USAF SERIES

T-38A

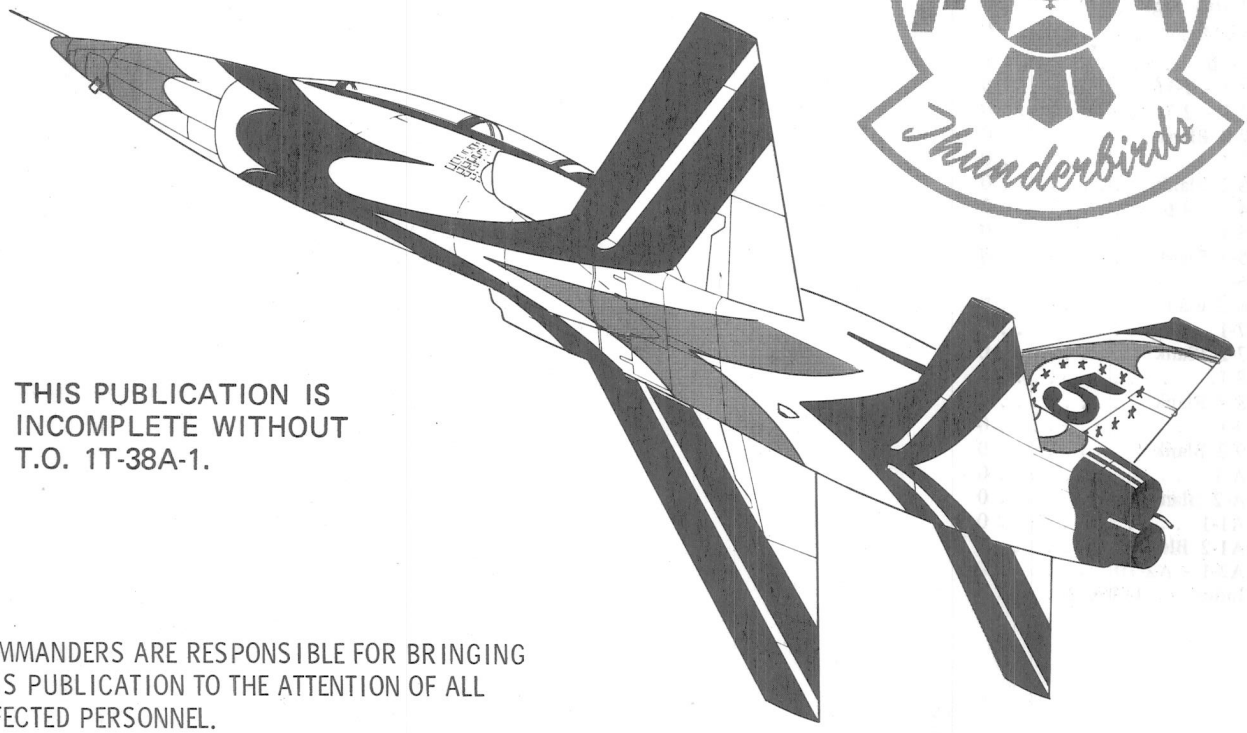
AIRCRAFT

FLIGHT OPERATING DIFFERENCE/SUPPLEMENTAL DATA

F41608-73-D-6565

THIS PUBLICATION REPLACES PRELIMINARY T.O. 1T-38A-1-2 DATED 1 JUNE 1974 AND INTERIM OPERATIONAL SUPPLEMENT -2S-1.

SEE TECHNICAL ORDER INDEX T.O. 0-1-1-5 AND SUPPLEMENTS THERETO FOR CURRENT STATUS OF TRAINER AIRCRAFT FLIGHT MANUALS, SAFETY AND OPERATIONAL SUPPLEMENTS, AND FLIGHT CREW CHECKLISTS.



THIS PUBLICATION IS INCOMPLETE WITHOUT T.O. 1T-38A-1.

COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS PUBLICATION TO THE ATTENTION OF ALL AFFECTED PERSONNEL.

THUNDERBIRD CONFIGURATION

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

T-38A (TB) 1-1B

1 SEPTEMBER 1974

LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 64, CONSISTING OF THE FOLLOWING:

Page No.	#Change No.	Page No.	#Change No.	Page No.	#Change No.
Title	0				
A	0				
Status Page	0				
Blank	0				
i - ii	0				
1-1 - 1-16	0				
2-1 - 2-7	0				
2-8 Blank	0				
3-1	0				
3-2 Blank	0				
4-1 - 4-6	0				
5-1	0				
5-2 Blank	0				
6-1	0				
6-2 Blank	0				
7-1	0				
7-2 Blank	0				
8-1	0				
8-2 Blank	0				
9-1	0				
9-2 Blank	0				
A-1	0				
A-2 Blank	0				
A1-1	0				
A1-2 Blank	0				
A2-1 - A2-10	0				
Index 1 - Index 2	0				

#Zero in this column indicates an original page.

*The asterisk indicates pages changed, added or deleted by current change.

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

USAF ACTIVITIES. – In accordance with T.O. 00-5-2.
NAVY ACTIVITIES. – In accordance with T.O. 00-5-2 and submitted to OCAMA.

FLIGHT MANUAL AND SUPPLEMENT STATUS

This page is published with each Safety and Operational Supplement, Flight Manual Change, and Flight Manual Revision. It provides a comprehensive listing of the current Flight Manual, Flight Crew Checklist, Safety Supplements, and Operational Supplements. The supplements you receive should follow in sequence. If you are missing one listed on this page, see your Publications Distribution Officer and get your copy. Periodically check Numerical Index T.O. 0-1-1-5, and supplements thereto, to make sure you have the latest supplements, checklist, and basic manual.

This supplement status page will be replaced by the supplement status page received with the latest formal safety or operational supplement.

Current Flight Manual	Date	Change
T.O. 1T-38A-1	1 Jan 72	3–1 Dec 74
T.O. 1T-38A-1-2	1 Sep 74	

Current Flight Crew Checklist	Date	Change
T.O. 1T-38A-1CL-1	1 Dec 74	

OUTSTANDING SAFETY SUPPLEMENTS

Number	Date	Short Title	Flight Manual Section Affected
None			

SAFETY SUPPLEMENTS INCORPORATED IN THIS ISSUE

None

RESCINDED, OR REPLACED SAFETY SUPPLEMENTS

None

OUTSTANDING OPERATIONAL SUPPLEMENTS

Number	Date	Short Title	Flight Manual Section Affected
None			

OPERATIONAL SUPPLEMENTS INCORPORATED IN THIS ISSUE

2S-1 (Int)	5 Jul 74	Operating Limitiations	II,V

RESCINDED, OR REPLACED OPERATIONAL SUPPLEMENTS

Number	Date
None	

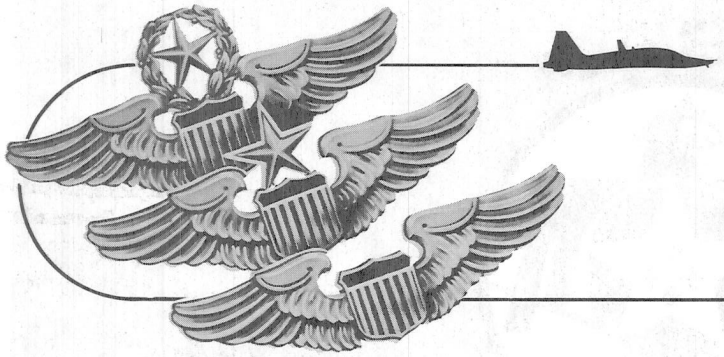


TABLE OF CONTENTS

* REFER TO BASIC FLIGHT MANUAL, T.O. 1T-38A-1.

SCOPE. This manual supplements T.O. 1T-38A-1 Flight Manual to provide difference/supplemental data between standard T-38A and the T-38A Flight Demonstration Aircraft. The format contained in this supplement is the same format contained in T.O. 1T-38A-1 Flight Manual; however, only those systems, equipment, procedures, and performance data that are different are presented.

