude	1500 ft above ground or as instructed
- Speed	185 KIAS
- Speed brakes	OUT
- Power	as required
- Landing gear	UP
- Base leg + final speed	COMPUTE
- Wing flaps	UP
- Collect tank	ON

b) Base Leg And Final To Glide Path

- Altitude	1500 ft
- Speed	160 KIAS + FUEL
- Landing gear	DOWN
- Speed brakes	IN
- Wing flaps	1/2 DOWN
- Power	as required

c) Glide Path

- Wing flaps	FULL DOWN
- Rate of descent	appr. 800 ft/min. or as instructed
- Speed	150 KIAS (plus fuel correction)
- Power	as required

Check:

- Landing gear	DOWN
- Wing flaps	DOWN
- Speed brakes	IN

Note

In an emergency, where there is insufficient fuel remaining, the landing pattern must be shortened. Also, keep in mind that about 300 lbs of fuel are required for a missed approach procedure.

LANDING

The ground landing roll distance is normal but point of touchdown is about 1000-1500 ft from the near end of the runway when making a GCA landing.

AFTER LANDING

In addition to normal procedures, execute the following :

1. Switch off the defroster-deicer system.
2. Switch off the pitot heater.
3. Switch off the radio compass.

UNUSUAL ATTITUDES

When attempting to recover from unusual flight attitudes keep in mind that roll rates are very high with G 91.

For this reason, avoid abrupt corrective maneuvers in order not to throw the aircraft into another critical attitude of opposite direction.

ICE

Icing can occur at any altitude. Normally, ice will form on the windshield, wing leading edges, empennage, and external tanks. When icing occurs on the aircraft it becomes very sluggish and difficult to handle for instrument flight.

CAUTION

Icing can cause the stalling speeds to increase considerably.

If icing occurs, change altitude immediately.

INDUCTION ICING

When flying at temperatures near the freezing point ice can form at the air intake without apparent icing of other parts of the aircraft.

Icing of the air intake reduces air mass flow to the combustion chambers and thereby thrust, which is indicated by a rapid increase of JPT. Under such circumstances, retard the throttle keep JPT within limits and leave the critical area or altitude as soon as possible.

If the engine overheats due to icing and noises are heard which lead to the conclusion that there has been mechanical damage to the power plant do not attempt an air start.

TURBULENCE AND THUNDERSTORMS

CAUTION

Avoid penetrating thunderstorms whenever possible.

A safe and comfortable penetration speed into zones of turbulent air for the G 91 is 260 kts. Power setting and pitch attitude required for penetration should be established prior to entry.

Following are special instructions for flying through storm areas :

BEFORE TAKEOFF

1. Make a thorough analysis of the general weather situation to determine thunderstorm areas and prepare a flight plan which will require the least possible exposure of the aircraft to regions of possible thunderstorms.
2. If penetration is unavoidable check proper operation of all flight instruments, navigation equipment, pitot heater, and instrument panel lights.

APPROACHING THE STORM AREA

Proceed as follows :

1. Lock shoulder harness.
2. Check flight controls and trim A/C.
3. Adjust power for 260 KIAS.
4. Turn on pitot heater.
5. Turn on defroster-deicer system.
6. Turn on cockpit lights full bright to minimize blinding effect of lightning.

WITHIN STORM

1. While in the storm maintain power setting and pitch attitude (established before penetration).
2. Concentrate principally on holding a level attitude by reference to the attitude indicator. Do not work the controls too abruptly when making corrections.
3. Maintain constant heading and make no turns unless absolutely necessary.
4. While in the storm area the airspeed indicator (MACH and IAS) can be greatly in error. It is recommended, therefore, that these

instruments not be depended upon in order to avoid precarious flight attitudes.

Engine RPM indicator and the attitude gyro are the primary instruments in determining airspeed.

5. Due to pressure fluctuations in the storm area the altimeter may supply false readings, the difference may be several thousand feet. Consequently, this situation must be considered when determining minimum safe altitude.

Note

Usually - the greatest turbulence is encountered between 10.000 and 20.000 ft. Below 6.000 and above 30.000 ft turbulence is not so great.

COLD WEATHER OPERATION

BEFORE ENTERING COCKPIT

Make certain that :

1. All protective covers and dust plugs have been removed.
2. The entire aircraft is free from frost, snow, and ice. Remove all ice by a direct flow of air from a portable ground heater.

CAUTION

- Care should be exercised to insure that water from melted ice is sponged so that it will not drain to some critical area and refreeze.
- Do not attempt to chip or scrape ice from the aircraft surfaces as this may cause damage to the aircraft.
- Dangerous loss of lift results if the aircraft is not adequately cleaned of all frost, snow, and ice.

Furthermore :

3. Drain pitot system water separators thoroughly.
4. Check to see that the shock absorber pistons and the piston rods of the actuating cylinders are clean. If not, clean them with a rag previously soaked in hydraulic fluid. Check shock absorber pressure.
5. At ambient temperatures of -26°C or below the cockpit must be preheated so that the cockpit, the instrument panel, and the canopy seal are properly heated.

AFTER ENTERING COCKPIT

1. Check flight controls for freedom of movement.
2. Connect A.P.U. to operate and check electrical and radio equipment.

BEFORE STARTING ENGINE

Pre-heat the engine through the intake ducts.

STARTING ENGINE

Use the normal starting procedure.

AFTER STARTING ENGINE

1. Turn on cabin heat and windshield defrosting system, as required, immediately after engine start.
2. Check to see that all control surfaces can be actuated over the full range of travel.
3. Check wing flap and flap indicator operation. If questionable readings result, cycle flaps three to four times to correct indicator action.
4. Check all instruments for normal operation.

Note

Because of low ambient temperatures, the thrust developed at all engine speeds is noticeably greater than normal.

TAXI

1. Avoid taxiing in deep snow as taxiing and steering are extremely difficult and frozen brakes may result.

CAUTION

Increase taxi interval at subfreezing temperatures to insure safe stopping distance and to prevent icing of aircraft surfaces by melted snow and ice in jetblast of a preceding aircraft.

BEFORE TAKEOFF

1. Make sure that the canopy is closed and locked.
2. Switch on pitot heat.
3. If necessary, switch on camera heaters.
4. Make run-up check during the first part of the takeoff roll as the brakes will not hold the aircraft on snow-covered or icy runways at full throttle.

TAKEOFF

At low ambient temperatures (2°C and below) the maximum engine speed of 100% RPM will not always be available. With throttle set at full power the engine, at an ambient temperature of -20°C, may possibly reach only 95% RPM.

AFTER TAKEOFF

After taking off from a runway covered with slush or mud it is recommended that the wing flaps and landing gear be cycled several times to avoid the formation of ice which could hinder proper operation of these assemblies.

CLIMB

Increased thrust during cold weather operation at low altitudes will result in better climb performance.

CRUISE

Aircraft operation during flight in cold weather should be governed by normal procedure.

DESCENT

Set the windshield defroster and cockpit temperature as required.

LANDING APPROACH

Use normal procedure.

LANDING

Landing speeds and techniques are normal. Great care must be exercised in the use of the brakes on slippery runways.

Switch off pitot heater after landing.

ENGINE SHUTDOWN

Shut down the engine in the normal manner.

BEFORE LEAVING THE AIRCRAFT

1. Release parking brake after wheels are chocked.
2. Always leave the aircraft parked with full fuel tanks to prevent moisture from entering the fuel system.
3. Install protective covers.
4. Remove batteries and store in a warm place when the aircraft is to be parked at temperatures below -29°C for more than four hours.

HOT WEATHER OPERATION

BEFORE ENTERING COCKPIT

Check particularly for hydraulic system leaks as heat and moisture may cause valves and packings to swell.

STARTING THE ENGINE

Normal starting procedures are also used in hot weather. JPT can reach maximum limit under these conditions.

TAXI

1. Brakes should be used as little as possible to prevent overheating.
2. If necessary, do not close the canopy entirely while taxiing.

TAKEOFF

During takeoff, the aircraft will accelerate more slowly than under normal conditions. Consequently, takeoff distance will be longer than usual because of decreased air density in hot weather.

Ground speed will be increased for the same indicated airspeed (see table "TAKEOFF DISTANCES").

CRUISE

Aircraft operation during flight in hot weather should be governed by normal procedure. At low altitudes, temperatures may be in the high ranges (consequently, set throttle so that JPT remains within maximum limits).

LANDING

1. Hot weather operation requires the pilot to be cautious of gusts and wind shifts near the ground.
2. Landing ground rolls are slightly longer than those at normal temperature.

DESERT OPERATION

GENERAL

Most procedures used for hot weather operation are valid for desert operation as well. However, sand and dust present dangers for aircraft in these areas.

BEFORE ENTERING COCKPIT

1. Make sure that the fuel filter has been checked and cleaned.
2. Make sure that the aircraft is not in the vicinity of another parked aircraft when starting the engine.

TAXI

1. Taxi carefully with minimum power to minimize the blowing of dust and sand into other aircraft.
2. Maintain adequate distance from any aircraft taxiing ahead.

TAKEOFF

While taking off, be aware of gusty winds.

CRUISE

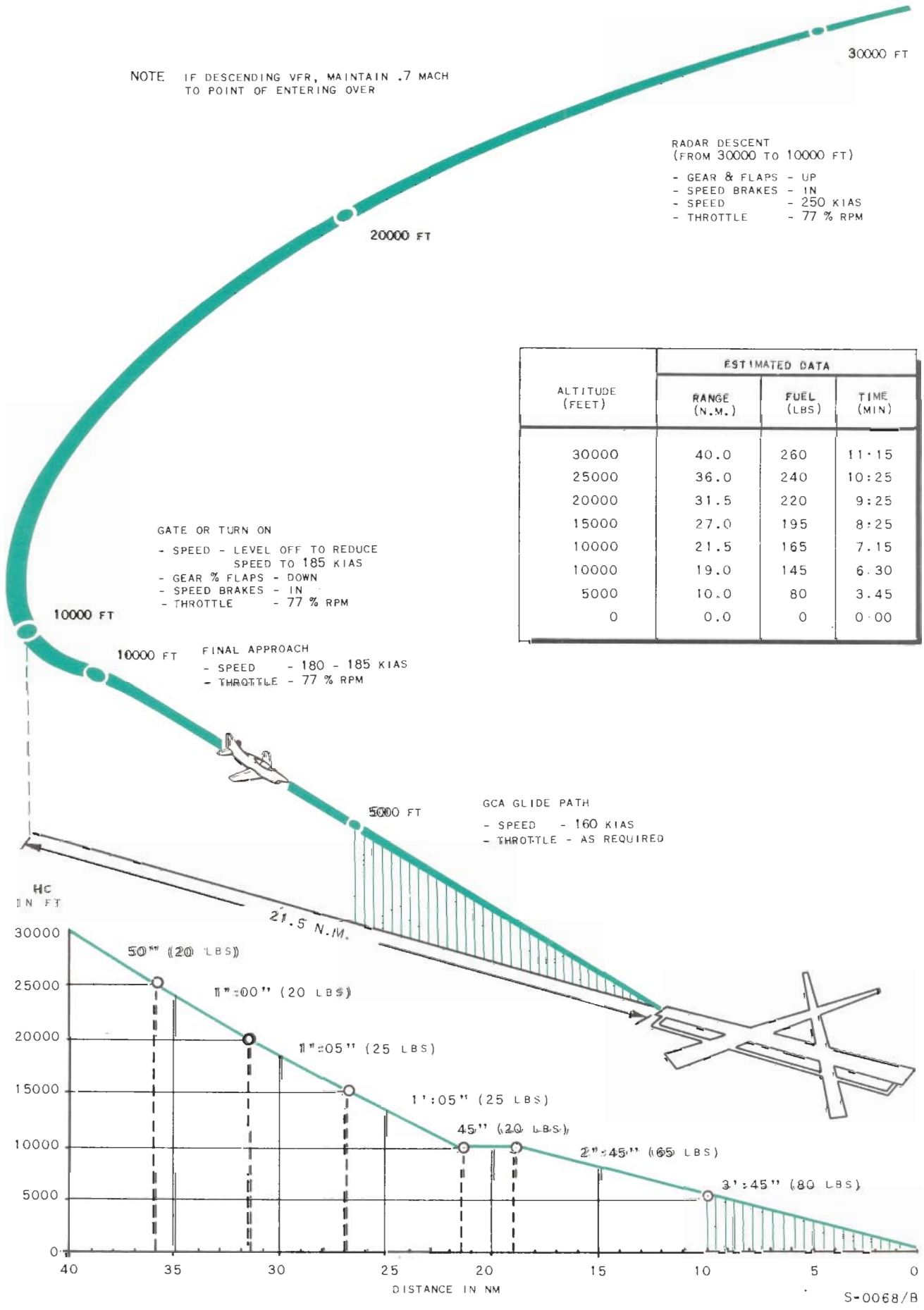
Sand and dust clouds are not to be penetrated when flying at low altitudes.

AFTER LANDING

Cover all ducts and air intakes as soon as possible to prevent the entrance of blowing sand and dust.