The Air Force serial numbers of the aircraft covered in this manual are as follows:

AF68-8100
AF68-8106
AF68-8131
AF68-8156
AF68-8174
AF68-8175
AF68-8176
AF68-8177
AF68-8184

DESCRIPTION

SECTION I

T-38A (TB) 1-23

TABLE OF CONTENTS

THE AIRCRAFT.

The Thunderbird T-38A flight demonstration aircraft is a modified version of the standard Air Force T-38A trainer aircraft. The aircraft have been repainted with a distinctive external paint design. Two aircraft have a modified vertical stabilizer tip with the VOR/localizer antenna removed from the cap of the vertical stabilizer and relocated in the canopy of the front cockpit. A smoke generating system and a cross-bleed engine start system have been added. A T_2 heater system has been added to enhance engine stability. Other changes include the addition of VHF communications and a VHF navigation system. Communication and navigation controls in the rear cockpit have been deactivated, and the angle-of-attack and anti-G suit systems have been removed. The nosewheel steering system has been modified to incorporate a nosewheel steering hold function. The demonstration aircraft have an increased horizontal trim authority over the standard T-38A aircraft with an added trim indicator on the front cockpit instrument panel. Provisions have been made for removal of the rear cockpit control stick. The landing gear audible warning signal has been deactivated. An MXU recorder has been installed in two aircraft. The instrument panels, subpanels, consoles, and pedestals in both cockpits have been rearranged, modified, or have had equipment removed in order to accomodate additional equipment. Refer to figures 1-2 and 1-9. To prevent oil draining during inverted flight a closed loop oil system has been installed.

AIRCRAFT GROSS WEIGHT.

The average gross weight of the aircraft for show configuration (fuel and oil for smoke system) and single aircrew is 11,900 pounds. The average gross weight of the aircraft for ferry configuration (fully fueled), including two aircrew, is 12,065 pounds.

ENGINES.

A T_2 heater system has been incorporated to help minimize the occurrence of compressor stalls.

ENGINE START AND IGNITION SYSTEM.

The aircraft uses a single-point, external, low pressure air source for initial motoring of the engine during ground start. The external air inlet is in the underside of the fuselage aft section. A manually operated diverter valve, mounted on the left engine, is externally positioned by the ground crew to direct the flow of air to the selected engine during the start sycle. Two engine start buttons (figures 1-6, 1-7) are located on the left subpanel of each cockpit. External ac power for starting either engine, allowing monitoring of the left and right engine instruments, is furnished by the electrical external power unit. Momentarily pressing the start button for the selected engine arms the ignition circuit and allows the ignition timer to run for approximately 30 seconds. The circuit is completed by moving the throttle to the IDLE position, causing the main and afterburner igniters to fire to start the engine. A battery-powered static inverter, activated by the start button, provides ignition power for starting either engine on the ground when ac external power is not available. The static inverter also acts as a standby source of power for airstart of either engine in case of dual engine flameout. For engine starts without ac power, it is recommended that the left engine be started first, since

GENERAL ARRANGEMENT DIAGRAM

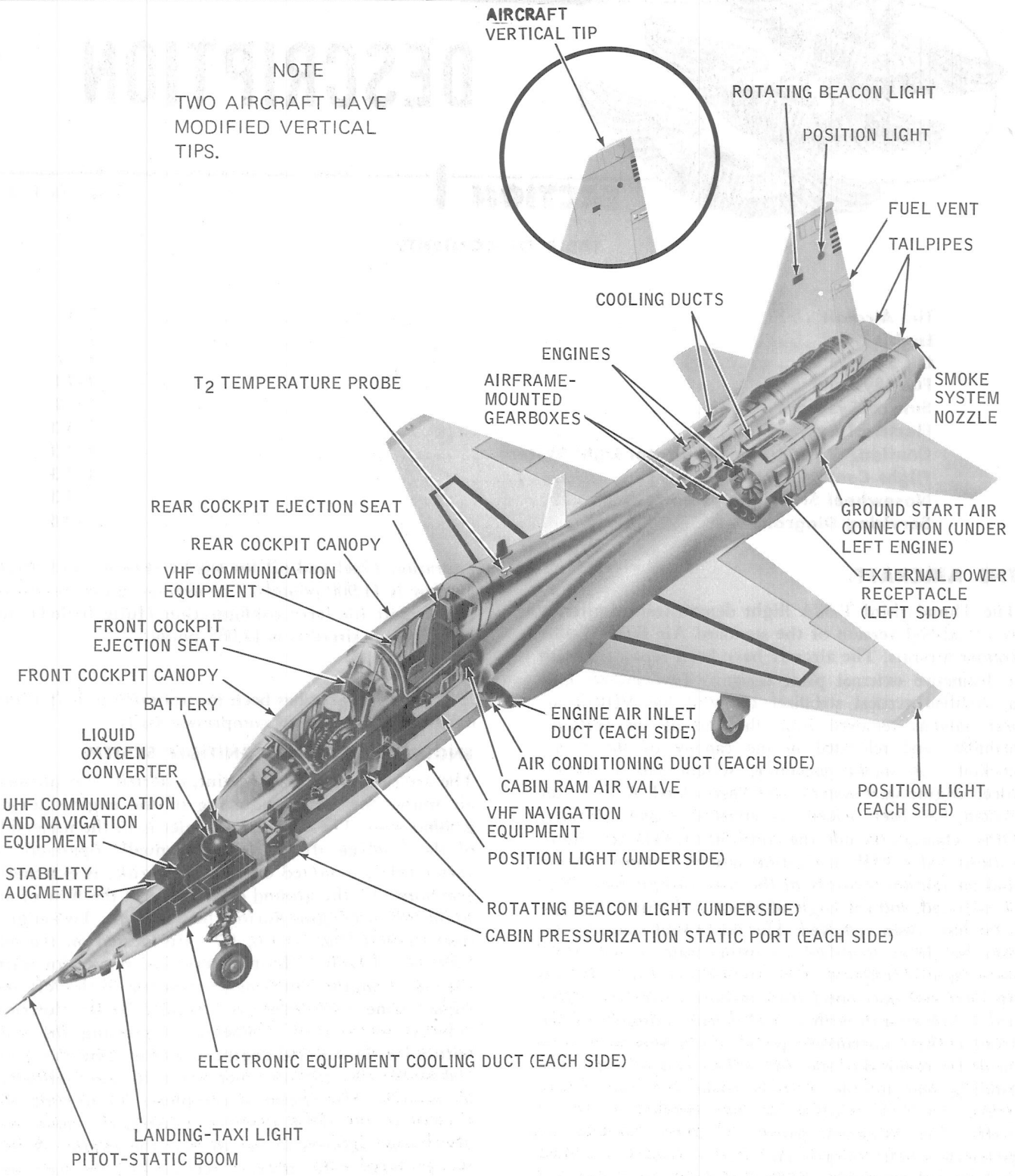


Figure 1-1.

COCKPIT ARRANGEMENT – FRONT (TYPICAL)