GAF TO 1F-G91(R3)-1

Radar Recovery



ALTITUDE (FEET)	ESTIMATED DATA		
	RANGE (N.M.)	FUEL (LBS)	TIME (MIN)
30000	40.0	260	11·15
25000	36.0	240	10:25
20000	31.5	220	9:25
15000	27.0	195	8:25
10000	21.5	165	7.15
10000	19.0	145	6.30
5000	10.0	80	3.45
0	0.0	0	0·00

Figure 9-1

Standard GCA Pattern

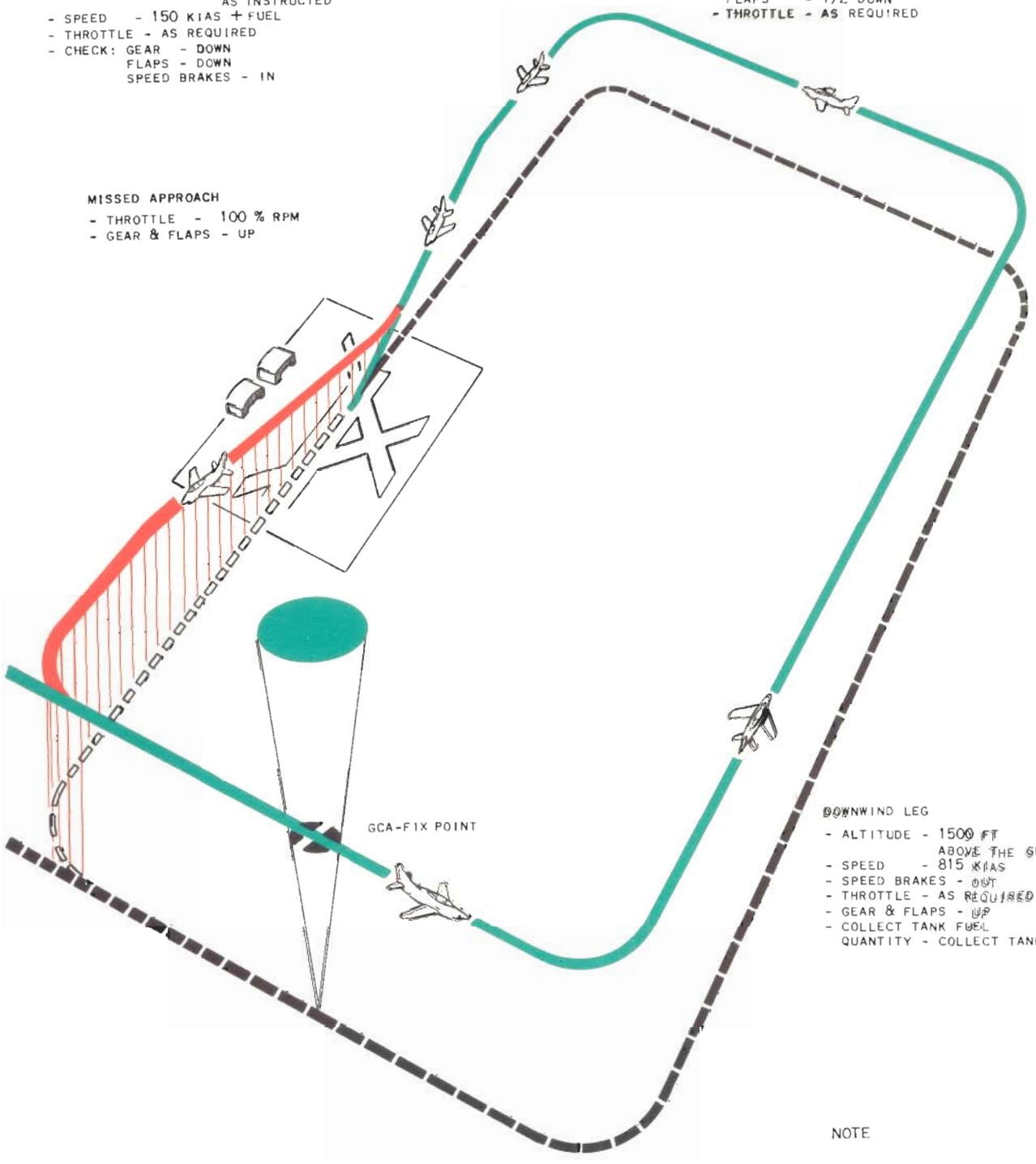


Figure 9-2

APPENDIX PERFORMANCE DATA

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SYMBOLS AND DEFINITIONS

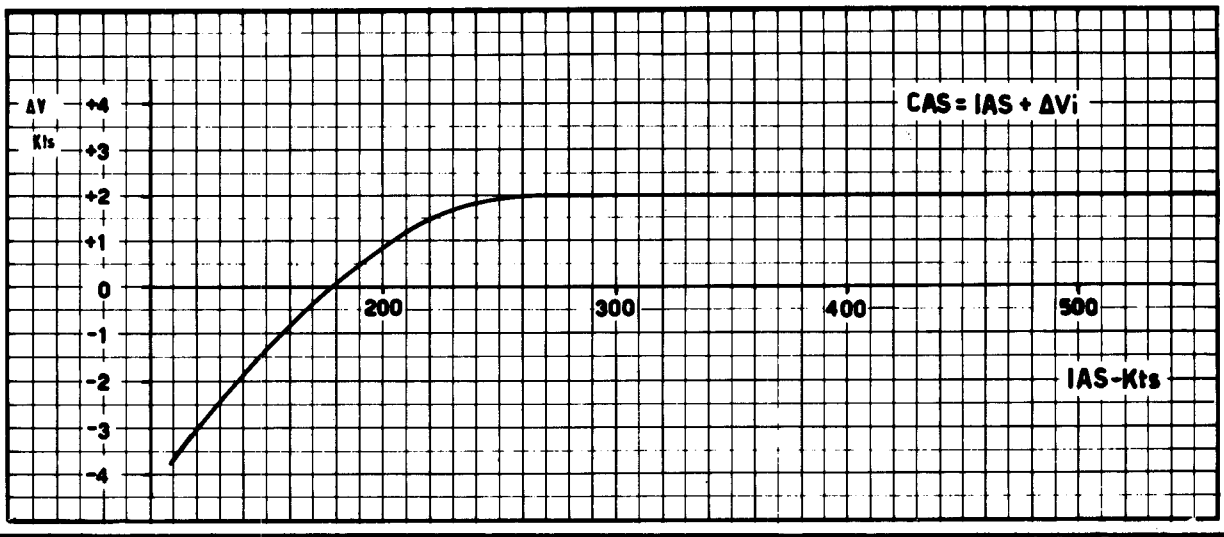
SYMBOL	DEFINITION
IAS	INDICATED AIRSPEED, AIRSPEED INDICATOR READING UNCORRECTED. WHERE THIS SYMBOL (IAS) IS USED ON THE PERFORMANCE CHARTS, MECHANICAL ERROR IN THE INSTRUMENT IS ASSUMED TO BE ZERO.
Vi	AIRSPEED POSITION ERROR CORRECTION
CAS	CALIBRATED AIRSPEED, INDICATED AIRSPEED CORRECTED FOR POSITION ERRORS : CAS = IAS + Vi
Vc	AIRSPEED COMPRESSIBILITY CORRECTION
EAS	EQUIVALENT AIRSPEED
TAS	TRUE AIRSPEED EQUIVALENT AIRSPEED CORRECTED FOR ATMOSPHERIC DENSITY
GS	GROUND SPEED
H	ALTIMETER POSITION ERROR CORRECTION
C.G.	CENTER OF GRAVITY
Hd	DENSITY ALTITUDE
Hc	ALTITUDE CORRECTED FOR POSITION ERROR
Hi	INDICATED ALTITUDE
M	MACH NUMBER
MAC	MEAN AERODYNAMIC CHORD
NM	NAUTICAL MILES
OAT	OUTSIDE AIR TEMPERATURE
TMN	TRUE MACH NUMBER
SL	SEA LEVEL
W	AIRCRAFT WEIGHT

Table No.

1	OPERATING FLIGHT LIMITS (See Section V, figs. 5-2, 5-4 and 5-5)
2	ALTITUDE LOST IN A PULL-OUT FROM FROM DIVES (See Section VI, fig. 6-1)

AIRPLANE MODEL:	AIRSPEED POSITION ERROR CORRECTION	ENGINE MODEL:
FIAT G 91 R/3		B.Or. 803 D 11

WING PITOT

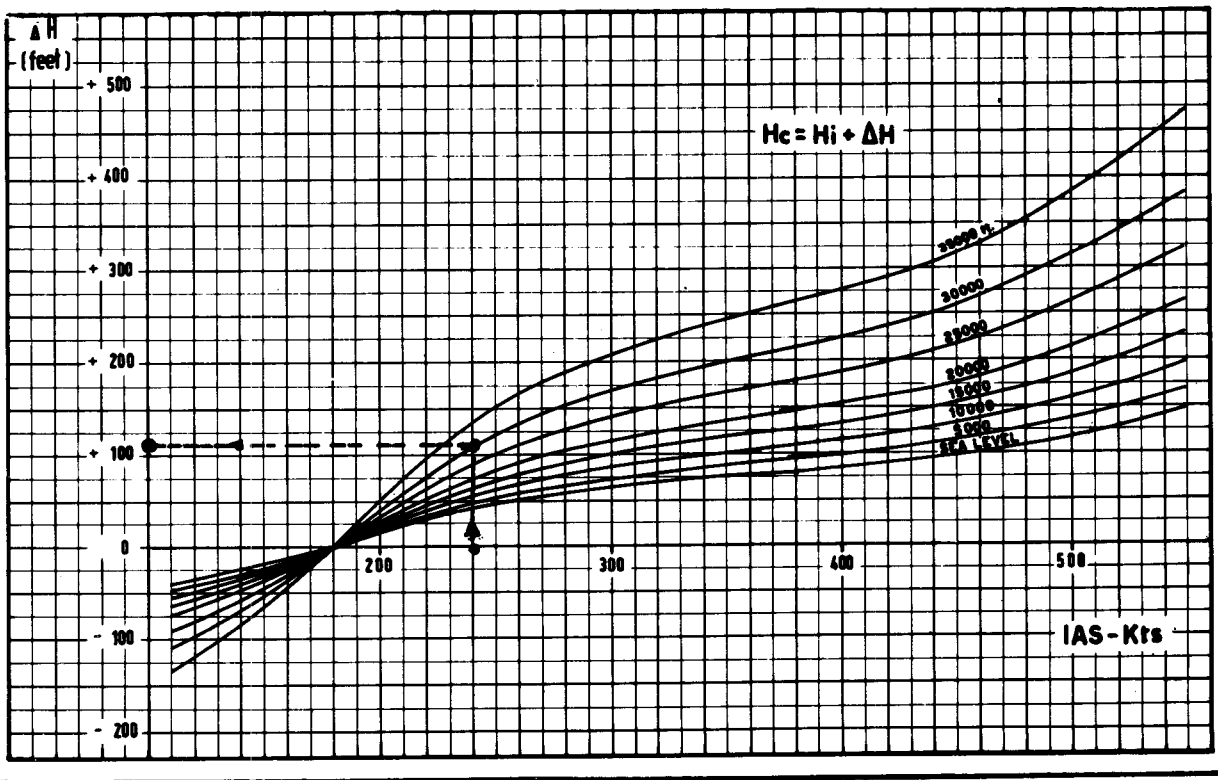


Date: JUL 19, 1961	Data basis: ESTIMATED

S-0051-1

Table 3

AIRPLANE MODEL:	ALTITUDE CALIBRATION	ENGINE MODEL:
FIAT G 91 R/3		B.Or. 803 D 11



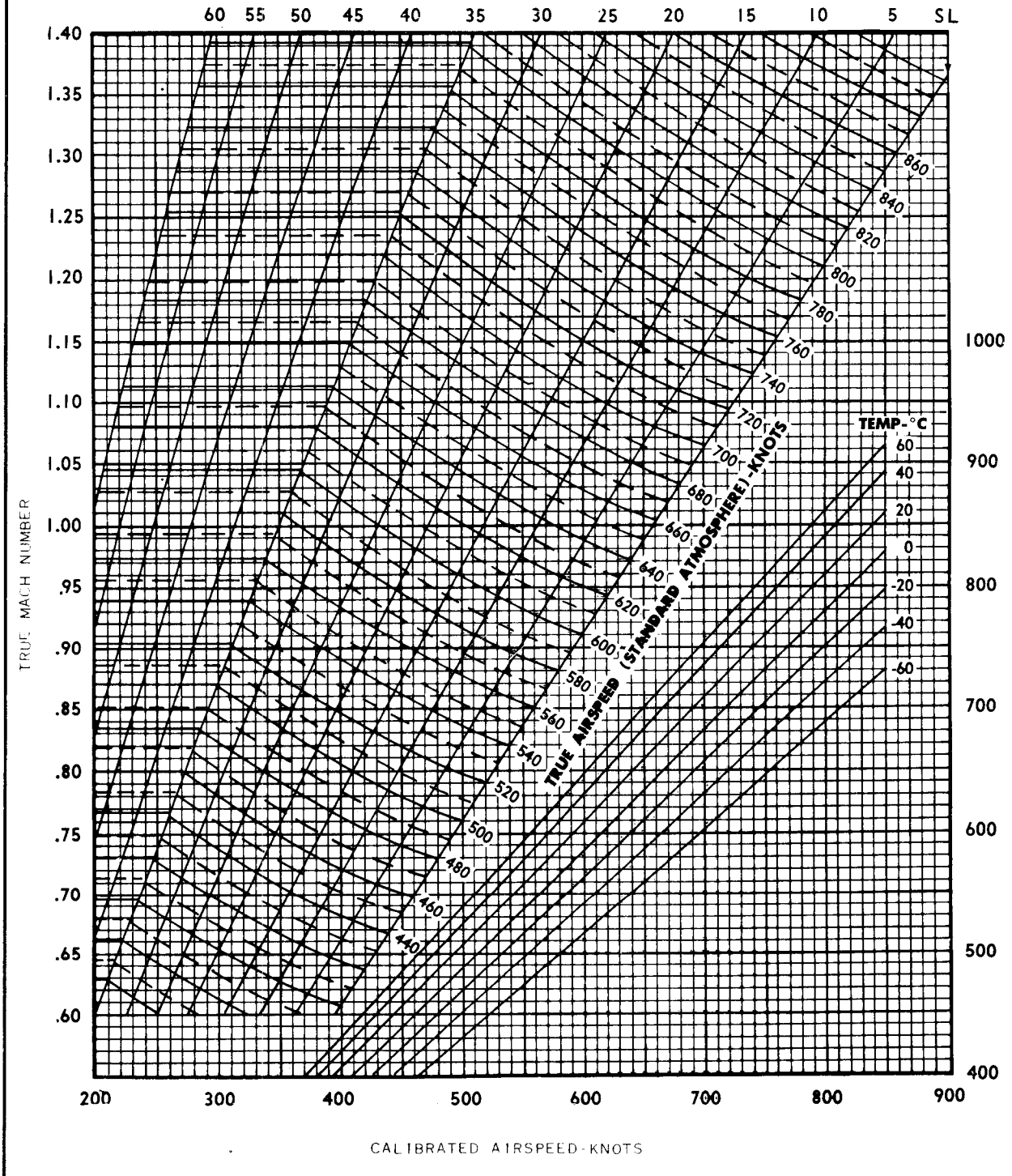
EXAMPLE: IN ORDER TO MAINTAIN ASSIGNED FLIGHT LEVEL OF 30000 FEET PRESS.ALT., AT 240 KIAS, FLY AT 30110 FEET INDICATED ALTITUDE TO ACCOUNT FOR ALTIMETER POSITION ERROR.