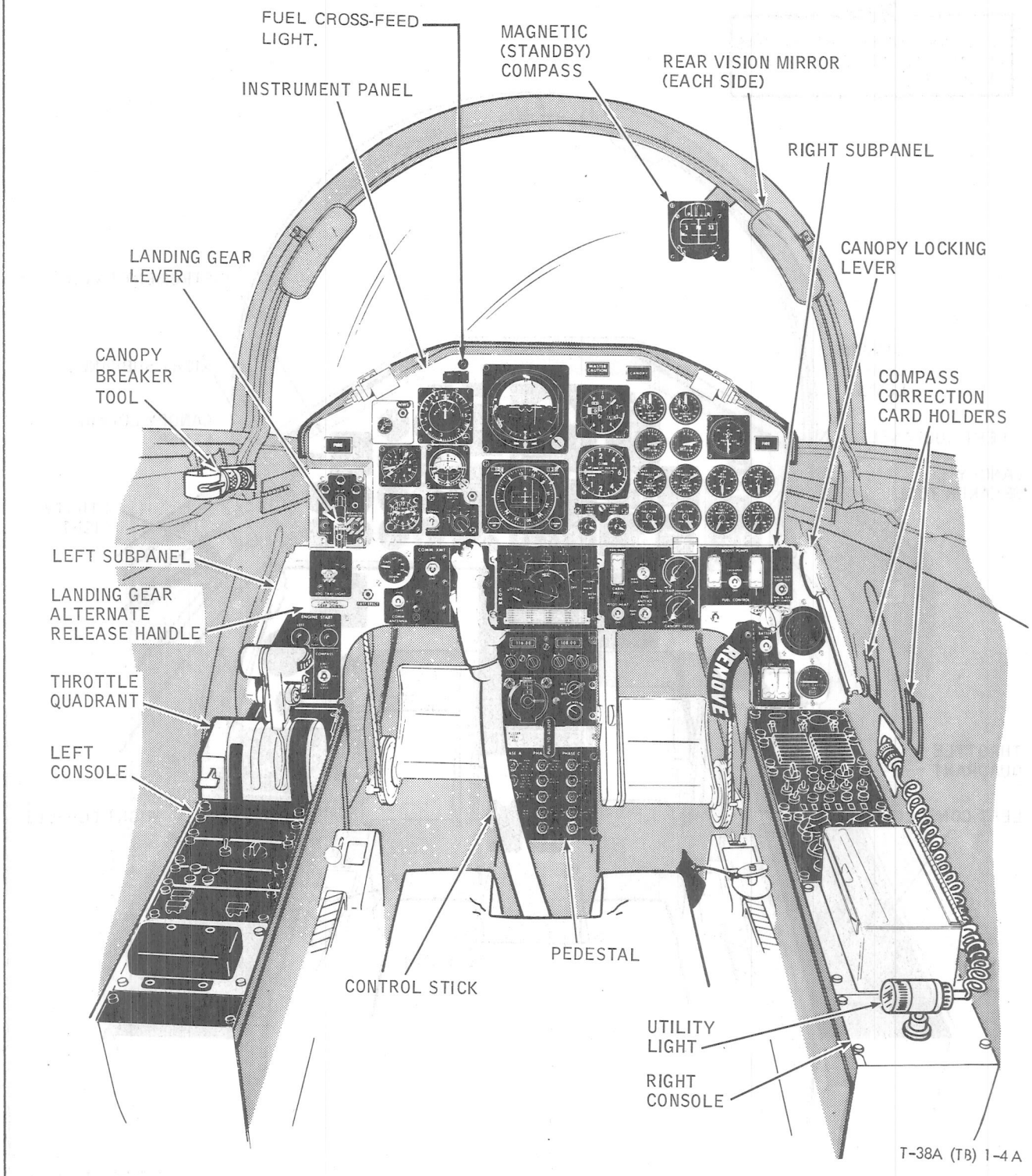


Figure 1-2.

COCKPIT ARRANGEMENT - REAR (TYPICAL)

Note

THE INSTRUMENT PANEL HAS BEEN REMOVED FROM TWO AIRCRAFT.

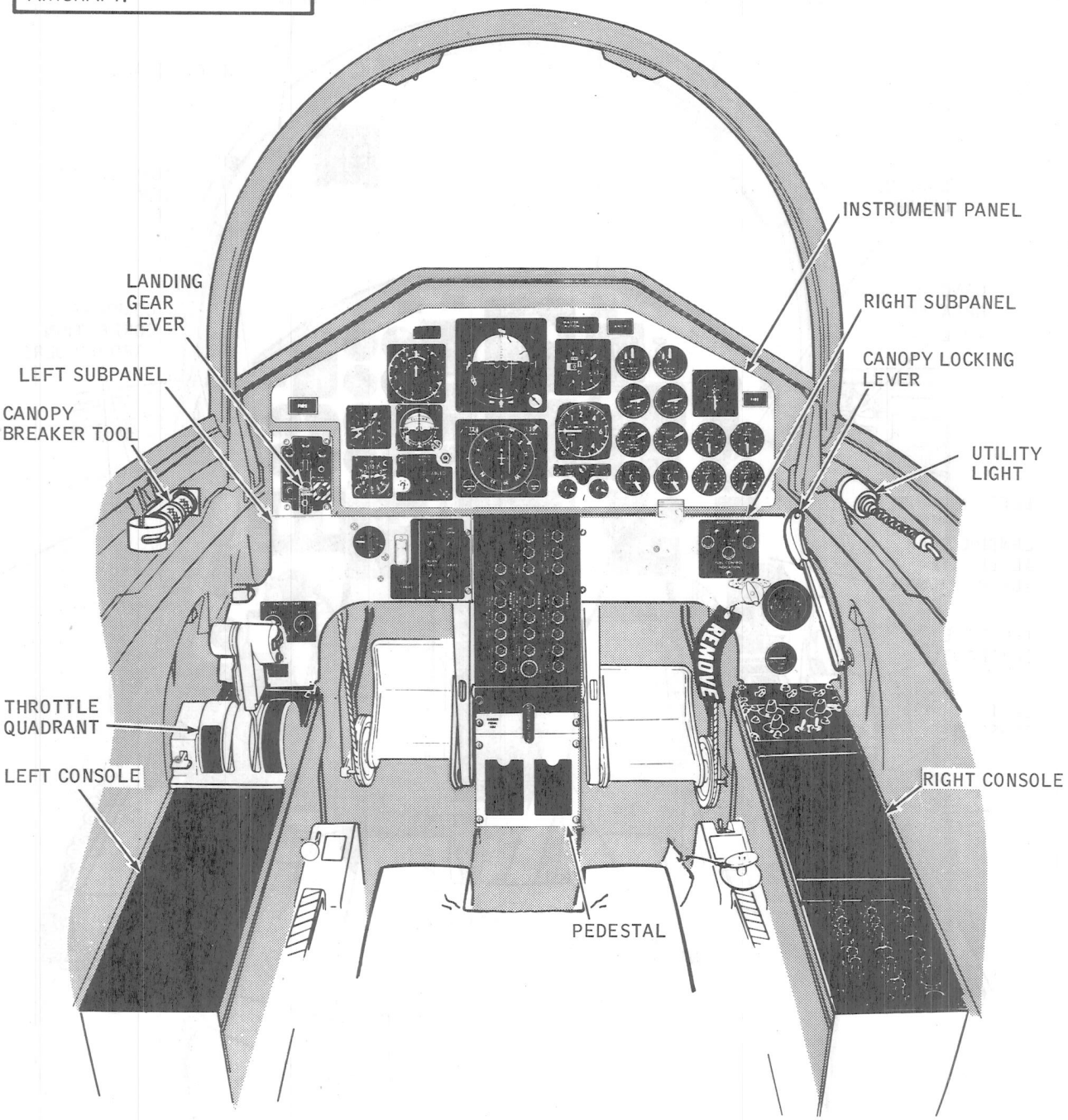
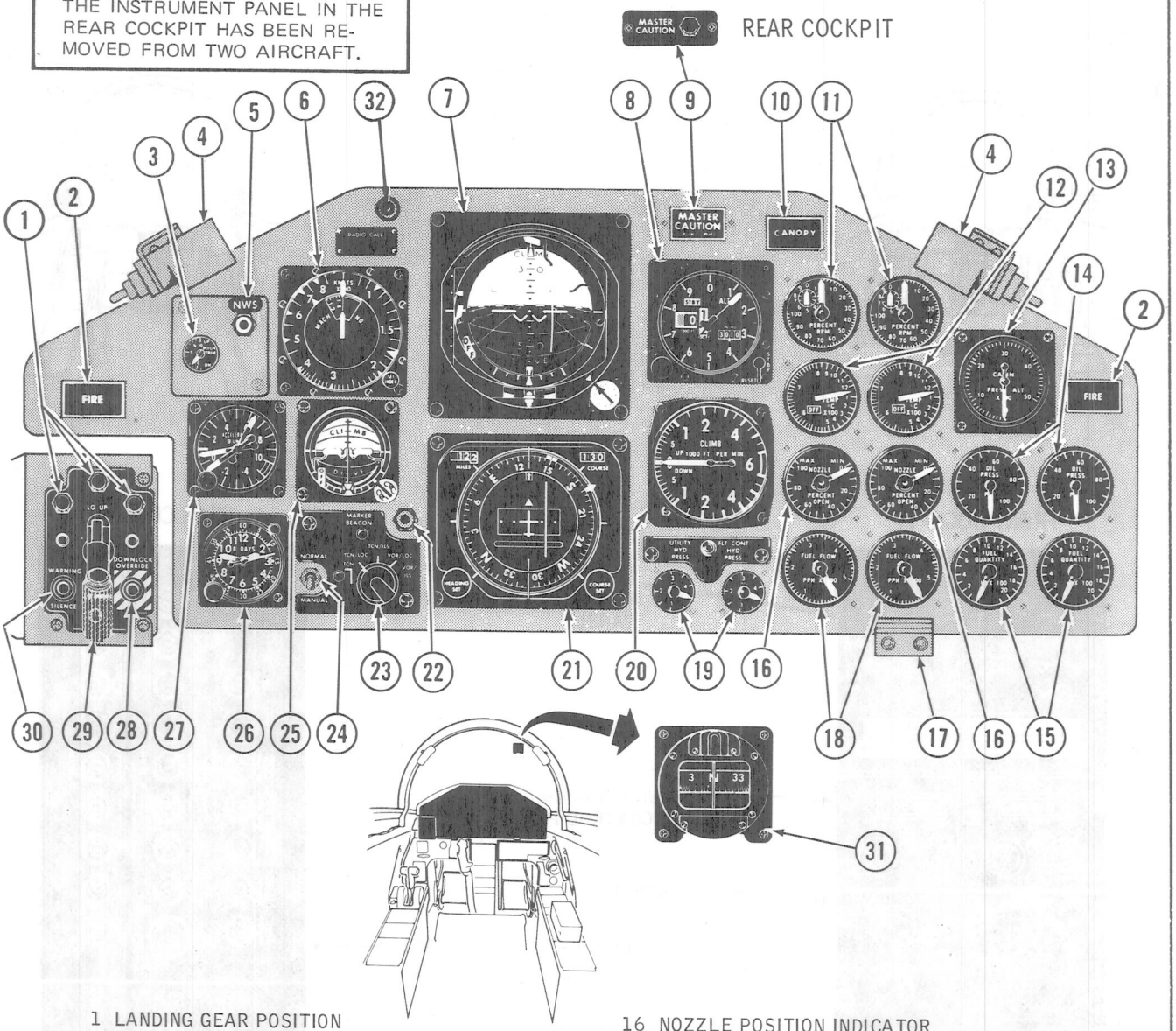


Figure 1-3.

INSTRUMENT PANEL - BOTH COCKPITS (TYPICAL)

Note

THE INSTRUMENT PANEL IN THE REAR COCKPIT HAS BEEN REMOVED FROM TWO AIRCRAFT.



1 LANDING GEAR POSITION INDICATOR LIGHTS
2 ENGINE FIRE WARNING LIGHT
3 PITCH TRIM INDICATOR (Front cockpit only)
4 FLOODLIGHT
5 NOSEWHEEL STEERING LIGHT (Front cockpit only)
6 AIRSPEED/MACH INDICATOR
7 ATTITUDE DIRECTOR INDICATOR
8 ALTIMETER
9 MASTER CAUTION LIGHT
10 CANOPY WARNING LIGHT
11 ENGINE TACHOMETERS
12 EXHAUST GAS TEMPERATURE INDICATORS (Warning flags front cockpit only)
13 CABIN ALTIMETER (Front cockpit only)
14 OIL PRESSURE INDICATORS
15 FUEL QUANTITY INDICATORS
16 NOZZLE POSITION INDICATOR
17 CARD CLIP
18 FUEL FLOW INDICATORS
19 HYDRAULIC PRESSURE INDICATORS
20 VERTICAL VELOCITY INDICATOR
21 HORIZONTAL SITUATION INDICATOR
22 MARKER BEACON LIGHT
23 NAVIGATION MODE SWITCH (Front cockpit only)
24 STEERING MODE SWITCH (Front cockpit only)
25 STANDBY ATTITUDE INDICATOR
26 CLOCK
27 ACCELEROMETER
28 LANDING GEAR DOWNLOCK OVERRIDE BUTTON
29 LANDING GEAR LEVER
30 LANDING GEAR WARNING SILENCE BUTTON
31 MAGNETIC COMPASS (Front cockpit only)
32 FUEL CROSS FEED LIGHT

T-38A (TB) 1-6A

Figure 1-4.