Date: AUG 3, 1961	Data basis: ESTIMATED

S-0052-1

Table 4

AIRPLANE MODEL:	AIRSPEED MACH NUMBER CURVES *PRESSURE ALTITUDE - 1000 Feet*	ENGINE MODEL:

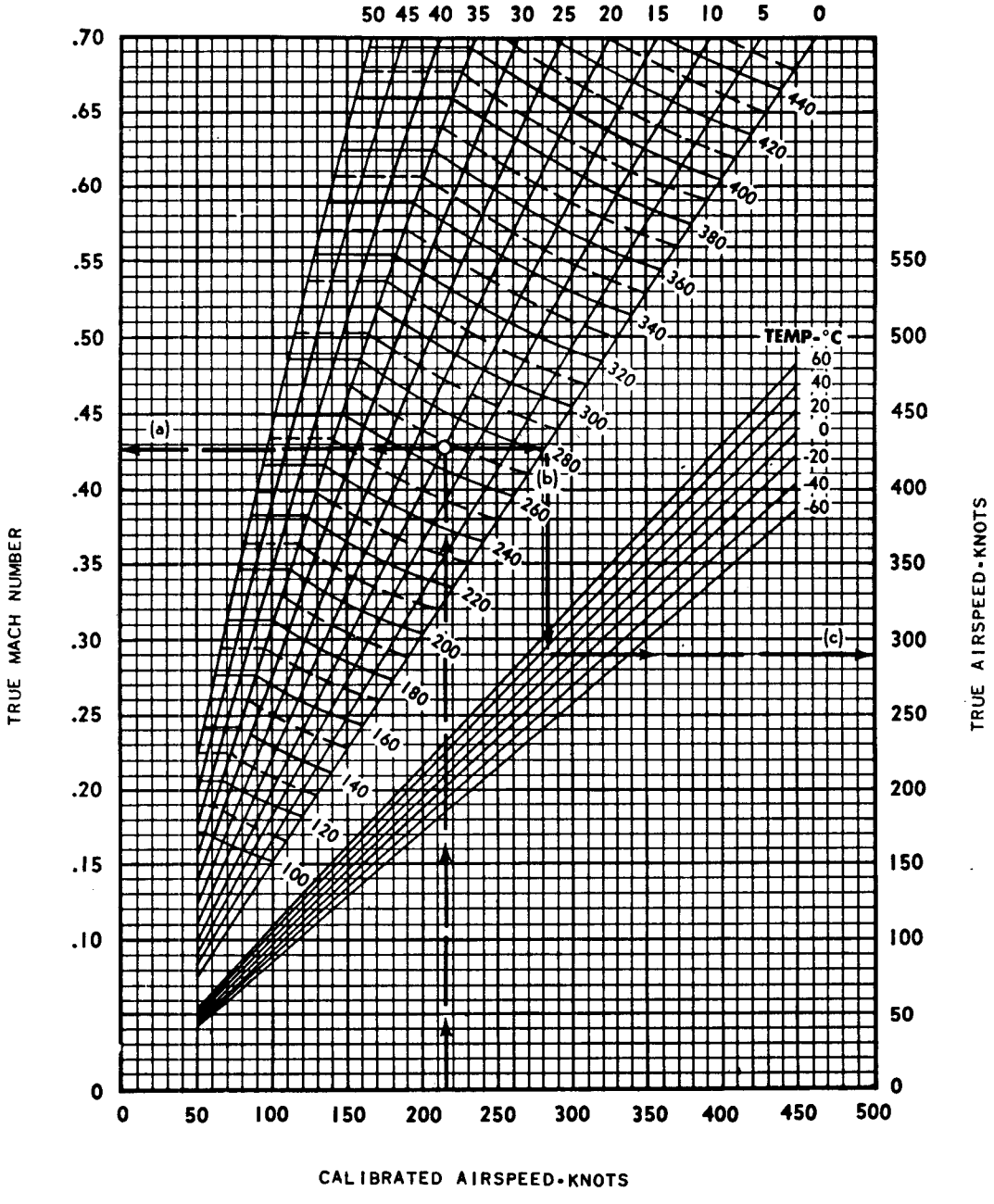


Date:	Data basis:

S-0026

Table 5/1

AIRPLANE MODEL:	AIRSPEED MACH NUMBER CURVES *PRESSURE ALTITUDE - 1000 Feet*	ENGINE MODEL:



EXAMPLE:

CAS = 215 KNOTS
ALT = 15,000 FEET
(A) TMN = .428
(B) TAS = 267 KNOTS AT STANDARD TEMP. (-14.7°C)
(C) TAS = 290 KNOTS AT TEMP. OF 30°C

Date:	Data basis:

S-0023-1

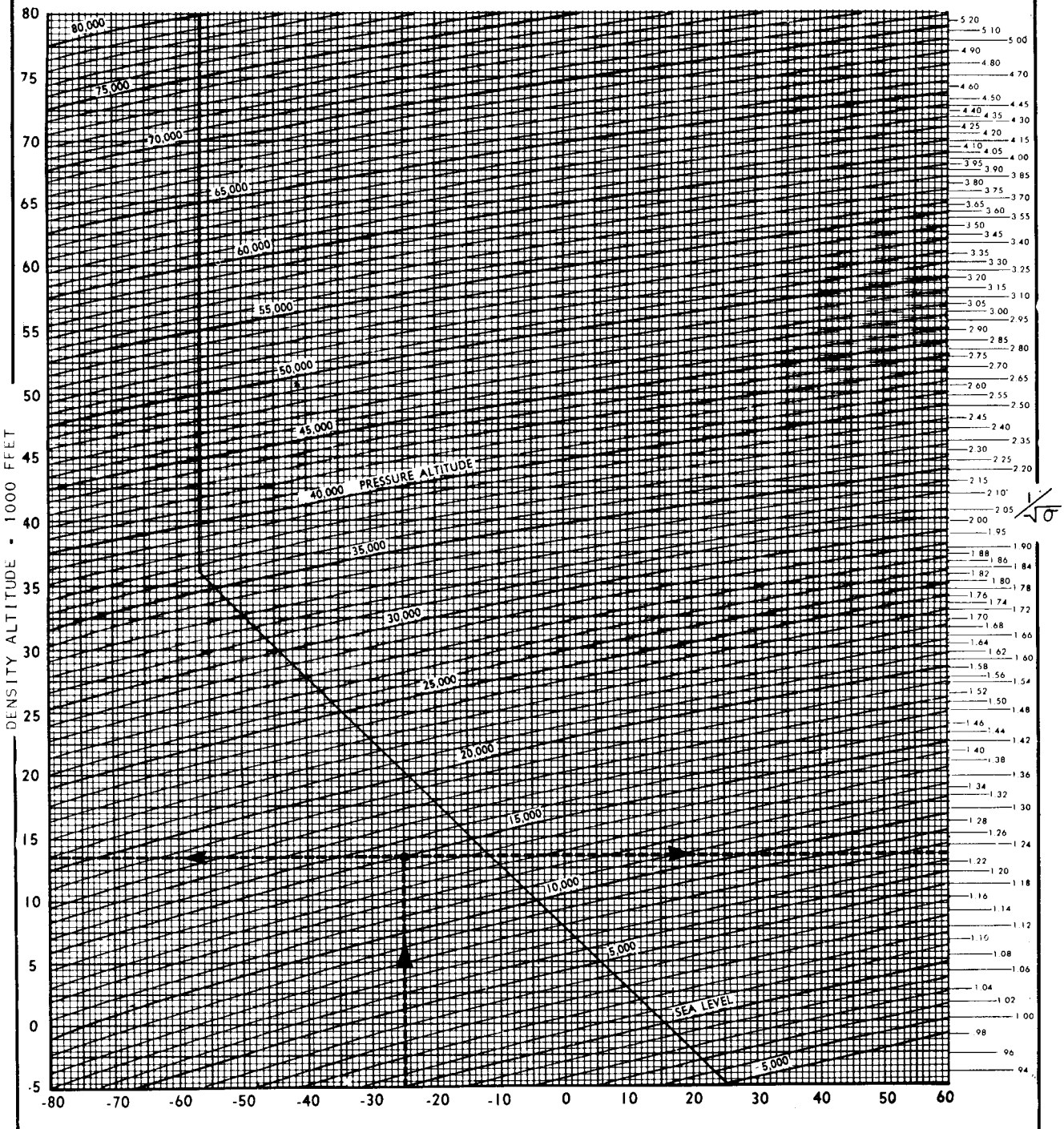
Table 5/2

AIRPLANE MODEL:

DENSITY ALTITUDE CHART

ICAO

ENGINE MODEL:



EXAMPLE:

A) HC = 15000 FT DAT = +25°C HD = 13500 FT $1/\sqrt{\sigma}$ = 1.23

B) TAS = 290 KTS EAS = TAS / $1/\sqrt{\sigma}$ = 290/1.23 = 236 KTS

Date

Data basis:

S-0024-1

Table 6

AIRPLANE MODEL:

STANDARD ATMOSPHERE TABLE

ENGINE MODEL:

STANDARD S L CONDITIONS:

Temperature 15°C (59°F)
Pressure 29.921 IN.Hg 2116.216 LB/SQ FT
Density .0023769 SLUGS/CU FT
Speed of sound 1116.89 FT/SEC 661.7 KNOTS

CONVERSION FACTORS:

1 IN.Hg 70.727 LB/SQ FT
1 IN.Hg 0.49116 LB/SQ IN.
1 KNOT 1.151 M.P.H.
1 KNOT 1.688 FT/SEC.

ALTITUDE FEET	DENSITY RATIO σ	$\sigma^{-1/2}$ $\frac{1}{\sqrt{\sigma}}$	TEMPERATURE °C	TEMPERATURE °F	SPEED OF SOUND KNOTS	PRESSURE IN. Hg	PRESSURE RATIO δ
0	1.000	1.0000	15.000	59.000	661.7	29.921	1.0000
1000	.9711	1.0148	13.019	55.434	659.5	28.856	.9644
2000	.9428	1.0299	11.038	51.868	657.2	27.821	.9298
3000	.9151	1.0454	9.056	48.302	654.9	26.817	.8962
4000	.8881	1.0611	7.076	44.735	652.6	25.842	.8637
5000	.8617	1.0773	5.094	41.169	650.3	24.896	.8320
6000	.8359	1.0938	3.113	37.603	648.7	23.978	.8014
7000	.8106	1.1107	1.132	34.037	645.6	23.088	.7716
8000	.7860	1.1279	-0.850	30.471	643.3	22.225	.7428
9000	.7620	1.1456	-2.831	26.905	640.9	21.388	.7148
10,000	.7385	1.1637	-4.812	23.338	638.6	20.577	.6877
11,000	.7155	1.1822	-6.793	19.772	636.2	19.791	.6614
12,000	.6932	1.2011	-8.774	16.206	633.9	19.029	.6360
13,000	.6713	1.2205	-10.756	12.640	631.5	18.292	.6113
14,000	.6500	1.2403	-12.737	9.074	629.0	17.577	.5875
15,000	.6292	1.2606	-14.718	5.508	626.6	16.886	.5643
16,000	.6090	1.2815	-16.699	1.941	624.2	16.216	.5420
17,000	.5892	1.3028	-18.680	-1.625	621.8	15.569	.5203
18,000	.5699	1.3246	-20.662	-5.191	619.4	14.942	.4994
19,000	.5511	1.3470	-22.643	-8.757	617.0	14.336	.4791
20,000	.5328	1.3700	-24.624	-12.323	614.6	13.750	.4595
21,000	.5150	1.3935	-26.605	-15.889	612.1	13.184	.4406
22,000	.4976	1.4176	-28.587	-19.456	609.6	12.636	.4223
23,000	.4806	1.4424	-30.568	-23.022	607.1	12.107	.4046
24,000	.4642	1.4678	-22.549	-26.588	604.6	11.597	.3876
25,000	.4481	1.4938	-34.530	-30.154	602.1	11.103	.3711
26,000	.4325	1.5206	-36.511	-33.720	599.6	10.627	.3552
27,000	.4173	1.5480	-38.492	-37.286	597.1	10.168	.3398
28,000	.4025	1.5762	-40.474	-40.852	594.6	9.725	.3250
29,000	.3881	1.6052	-42.455	-44.419	592.1	9.297	.3107
30,000	.3741	1.6349	-44.436	-47.985	589.5	8.885	.2970
31,000	.3605	1.6654	-46.417	-51.551	586.9	8.488	.2837
32,000	.3473	1.6968	-48.398	-55.117	584.4	8.106	.2709
33,000	.3345	1.7291	-50.379	-58.683	581.8	7.737	.2586
34,000	.3220	1.7623	-52.361	-62.249	579.2	7.382	.2467
35,000	.3099	1.7964	-54.342	-65.816	576.6	7.041	.2353
36,000	.2981	1.8315	-56.323	-69.382	574.0	6.712	.2243
36,089	.2971	1.8347	-56.500	-69.700	573.7	6.683	.2234
37,000	.2843	1.8753				6.397	.2138
38,000	.2710	1.9209				6.097	.2038
39,000	.2583	1.9677				5.811	.1942
40,000	.2462	2.0155				5.538	.1851

Date:

Data basis:

S-0021

Table 7/1

AIRPLANE MODEL:

STANDARD ATMOSPHERE TABLE

ENGINE MODEL:

STANDARD S L CONDITIONS:

Temperature 15°C (59° F)
Pressure 29 921 IN.Hg 2116.216 LB/SQ FT
Density 0023769 SLUGS/CU FT
Speed of sound 1116.89 FT/SEC 661.7 KNOTS

CONVERSION FACTORS:

1 IN.Hg 70.727 LB/SQ FT
1 IN.Hg 0.49116 LB/SQ IN.
1 KNOT 1.151 M.P.H.
1 KNOT 1.688 FT/SEC

ALTITUDE FEET	DENSITY RATIO σ	σ-1/2 $\frac{1}{\sqrt{\sigma}}$	TEMPERATURE °C	TEMPERATURE °F	SPEED OF SOUND KNOTS	PRESSURE IN. Hg	PRESSURE RATIO δ
41,000	.2346	2.0645	-56.500	-69.700	573.7	5.278	.1764
42,000	.2236	2.1148				5.030	.1681
43,000	.2131	2.1662				4.794	.1602
44,000	.2031	2.2189				4.569	.1527
45,000	.1936	2.2728				4.355	.1455
46,000	.1845	2.3281				4.151	.1387
47,000	.1758	2.3848				3.956	.1322
48,000	.1676	2.4428				3.770	.1260
49,000	.1597	2.5022				3.593	.1201
50,000	.1522	2.5630				3.425	.1145
51,000	.1451	2.6254				3.264	.1091
52,000	.1383	2.6892				3.111	.1040
53,000	.1318	2.7546				2.965	.09909
54,000	.1256	2.8216				2.826	.09444
55,000	.1197	2.8903				2.693	.09001
56,000	.1141	2.9606				2.567	.08578
57,000	.1087	3.0326				2.446	.08176
58,000	.1036	3.1063				2.331	.07792
59,000	.09877	3.1819				2.222	.07426
60,000	.09414	3.2593				2.118	.07078
61,000	.08972	3.3386	-56.500	-69.700	573.7	2.018	.06746
62,000	.08551	3.4198				1.924	.06429
63,000	.08150	3.5029				1.833	.06127
64,000	.07767	3.5881				1.747	.05840
65,000	.07403	3.6754				1.665	.05566
66,000	.07055	3.7649				1.587	.05305
67,000	.06724	3.8564				1.513	.05056
68,000	.06409	3.9502				1.442	.04819
69,000	.06108	4.0463				1.374	.04592
70,000	.05821	4.1447				1.310	.04377
71,000	.05548	4.2456				1.248	.04171
72,000	.05288	4.3488				1.190	.03976
73,000	.05040	4.4545				1.134	.03789
74,000	.04803	4.5633				1.081	.03611
75,000	.04578	4.6738				1.030	.03442
76,000	.04363	4.7874				0.982	.03280
77,000	.04158	4.9039				0.935	.03126
78,000	.03963	5.0231				0.892	.02980
79,000	.03777	5.1454				0.850	.02840
80,000	.03600	5.2706				0.810	.02707

Date

Data basis:

S-0022

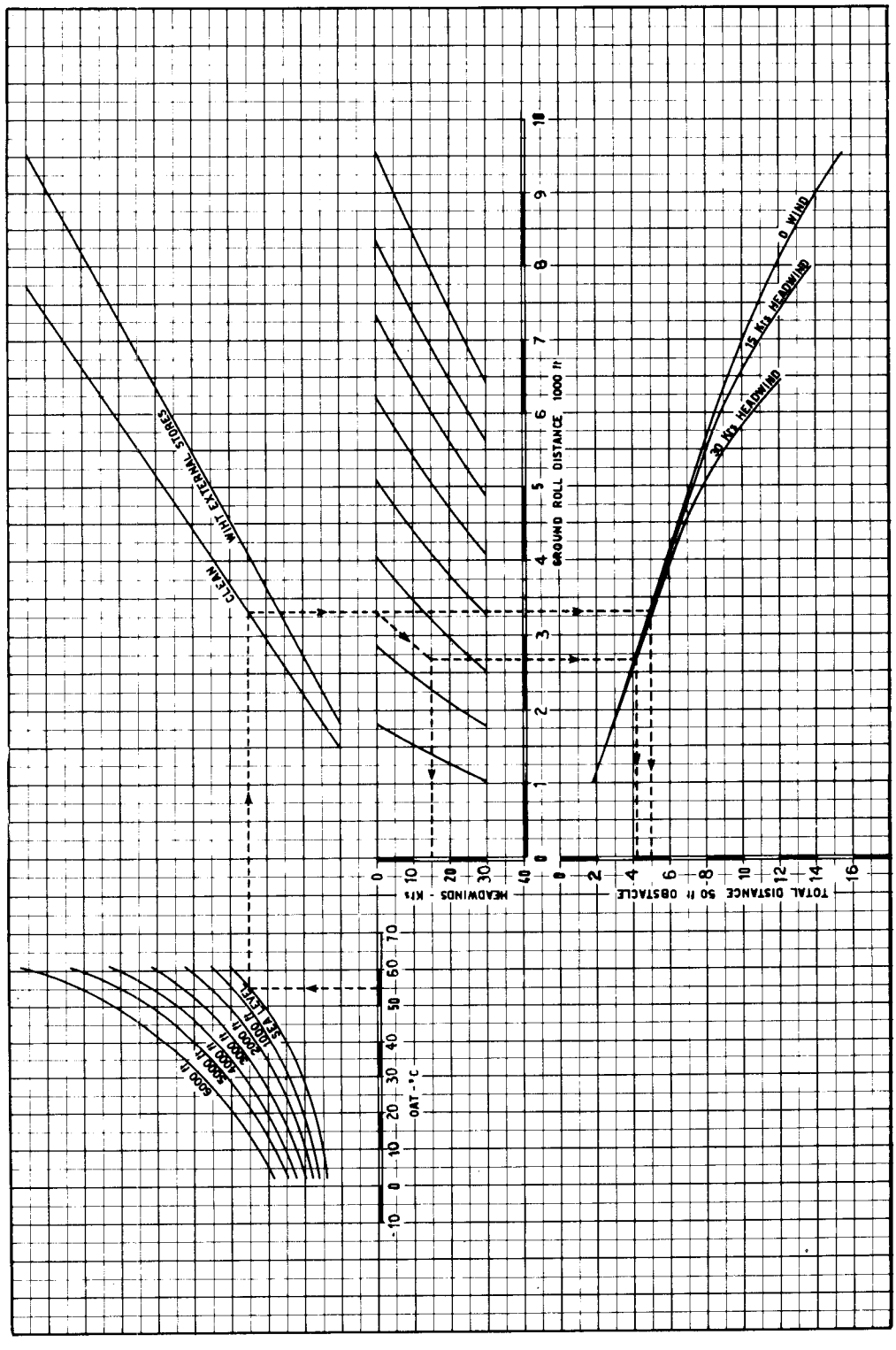
Table 7/2

AIRPLANE MODEL:
FIAT G 91 R/3

ENGINE MODEL:
B.Or. 863 D 11

TAKE-OFF DISTANCES

HARD SURFACE RUNWAY



Data basis: ESTIMATED

Date: JUL 21, 1961

S-0053-1

Table 8

AIRPLANE MODEL:

FIAT G 91 R/3

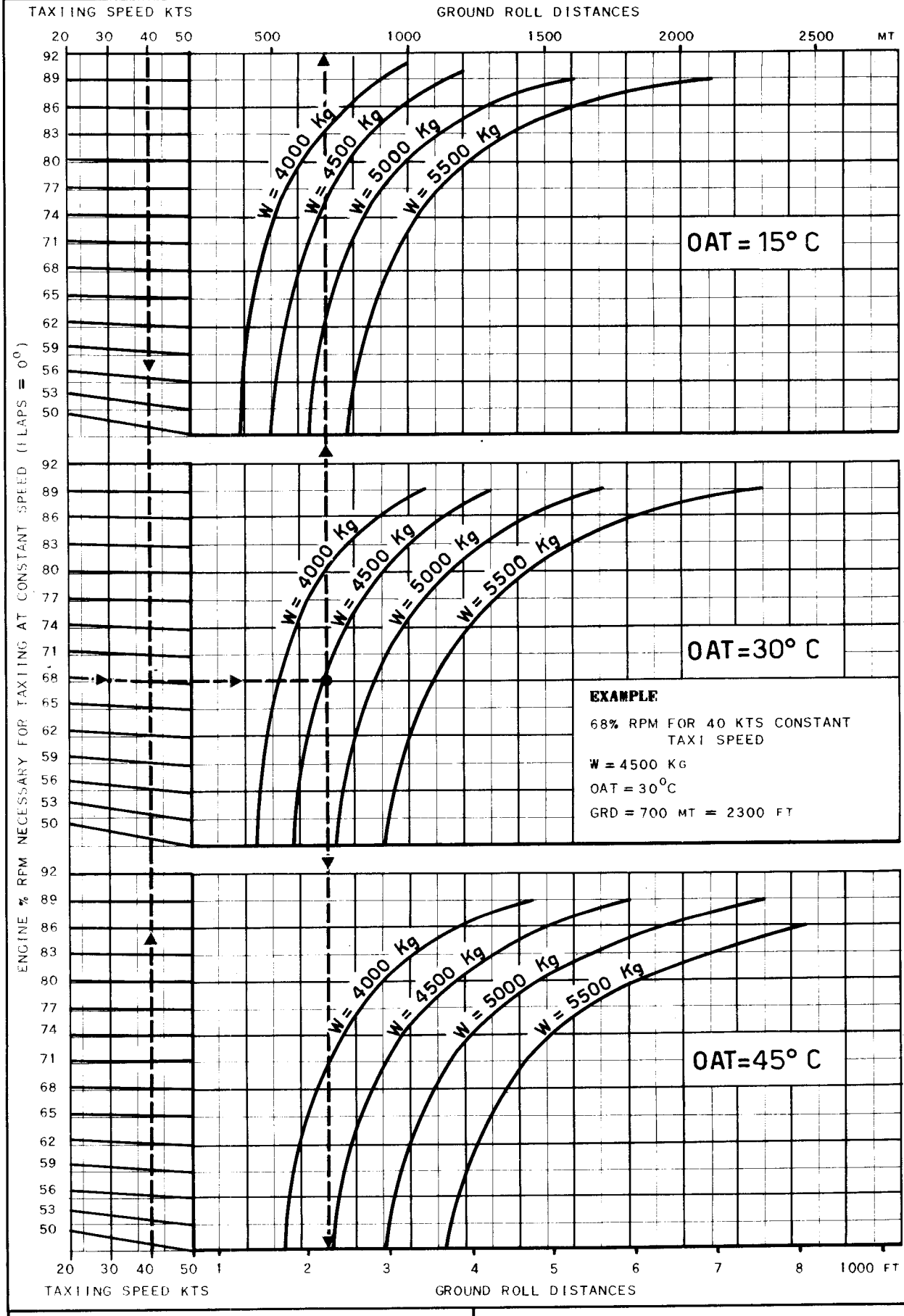
TAKE-OFF DISTANCES

BASED ON RPM FOR TAXIING AT LOW SPEED

Hc = 0 ft *FLAPS = 40*

ENGINE MODEL:

B.Or. 803 D 11



Date: AUG 4, 1961

Data basis: ESTIMATED

S-0054-1

Table 9/1

AIRPLANE MODEL:

FIAT G 91 R/3

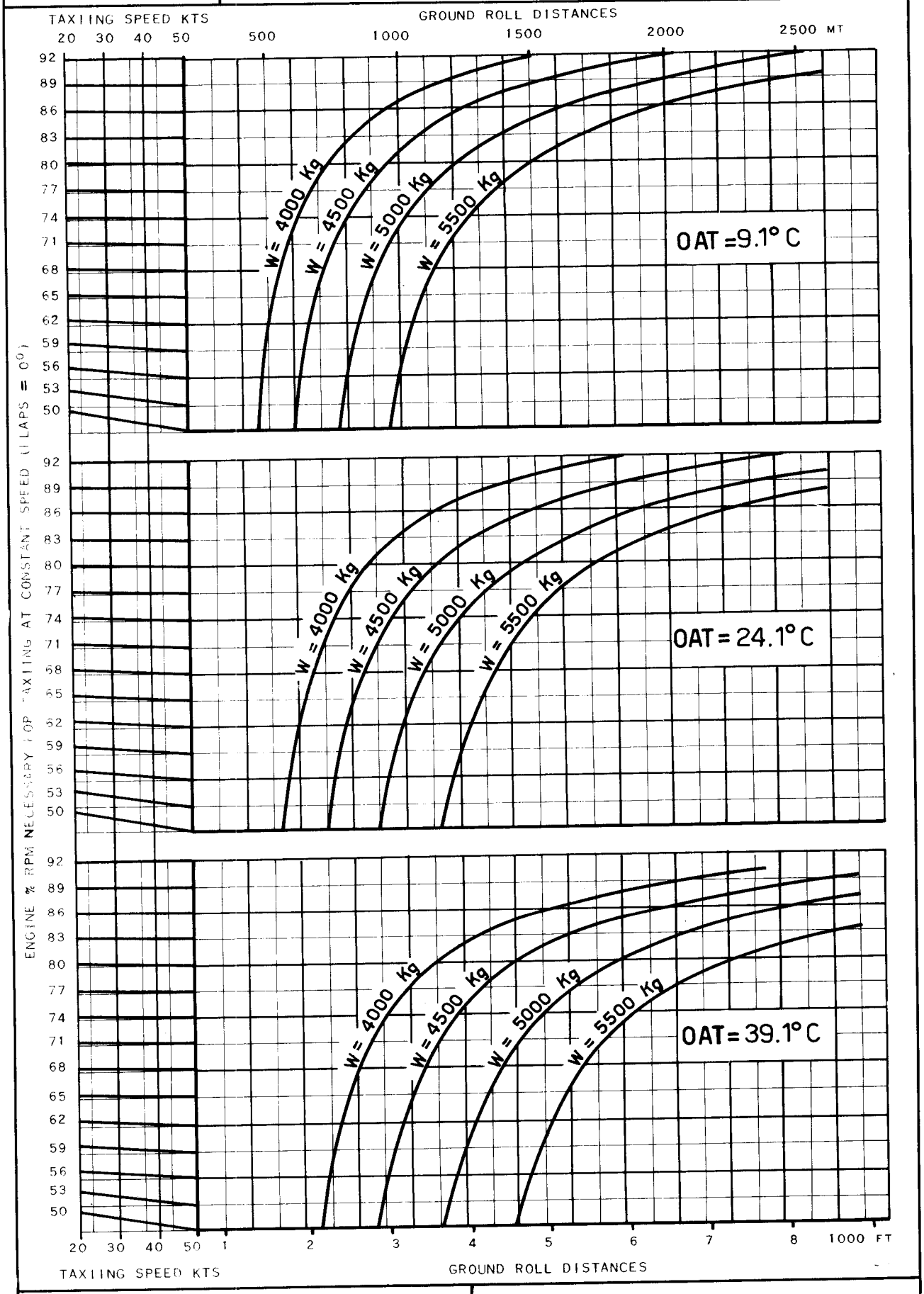
TAKE-OFF DISTANCES

BASED ON RPM FOR TAXIING AT LOW SPEED

Hc = 3000 ft *FLAPS = 40*

ENGINE MODEL:

B.Or. 803 D 11



Date: AUG 4, 1961

Data basis: ESTIMATED

S-0055-1

Table 9/2

AIRPLANE MODEL:

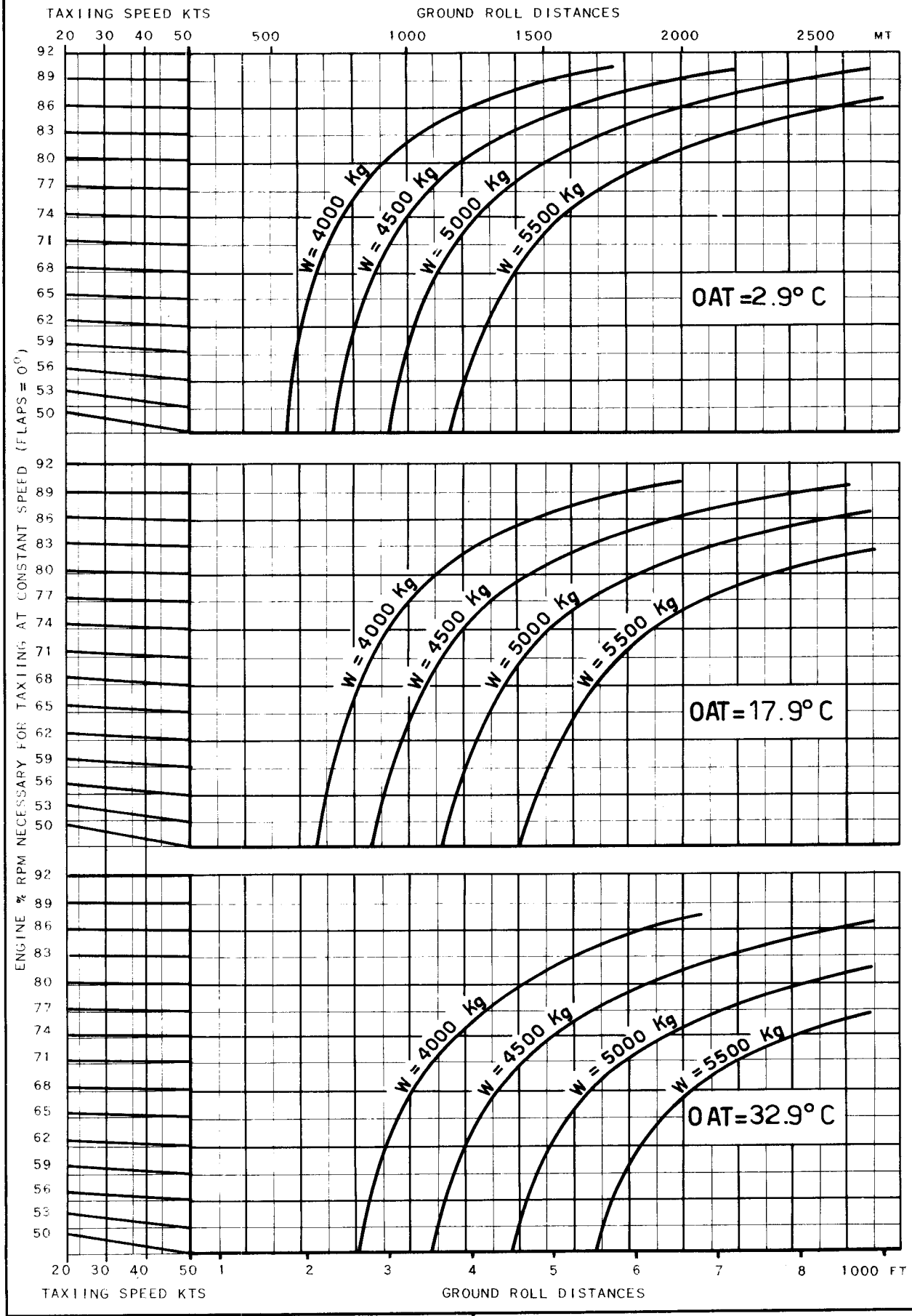
FIAT G 91 R/3

TAKE-OFF DISTANCES

BASED ON RPM FOR TAXIING AT LOW SPEED
Hc = 6000 ft *FLAPS = 40*

ENGINE MODEL:

B.Or. 803 D 11



Date AUG 4, 1961

Data basis: ESTIMATED

S-0056-1

Table 9/3

AIRPLANE MODEL

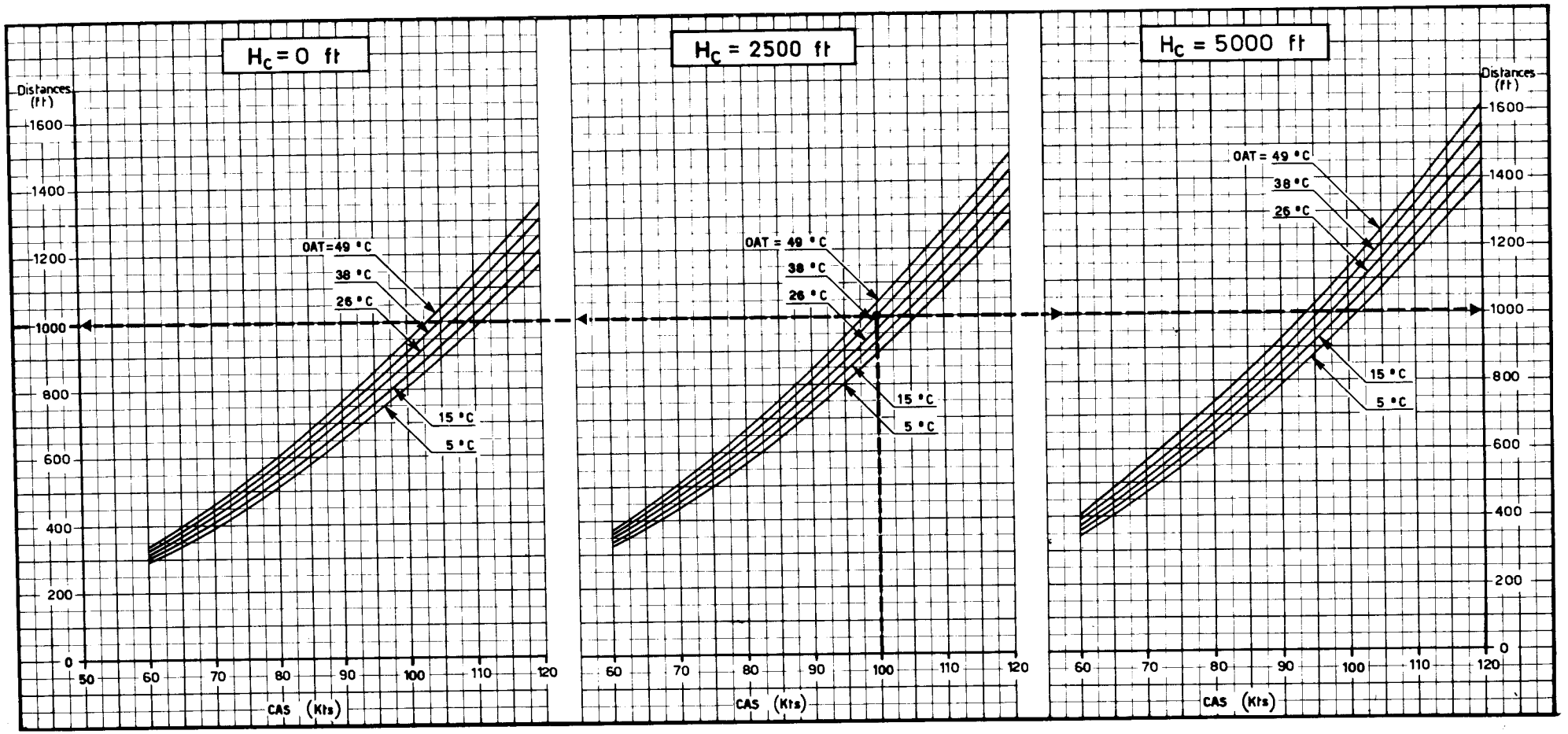
FIAT G 91 R/3

DISTANCE FOR TAKE-OFF REFUSAL

HARD SURFACE RUNWAY

ENGINE MODEL

B.Or. 803 D 11



EXAMPLE: FIELD Hc = 2500 FT; OAT = 38°C; CAS = 100 KTS • DISTANCE FOR TAKE-OFF REFUSAL = 1000 FT

REMARKS: WITH DRAG CHUTE AND FULL BRAKE ACTION

Date: JAN 31, 1961

Data basis: ESTIMATED

Table 10

A-16

S=0057-1

1F-G91(R3)-1

AIRPLANE MODEL:	CLIMB CHART	ENGINE MODEL:
FIAT G 91 R/3	*STANDARD AIR*	B.Or. 803 D 11

TAKE-OFF GROSS WEIGHT: 4900 Kg (10800 lbs) CONFIGURATION: CLEAN C.G = 22.6% M.A.C.	TAKE-OFF GROSS WEIGHT: 5350 Kg (11795 lbs) CONFIGURATION: TWO 260 lt (68.5 U.S.Gall.) TANKS C.G. = 22% M.A.C.