PEDESTALS

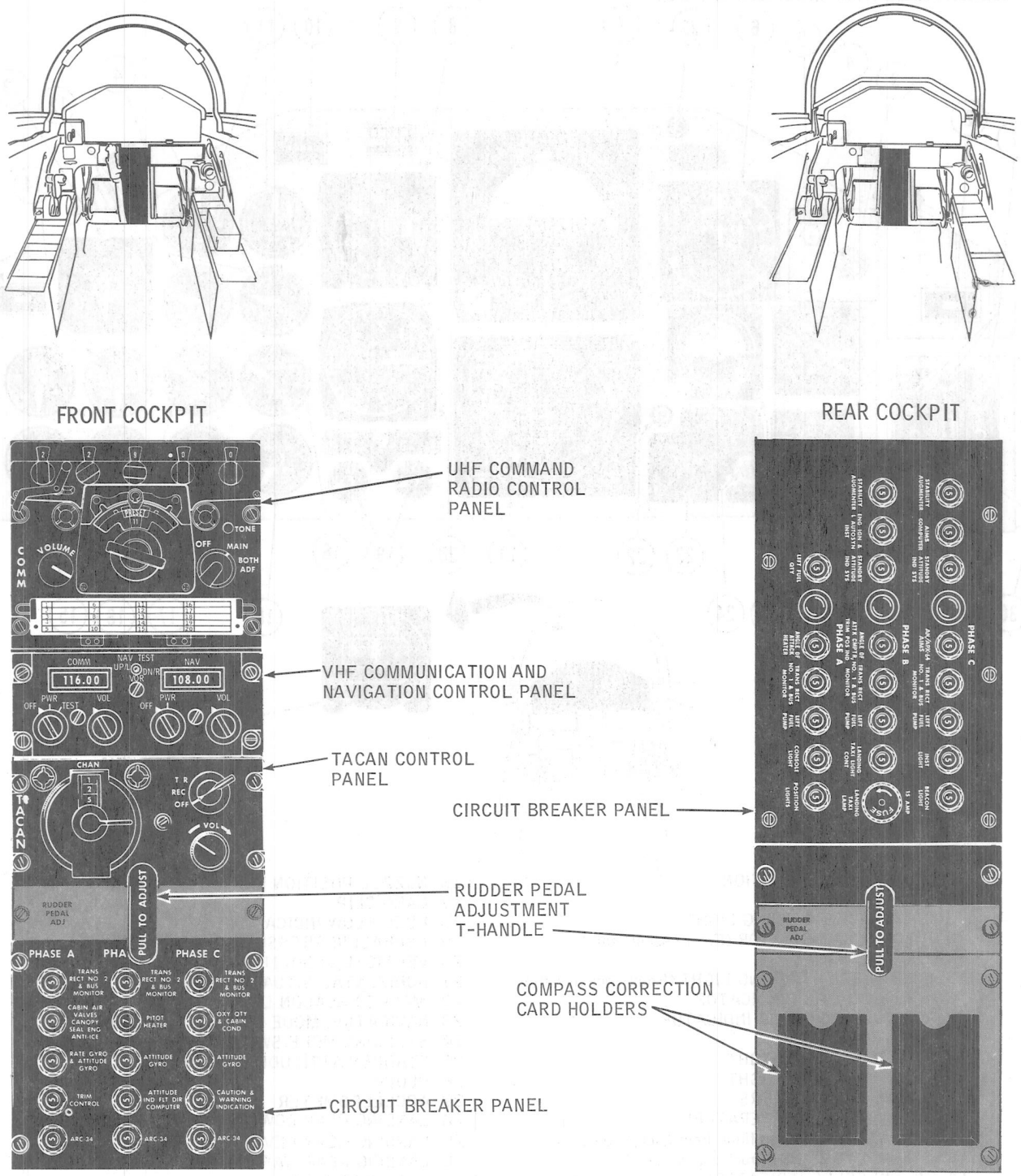
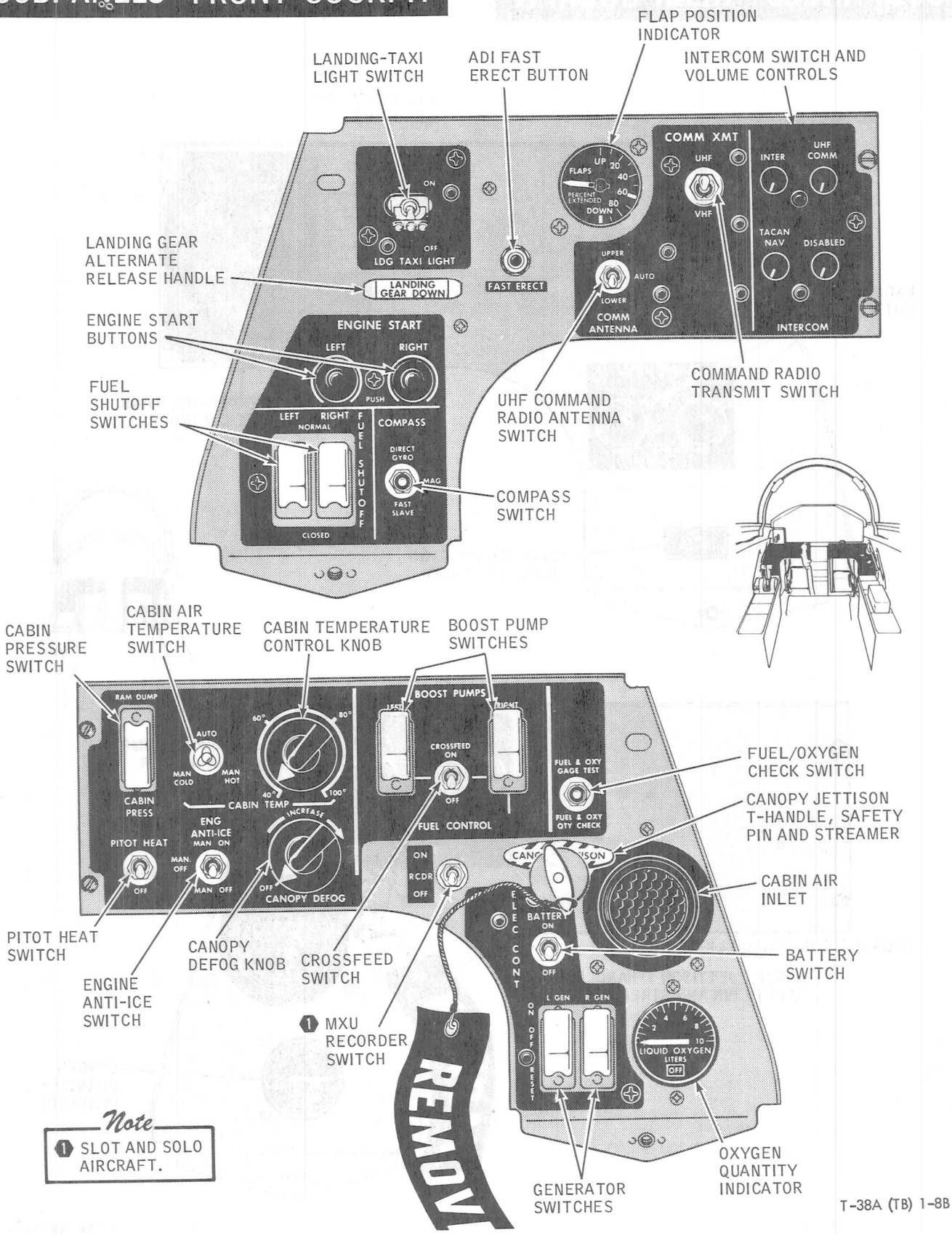


Figure 1-5.

SUBPANELS - FRONT COCKPIT



Note

1 SLOT AND SOLO AIRCRAFT.

T-38A (TB) 1-8B

Figure 1-6.

SUBPANELS – REAR COCKPIT

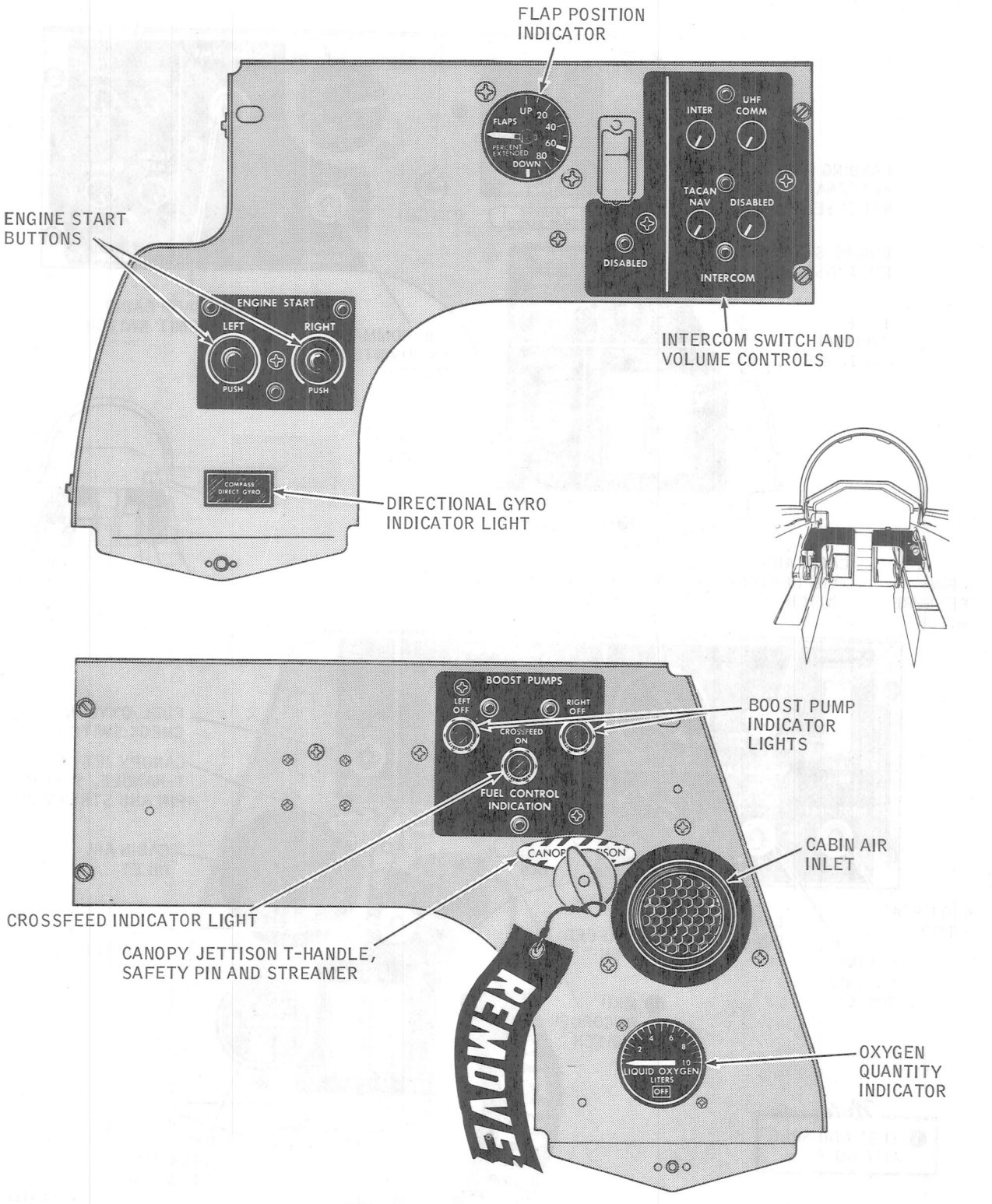


Figure 1-7.

CONSOLE PANELS – FRONT COCKPIT

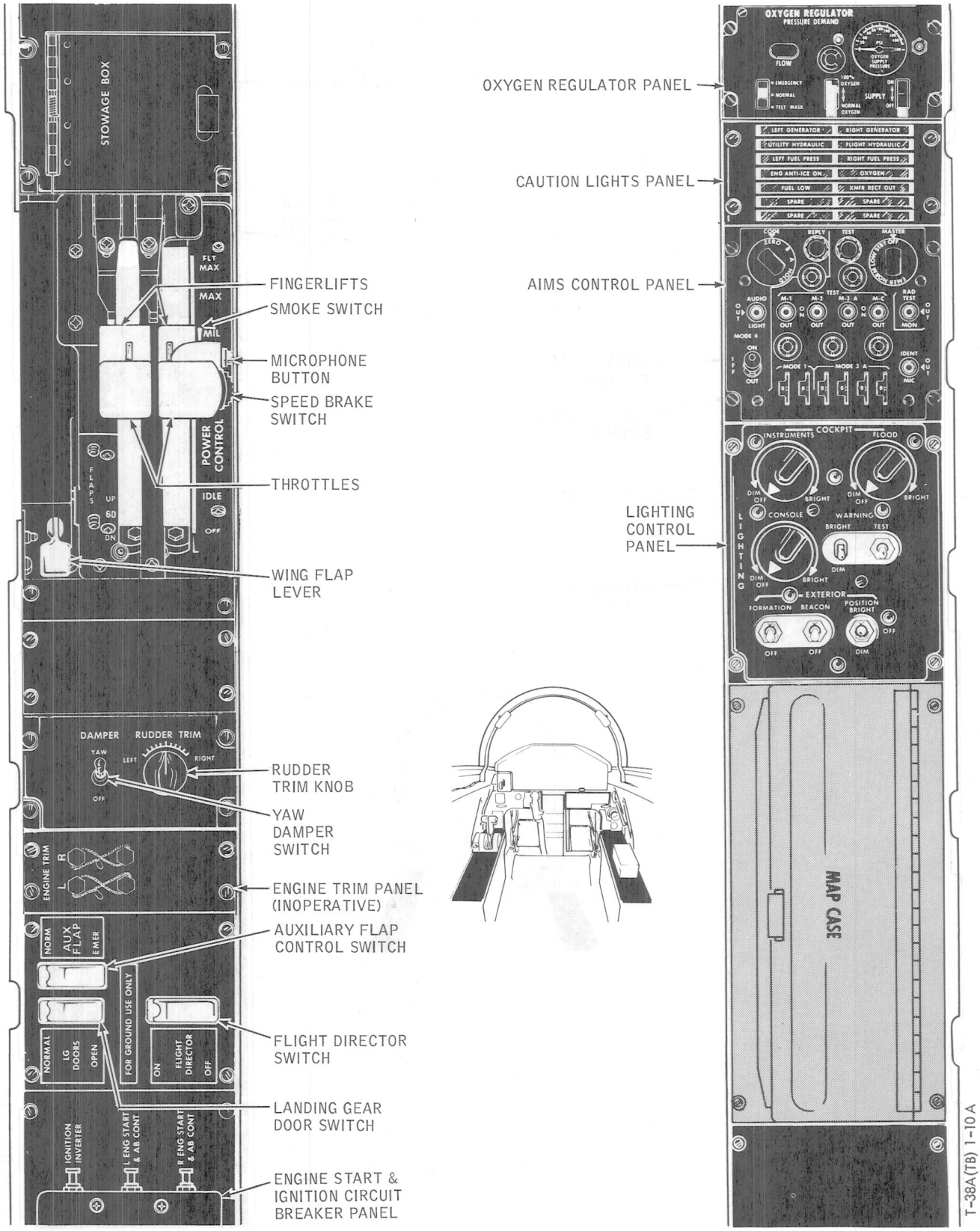


Figure 1-8.

CONSOLE PANELS – REAR COCKPIT

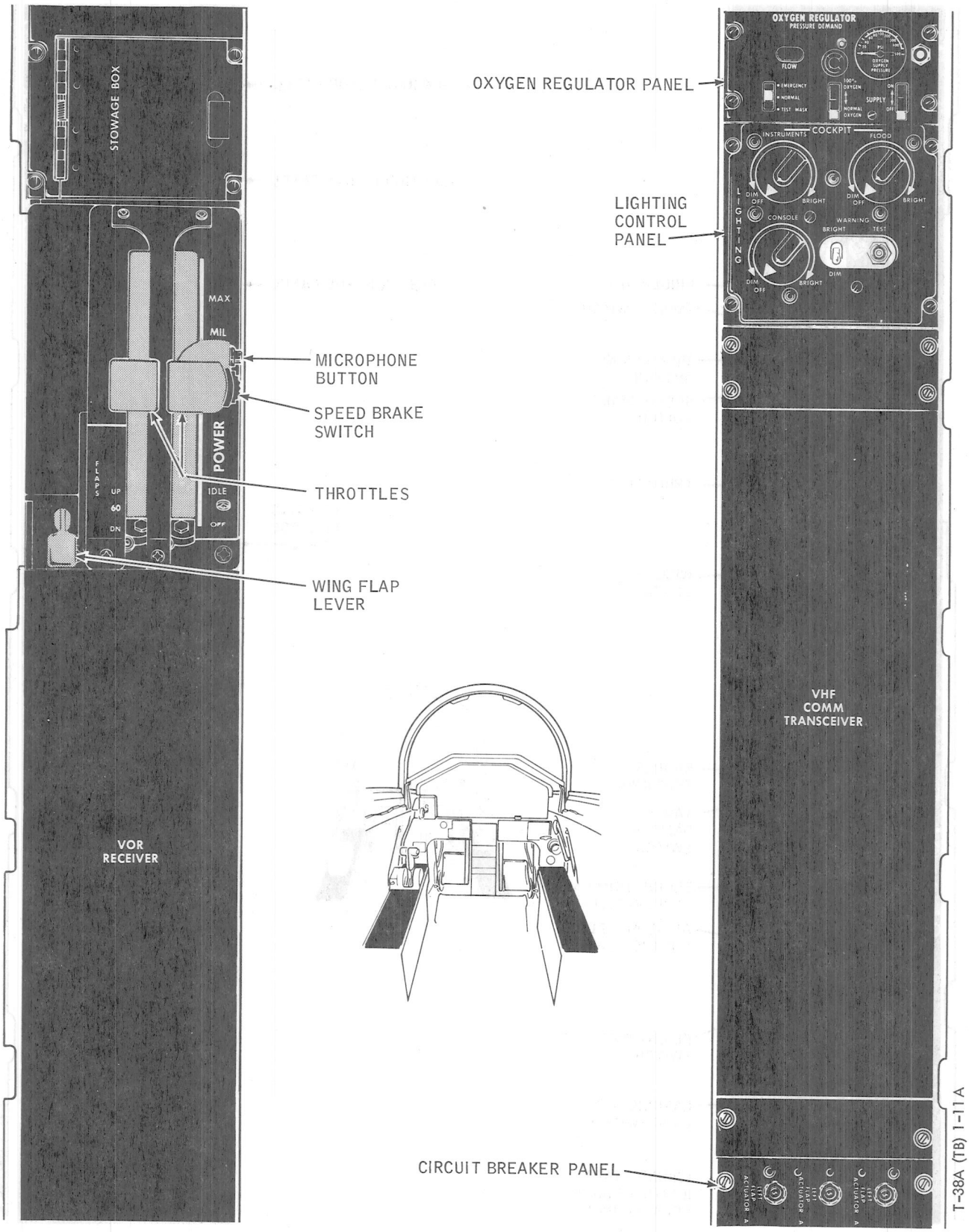


Figure 1-9.

the static inverter supplies ac power only to the left engine instruments for monitoring a start. After one engine has been started and the generator is on the line, the static inverter is automatically disconnected. Aircraft ac power is used for ignition when starting the other engine. Engine airstarts during flight are accomplished either by using the respective engine start button and positioning the throttle at IDLE as for normal starts, or by using the alternate airstart procedure. Alternate airstart is accomplished by positioning the throttle(s) into the afterburner range, which will close the afterburner ignition circuit to the engine main and afterburner igniters for approximately 30 seconds. The throttles must be retarded to MIL and returned to MAX (afterburner range) to recycle the starting timer. With the throttles at MAX range, the igniters may be energized for longer than 30 seconds by pushing and holding the engine start buttons.