RATE OF CLIMB ft/min.	DISTANCE n.m.	TIME min.	FUEL lbs	CAS Kts	MACH	Hc ft	MACH	CAS Kts	FUEL lbs	TIME min.	DISTANCE n.m.	RATE OF CLIMB ft/min.
7500	0	0	200*	420	0.64	Seal level	0 54	360	200*	0	0	6900
7000	8	2.2	280	410	0.67	5000	0.57	350	275	2.2	8	6300
6400	16	3	355	380	0.68	10000	0 59	330	350	3.1	16	5700
5700	24	3.8	410	350	0.69	15000	0.61	310	410	4	24	5000
5000	31	4.7	460	325	0.7	20000	0.63	290	470	5.2	32	4300
4250	39	5.7	515	300	0.72	25000	0.65	270	545	6.3	40	3500
3400	47	7.2	570	270	0.72	30000	0 67	250	620	8	48	2750
2500	55	8.8	625	240	0.72	35000	0.69	230	695	9 9	56	1900
1600	63	10.6	680	215	0.72	40000	-	-	-	-	-	-

* *Allowance for start, taxi, take-off and acceleration to climb speed.*

Date: AUG 8, 1961	Data basis: ESTIMATED

Table 11

S-0058

AIRPLANE MODEL: FIAT G 91 R/3

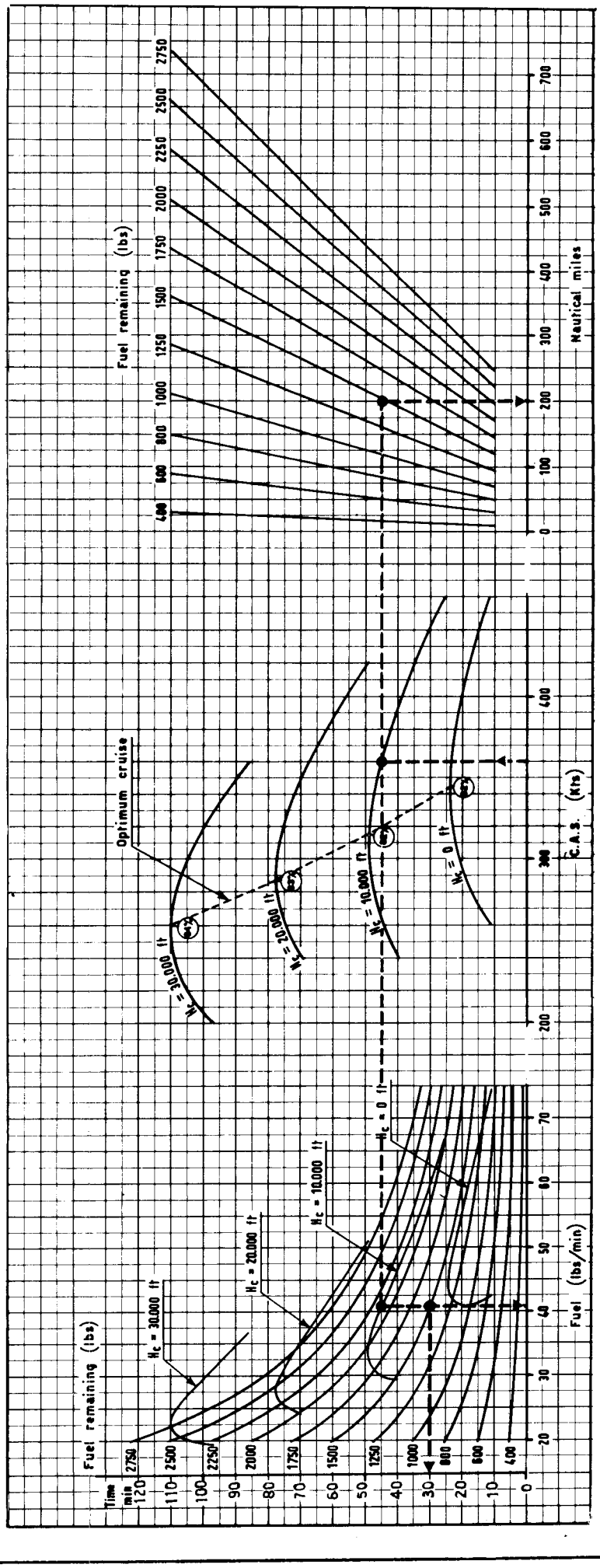
ENGINE MODEL: B.Or. 803 D 11

CRUISE CHART

PERFORMANCE IN LEVEL FLIGHT

CONFIGURATION: CLEAN

MAXIMUM FUEL: 2680 lbs



EXAMPLE: CAS = 360 KTS
HC = 10000 FT

FUEL REMAINING = 1500 LBS
CONFIGURATION = CLEAN

DISTANCE COVERED = 200 N.MI.
TIME = 30 MIN
FUEL SPECIFIC CONSUMPTION = 41 LBS/MIN

REMARKS: RANGES AND TIMES ARE GIVEN LEAVING A 300 LBS FUEL RESERVE FOR APPROACH AND LANDING.

Date: JUL 28, 1961

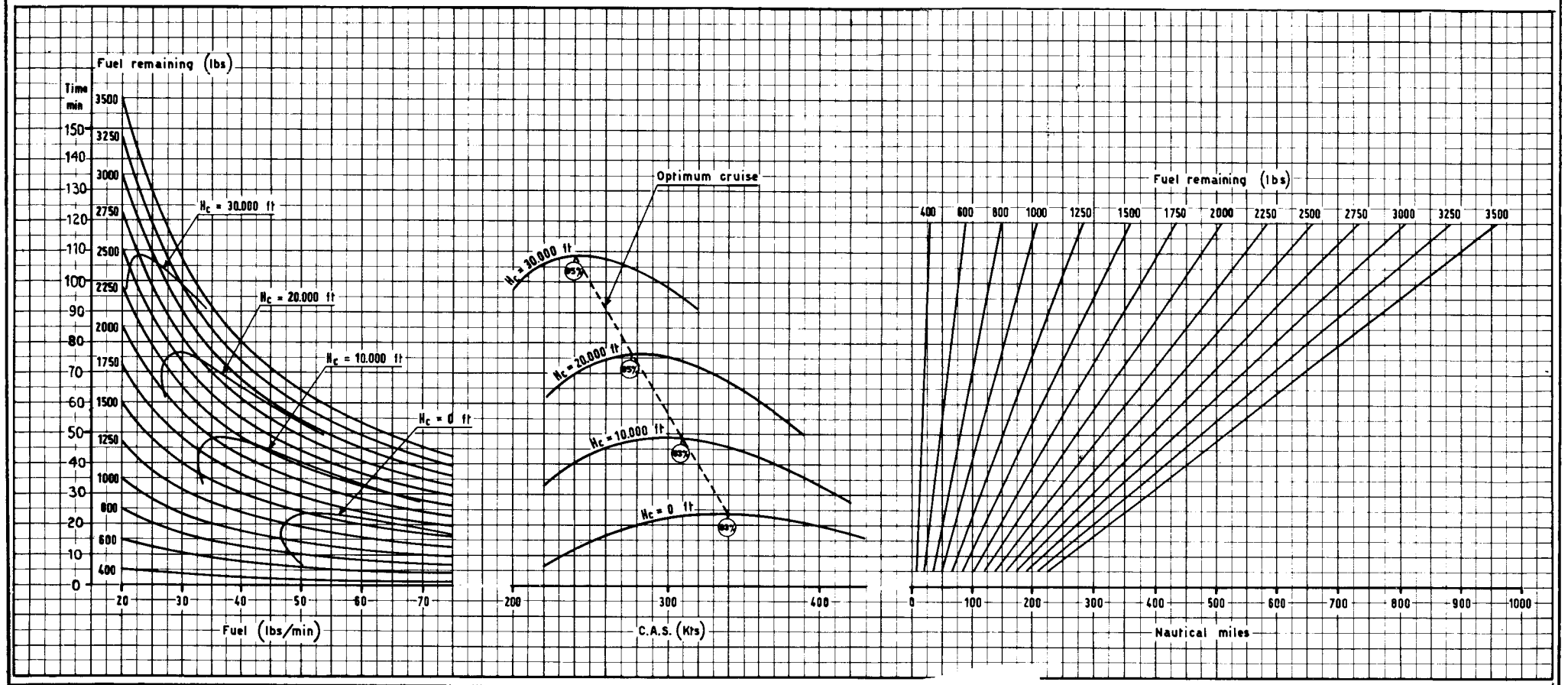
Data basis: ESTIMATED

S-0059-1

Table 12/1

AIRPLANE MODEL:	CRUISE CHART	ENGINE MODEL:
FIAT G 91 R/3	*PERFORMANCE IN LEVEL FLIGHT*	B.Or. 803 D 11

CONFIGURATION: TWO 260 lt EXTERNAL TANKS **MAXIMUM FUEL: 3550 lbs**



REMARKS: RANGES AND TIMES ARE GIVEN LEAVING A 300 LBS FUEL RESERVE APPROACH AND LANDING.

Date: JUL 24, 1961	Data basis: ESTIMATED

AIRPLANE MODEL: FIAT G 91 R/3

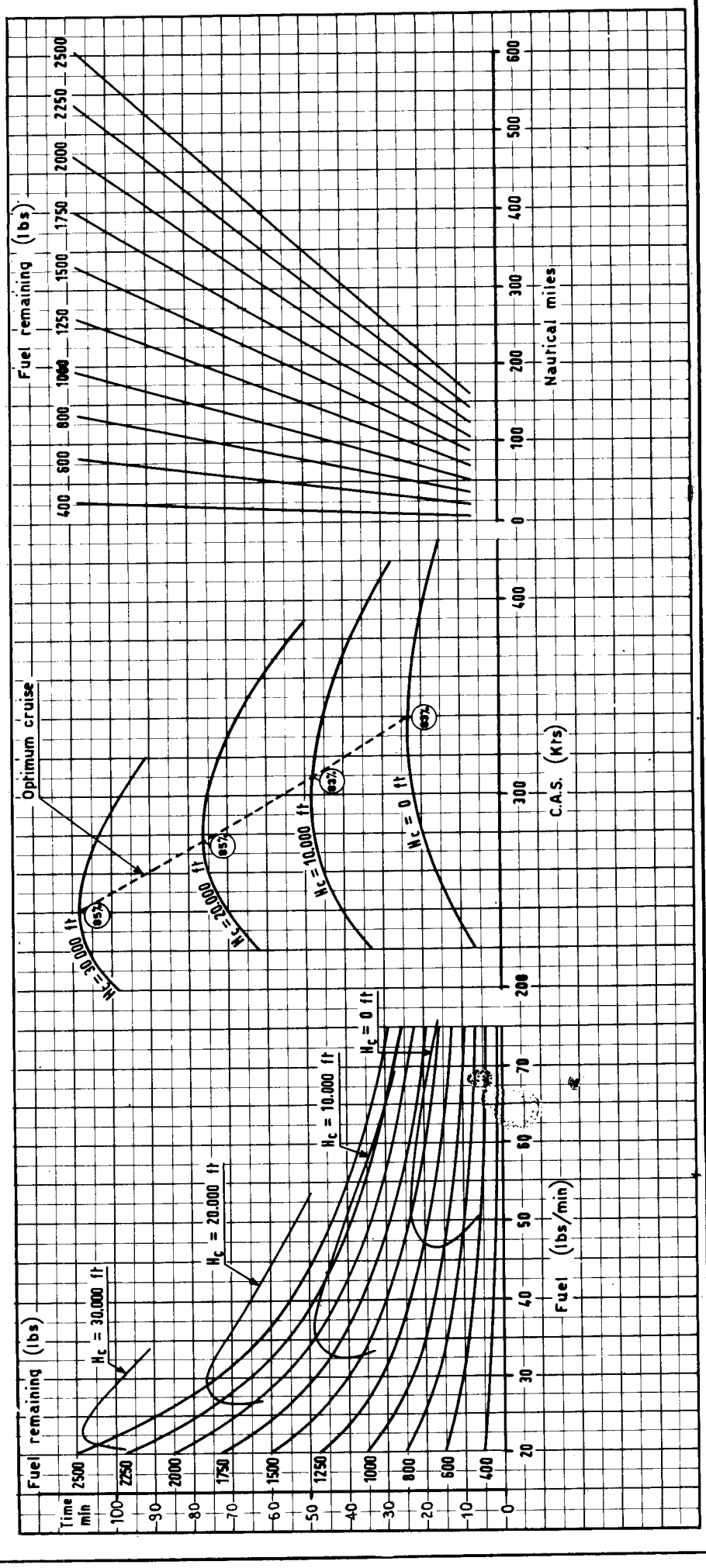
ENGINE MODEL: B.Or. 803 D 11

CRUISE CHART

PERFORMANCE IN LEVEL FLIGHT

CONFIGURATION: TWO 500 lbs BOMBS

MAXIMUM FUEL: 2680 lbs



REMARKS: RANGES AND TIMES ARE GIVEN LEAVING A 300 LBS FUEL RESERVE FOR APPROACH AND LANDING.