Crossbleed Start.

A crossbleed start capability without external air is provided for starting the right engine after the left engine has been started. Compressed air from the eighth stage of the left engine compressor section is used for inital motoring of the right engine. A crossbleed control valve installed as part of the left engine compressor ducting system is armed for activation when the left engine throttle is advanced above 70% rpm. Actuation of the right engine start button will then open the crossbleed control valve, permitting air to flow from the left to the right engine. The right engine ignition circuit is then completed by moving the right throttle from OFF to IDLE position. In order to ensure adequate flow of air for starting, the left engine should be operating between 85% and 90% rpm. The crossbleed control valve closes and power is removed from the valve-open circuit any time the left throttle is below approximately 70% rpm, the aircraft is airborne, and approximately 30 seconds after the right engine start button has been actuated.

ENGINE INSTRUMENTS.

The static inverter, powered by the battery, supplies power for the left engine instruments during engine ground or airstart cycle when ac power is not available.

OIL SYSTEM.

A closed loop oil system has been installed, extending inverted flight without the drop or loss of oil pressure.

FUEL SYSTEM.

The fuel system is the same as the basic T-38A system, except that in the show configuration, total fuel quantity is reduced when the left system aft dorsal cell (49 gallons) is used as the oil supply tank for the smoke generating system. In this configuration, the aft dorsal cell is isolated from the fuel system by a shutoff valve controlled by a switch in the rear cockpit. Refer to servicing diagram (figure 1-13) for fuel quantity data for show and ferry configurations.

SMOKE SYSTEM.

The smoke system (figure 1-10) is provided to enable the aircraft to trail white smoke. Smoke generation is created by ejecting oil from the fuel system aft dorsal cell into the left engine exhaust wake. System components include the aft dorsal cell (49 gallons), aft dorsal cell shutoff valve, aft dorsal tank switch, oil pump, oil control valve, and a smoke switch.

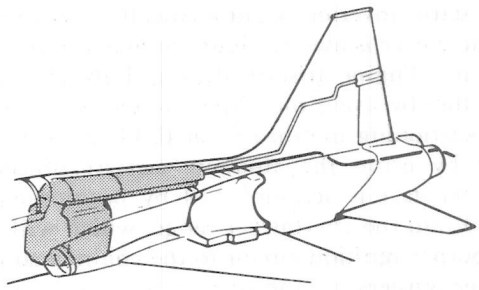
AFT DORSAL TANK SWITCH.

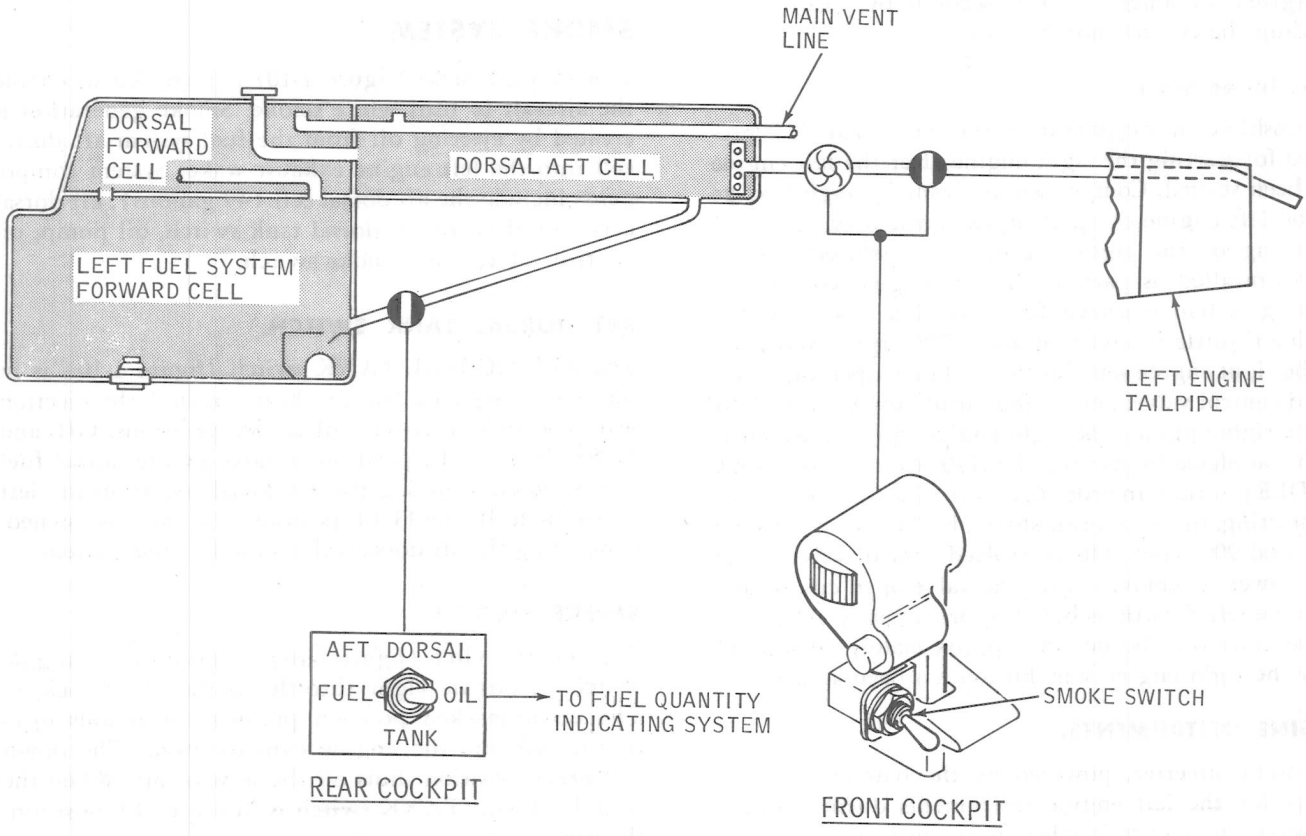
The AFT DORSAL TANK switch (figure 1-10) is in the rear cockpit on the top beam behind the ejection seat. The switch has two placarded positions, OIL and FUEL. In the OIL position, a valve in the dorsal fuel cell is closed, isolating the aft dorsal cell from the left fuel system. In the FUEL position, the valve is opened, connecting the aft dorsal cell to the left fuel system.

SMOKE SWITCH.

The smoke switch (figure 1-10), a two-position toggle switch, is on the right throttle in the front cockpit. The up unmarked position permits continuous ejection of oil into the engine exhaust wake. The down unmarked position shuts off the flow of oil. When the AFT DORSAL TANK switch is in the FUEL position, the smoke switch is inoperative.

SMOKE SYSTEM





ELECTRICAL ACTUATION

SHUTOFF VALVE

SINGLE-POINT FUELING RECEPTACLE

PUMP

MANUAL FILLER CAP

MANIFOLD

NOZZLE

T-38A (TB) 1-12A

Figure 1-10.

ELECTRICAL SYSTEMS.

The demonstration aircraft contain the same electrical systems as the standard T-38A aircraft. However, there are circuit breaker differences and electrical power sources have changed for some equipment from the left ac bus to the right ac bus and new VHF communications and navigation equipment have been added. Refer to figures 1-11 and 1-12.

CAUTION, WARNING, AND INDICATOR LIGHT SYSTEM.

CAUTION LIGHT PANEL.

The caution light panel has been removed from the rear cockpit.

MASTER CAUTION LIGHT.