Data basis: ESTIMATED

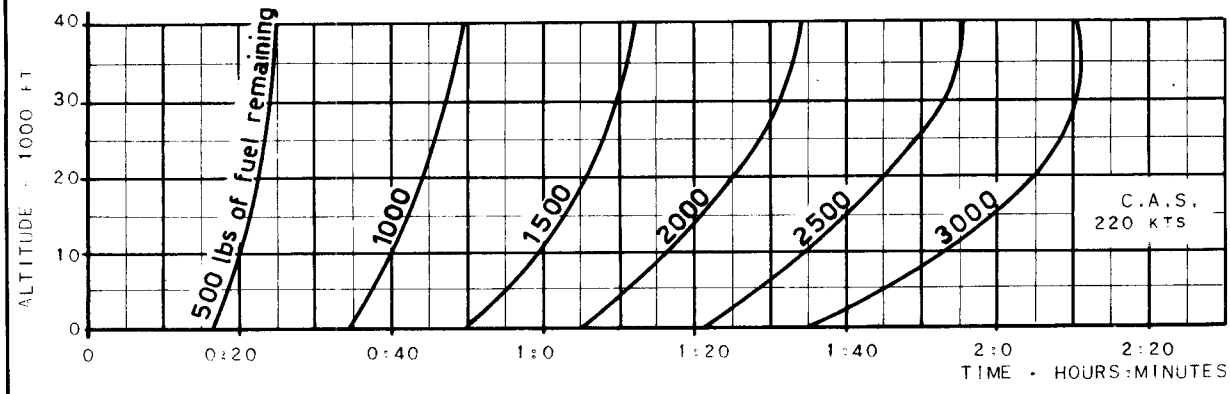
Date: JUL 28, 1961

S-0061-1

Table 12/3

AIRPLANE MODEL:	MAXIMUM ENDURANCE	ENGINE MODEL:
FIAT G 91 R/3	*TAKE-OFF GROSS WEIGHT 5350 Kg (11795 lbs)*	B.Or. 803 D 11

CONFIGURATION: TWO 260 lt (68.5 U.S.Gall.) EXTERNAL TANKS



REMARKS: 1) LOITER AT RECOMMENDED C.A.S.
2) MAINTAIN CONSTANT ALTITUDE

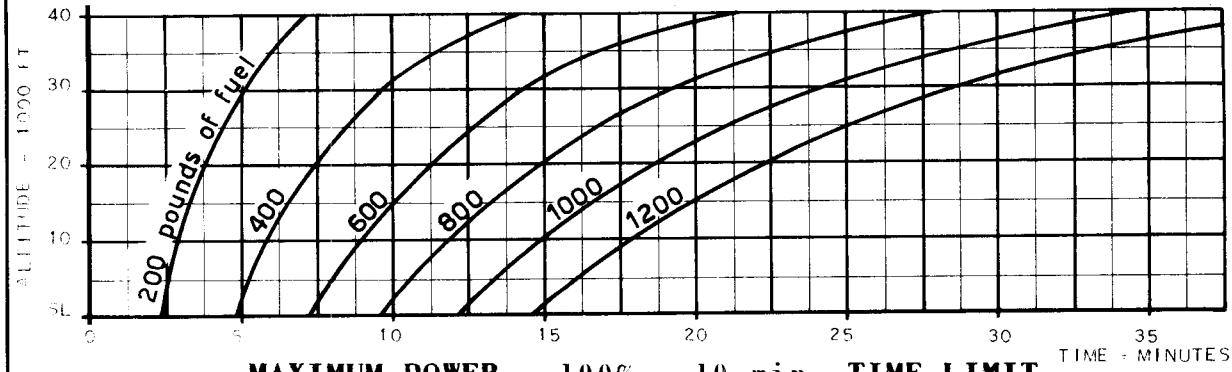
Date: AUG 8, 1961	Data basis: ESTIMATED

S-0062

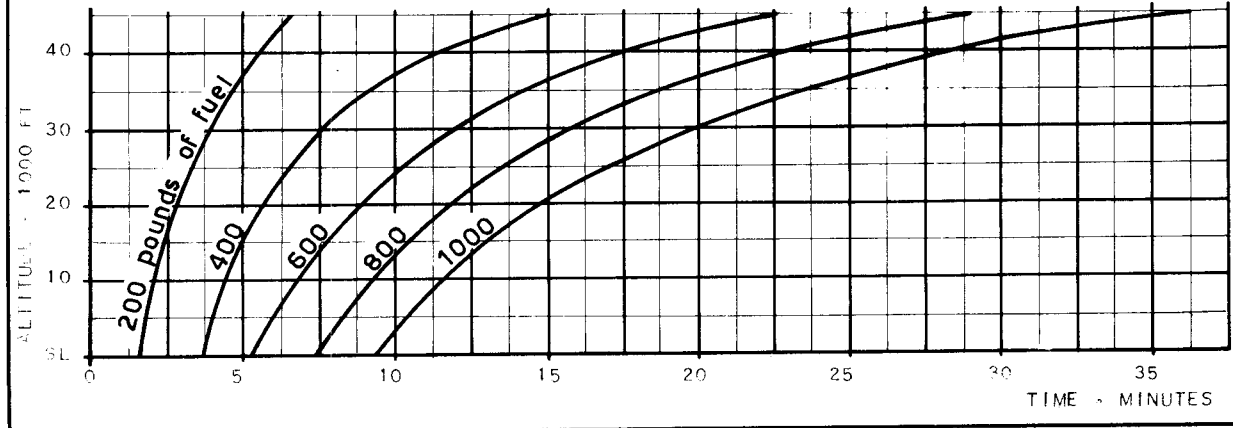
Table 13

AIRPLANE MODEL:	COMBAT ALLOWANCE	ENGINE MODEL:
FIAT G 91 R/3		B Or. 803 D 11

NORMAL POWER - 94% RPM - NO TIME LIMIT



MAXIMUM POWER - 100% - 10 min. TIME LIMIT



Date: AUG 8, 1961	Data basis: ESTIMATED

S-0063

Table 14

AIRPLANE MODEL:

FIAT G 91 R/3

MISSION PROFILE

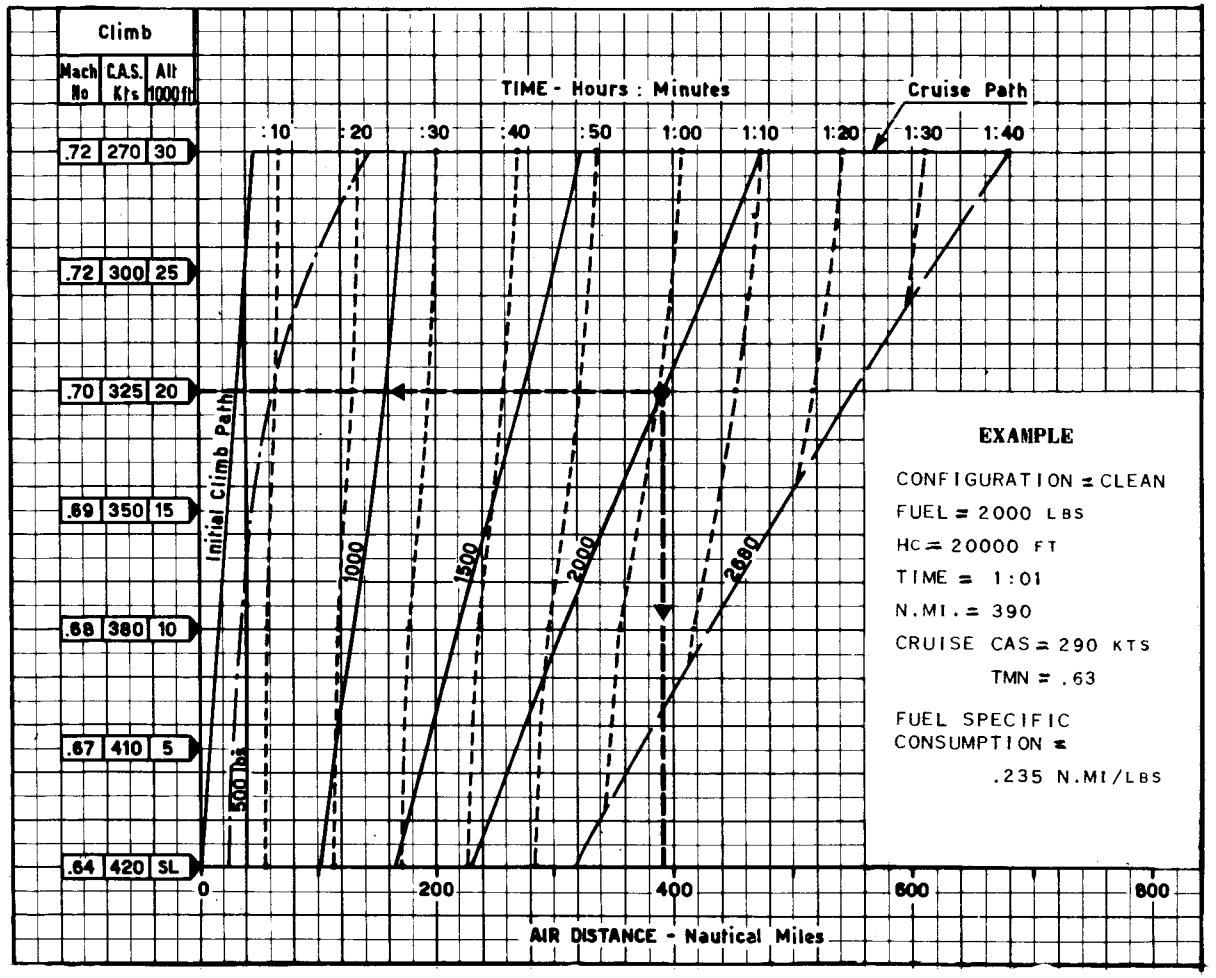
TAKE-OFF GROSS WEIGHT: 10800 lbs

CONFIGURATION: CLEAN

ENGINE MODEL:

B.Or. 803 D 11

FUEL: Max 2680 lbs; Grade JP4; Density 6.3 lbs/gall



CODE:

- LINE OF BEST RANGE FOR CONSTANT-ALTITUDE FLIGHT
- CLIMB - CRUISE PATH
- ZERO FUEL REMAINING
- FUEL CONSUMED
- TIME (START, TAXI AND TAKE-OFF NOT INCLUDED)

REMARKS:

1) FUEL ALLOWANCE FOR START, TAXI AND TAKE-OFF 200 LBS INCLUDED
2) NO ALLOWANCE OR RESERVE MADE FOR LOITER, DESCENT OR LANDING
3) FOR CLIMB (SEE CLIMB CHART FOR DETAILER INFORMATION)
4) FOR CRUISE PROCEDURE:

CRUISE				
Altitude feet	**Mach No.**	**C.A.S. Kts**	**T.A.S. Kts**	**N.M/lb**
30.000	.69	260	410	0.300
20.000	.63	290	385	0.235
10.000	.56	310	355	0.178
SEA LEVEL	.52	345	345	0.128

Date: JUL 28, 1961

Data basis: ESTIMATED

Table 15/1

S-0064-1

A-22

1F-G91(R3)-1

AIRPLANE MODEL:

FIAT G 91 R/3

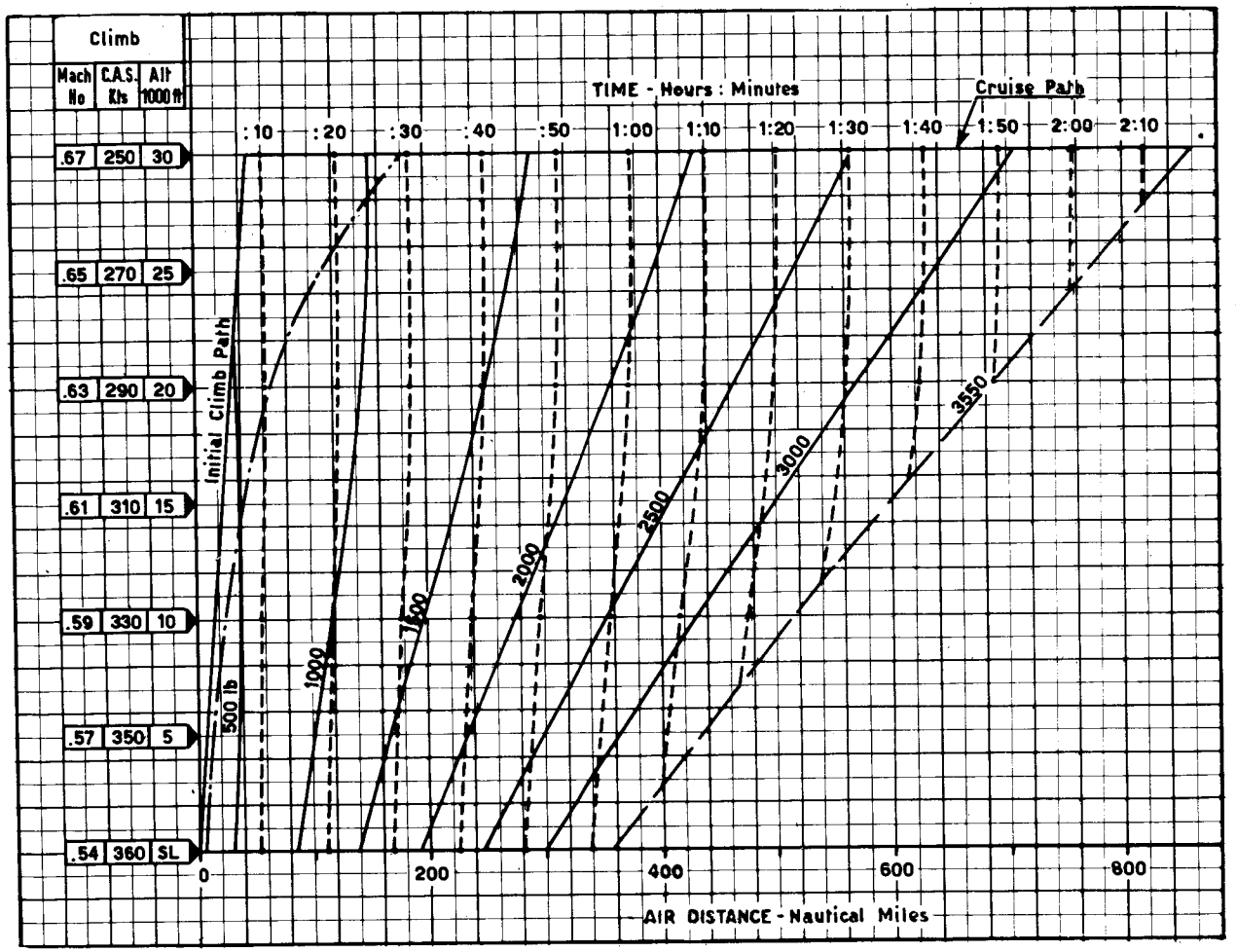
MISSION PROFILE

TAKE-OFF GROSS WEIGHT: 11800 lbs
CONFIGURATION: TWO 260 lt EXTERNAL TANKS

ENGINE MODEL:

B.Or. 803 D 11

FUEL: Max 3550 lbs; Grade JP4; Density 6.3 lbs/gall



CODE:

- LINE OF BEST RANGE FOR CONSTANT-ALTITUDE FLIGHT
- CLIMB - CRUISE PATH
- ZERO FUEL REMAINING
- FUEL CONSUMED
- TIME (START, TAXI AND TAKE-OFF NOT INCLUDED)

REMARKS:

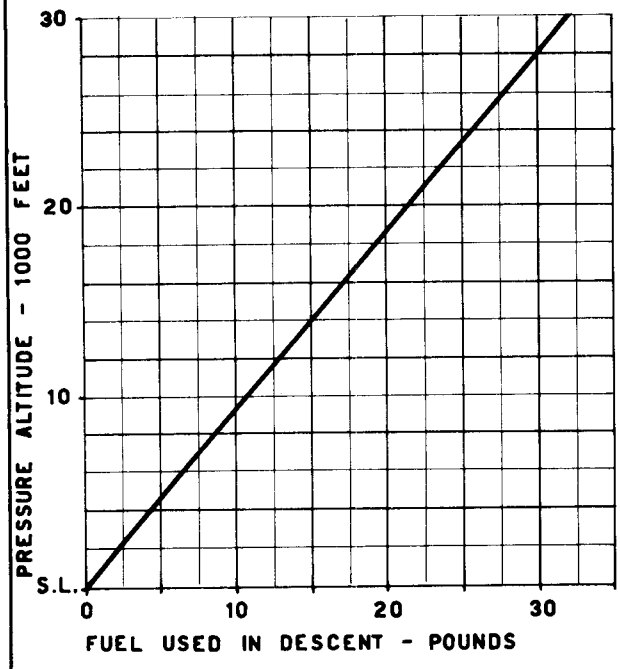
1) FUEL ALLOWANCE FOR START, TAXI AND TAKE-OFF 200 LBS INCLUDED
2) NO ALLOWANCE OR RESERVE MADE FOR LOITER, DESCENT OR LANDING
3) FOR CLIMB (SEE CLIMB CHART FOR DETAILED INFORMATION)
4) FOR CRUISE PROCEDURE:

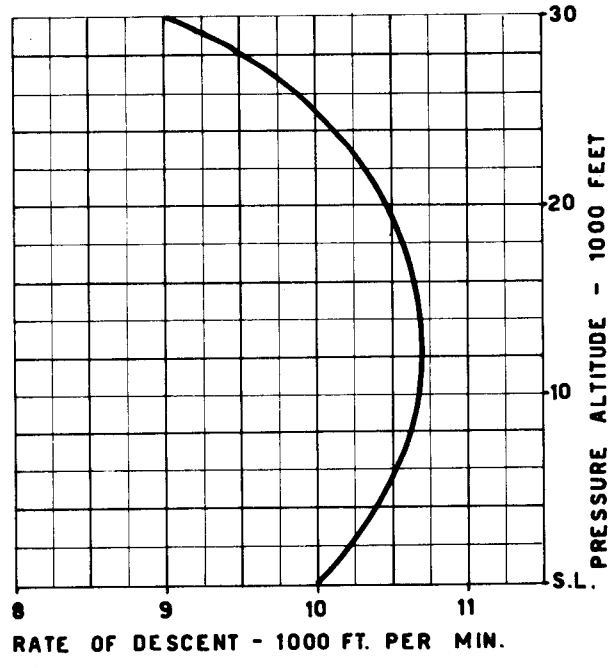
CRUISE				
Altitude feet	**Mach No.**	**C.A.S. Kts**	**T.A.S. Kts**	**N.M/lb**
30.000	.64	240	380	0.277
20.000	.61	280	375	0.213
10.000	.56	310	345	0.157
SEA LEVEL	.51	340	340	0.107

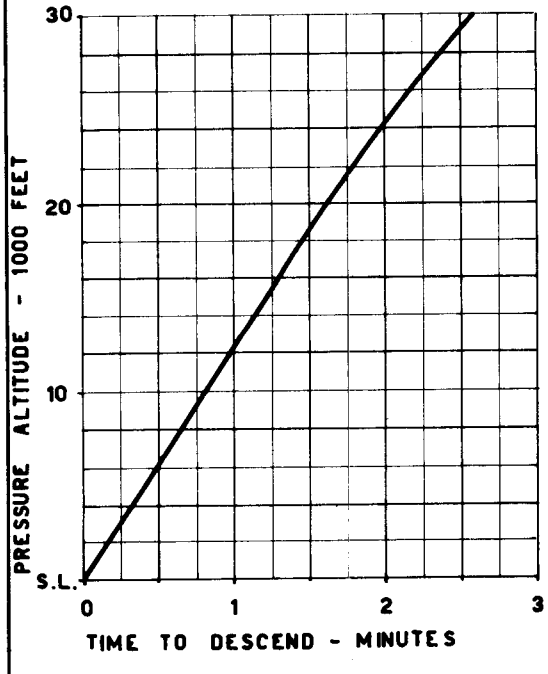
Date: JUL 28, 1961

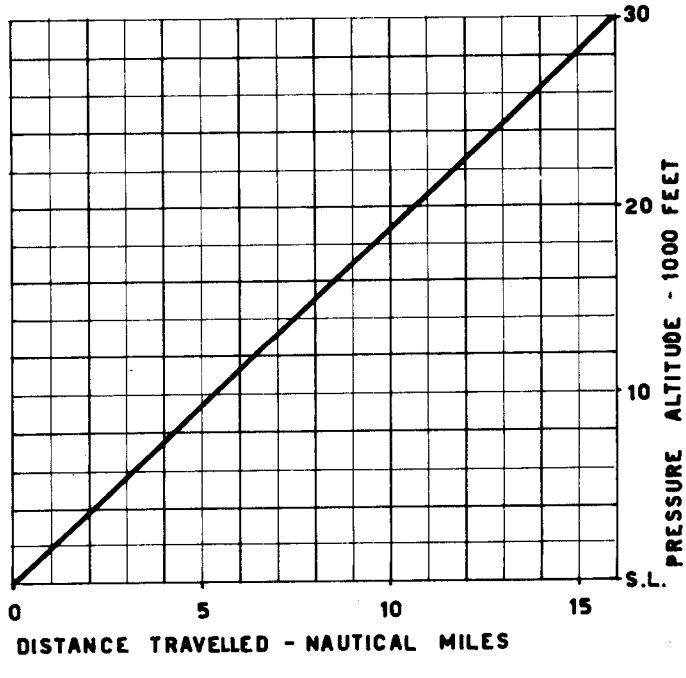
Data basis: ESTIMATED

AIRPLANE MODEL:	DESCENT	ENGINE MODEL:
FIAT G 91 R/3	*LANDING GEAR "UP"* *SPEED BRAKES "IN"*	B.Or. 803 D 11









REMARK:

RECOMMENDED CAS = 250 KTS

Date: JUL 28, 1961	Data basis: ESTIMATED

S-0066-1

Table 16

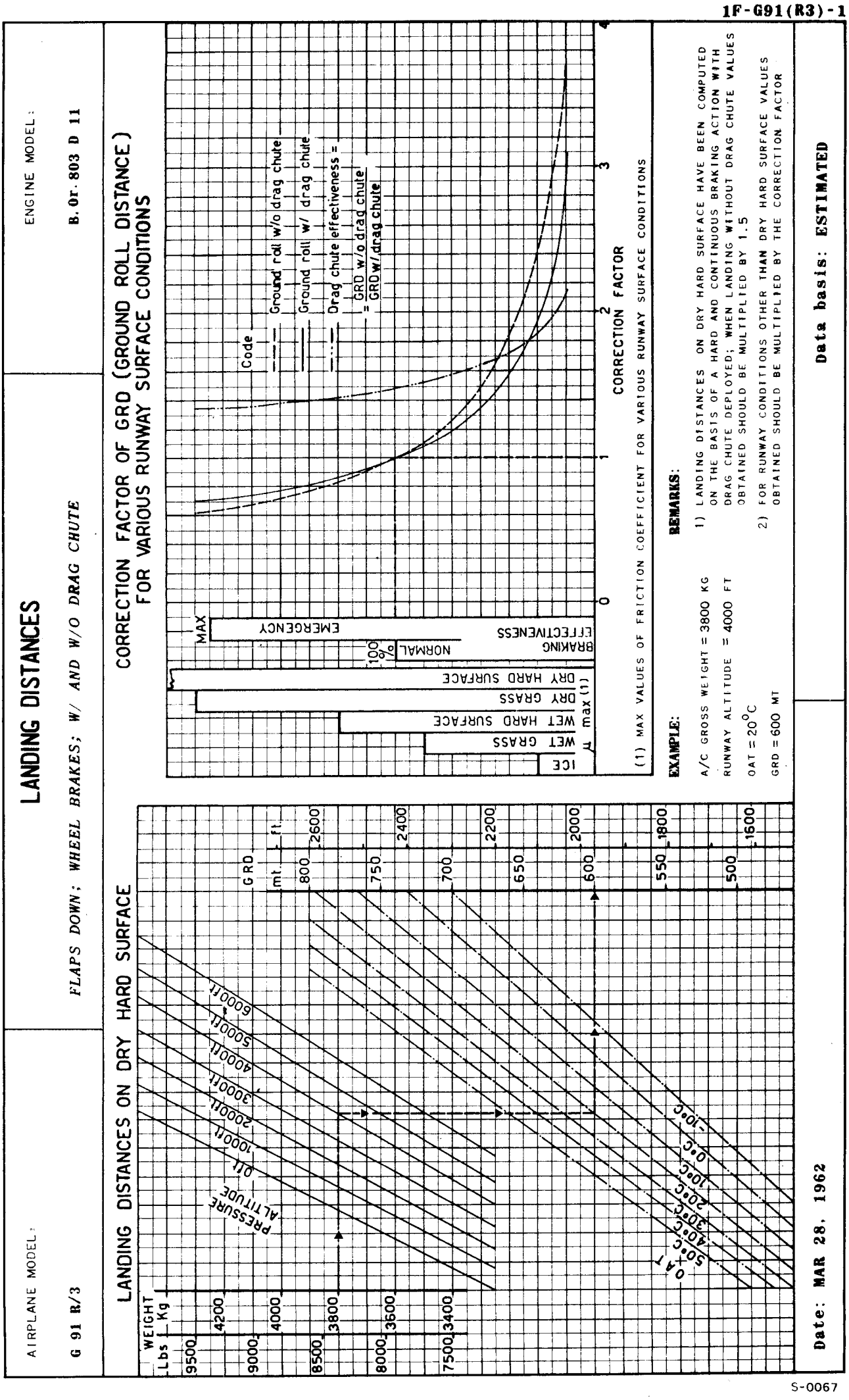

AIRPLANE MODEL:
G 91 R/3
LANDING DISTANCES
FLAPS DOWN; WHEEL BRAKES; W/ AND W/O DRAG CHUTE
ENGINE MODEL:
B. Or. 803 D 11
CORRECTION FACTOR OF GRD (GROUND ROLL DISTANCE) FOR VARIOUS RUNWAY SURFACE CONDITIONS
Code
Ground roll w/o drag chute
Ground roll w/ drag chute
Drag chute effectiveness = GRD w/o drag chute / GRD w/ drag chute
BRAKING EFFECTIVENESS
NORMAL
EMERGENCY
MAX
100 %
ICE
WET GRASS
WET HARD SURFACE
DRY GRASS
DRY HARD SURFACE
μ max (1)
CORRECTION FACTOR
(1) MAX VALUES OF FRICTION COEFFICIENT FOR VARIOUS RUNWAY SURFACE CONDITIONS
REMARKS:
1) LANDING DISTANCES ON DRY HARD SURFACE HAVE BEEN COMPUTED ON THE BASIS OF A HARD AND CONTINUOUS BRAKING ACTION WITH DRAG CHUTE DEPLOYED; WHEN LANDING WITHOUT DRAG CHUTE VALUES OBTAINED SHOULD BE MULTIPLIED BY 1.5
2) FOR RUNWAY CONDITIONS OTHER THAN DRY HARD SURFACE VALUES OBTAINED SHOULD BE MULTIPLIED BY THE CORRECTION FACTOR
EXAMPLE:
A/C GROSS WEIGHT = 3800 KG
RUNWAY ALTITUDE = 4000 FT
OAT = 20°C
GRD = 600 MT
LANDING DISTANCES ON DRY HARD SURFACE
WEIGHT Lbs Kg
PRESSURE ALTITUDE
OAT
GRD mt ft
Date: MAR 28, 1962
Data basis: ESTIMATED
S-0067

Table 17