The standard master caution light (figure 1-4) in the rear cockpit has been replaced by a master caution indicator light, which is slaved off the front cockpit master caution light. The master caution indicator light in the rear cockpit is dimmed by the bright/dim switch in the front cockpit. When a light illuminates on the caution light panel, the master caution light will also illuminate. When the condition is corrected, the master caution light will go out, but if the condition cannot be corrected, the master caution light on the front cockpit instrument panel may be pressed, causing the master caution light in both cockpits to go out and rearming the lights to provide warning of subsequent malfunctions.

CAUTION, WARNING, AND INDICATOR LIGHT TEST SWITCH.

When the test switch (figure 1-8) is placed at the TEST position in the front cockpit, the fire detection system lights, all caution, warning, and indicator lights except the marker beacon light, the nosewheel steering light in the front cockpit, and the master caution lights in both cockpits will illuminate. When the test switch (figure 1-9) is placed at the TEST position in the rear cockpit, the fire detection system lights and all warning and indicator lights except the marker beacon and master caution light in the rear cockpit will illuminate. The marker beacon lights in both cockpits and the master caution light in the rear cockpit are press-to-test lights.

FLIGHT CONTROL SYSTEM.

The demonstration aircraft have an increased horizontal trim authority over the standard T-38A aircraft to meet the requirements for flight demonstrations. Provisions have been made for removal of the rear cockpit control stick.

TAKEOFF TRIM BUTTON AND INDICATOR LIGHT.

The takeoff trim button and indicator light panel have been removed from the aircraft.

PITCH TRIM INDICATOR.

A pitch trim indicator has been added to the instrument panel in the front cockpit (figure 1-4) to provide a visual indication of the horizontal tail position.

NOSEWHEEL STEERING SYSTEM.

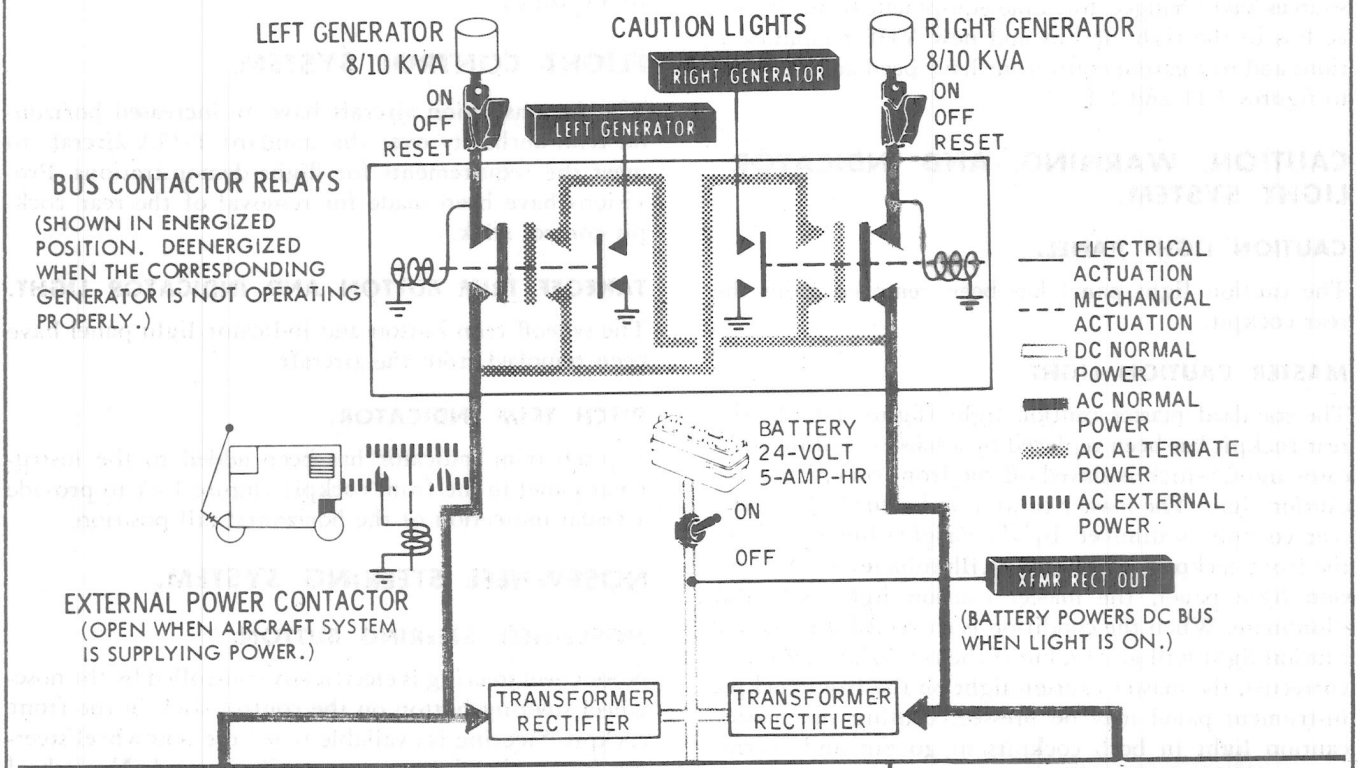
NOSEWHEEL STEERING BUTTON.

Nosewheel steering is electrically controlled by the nosewheel steering button on the control stick in the front cockpit. Steering is available when the nosewheel steering button has been momentarily pressed. Nosewheel steering will remain activated until the nosewheel steering button is momentarily pressed again or the nose gear is off the ground. When the weight of the aircraft is not on the nose gear, the system automatically deactivates.

NOSEWHEEL STEERING LIGHT.

A nosewheel steering light (figure 1-4) is located on the instrument panel in the front cockpit. When the nosewheel steering system is activated, the nosewheel steering light will illuminate, indicating the nosewheel steering system is engaged.

ELECTRICAL SYSTEM



LEFT 115/200-VOLT AC BUS

- AIMS (3)
- CONSOLE LIGHTS
- FUEL LOW WARNING
- IGNITION EXCITERS
- INSTRUMENT LIGHTS
- LANDING-TAXI LIGHT (REQUIRES DC FOR EXTENSION)
- (1) LEFT AUTOSYN INDICATORS
- LEFT FUEL BOOST PUMP
- LEFT FUEL QUANTITY INDICATOR
- POSITION LIGHTS (6-VOLT AC)
- ROTATING BEACONS
- RUDDER TRIM CONTROL
- STABILITY AUGMENTER
- STANDBY ATTITUDE INDICATOR
- TRIM INDICATOR

(1) AUTOSYN INDICATORS:
- EXHAUST GAS TEMPERATURE INDICATORS
- FUEL FLOW INDICATORS
- HYDRAULIC PRESSURE INDICATORS
- OIL PRESSURE INDICATORS

(2) (ALSO REQUIRES AC)
(3) (ALSO REQUIRES DC)

28-VOLT DC BUS

- CAUTION, WARNING, AND INDICATOR LIGHTS-BRIGHT (DIM LIGHT IS AC)
- CROSSFEED VALVE
- ENGINE CROSS START
- ENGINE START AND IGNITION CONTROL
- FIRE DETECTORS
- FLAP CONTROL (2)
- FLAP POSITION INDICATOR
- FLIGHT DIRECTOR MODE SELECTOR (2)
- FLOODLIGHTS (EMERGENCY)
- FORMATION LIGHTS
- FUEL/OXYGEN CHECK SWITCH
- FUEL SHUTOFF VALVES
- INTERPHONE
- LANDING GEAR AUDIBLE WARNING SIGNAL
- LANDING GEAR CONTROL AND SAFETY CIRCUITS
- LANDING GEAR DOOR SWITCH
- MARKER BEACON LIGHT
- MASTER CAUTION LIGHT CONTROL
- NOSEWHEEL STEERING CONTROL AND LIGHT
- NOZZLE POSITION INDICATORS
- SMOKE SYSTEM CONTROL (2)
- SPEED BRAKE CONTROL
- STATIC INVERTER
- T_2 HEATER CONTROL
- TACAN (2)
- TACAN ANTENNA SELECTOR
- TURN NEEDLE
- VHF COMMAND RADIO
- VIBRATOR, AAU-19/A ALTIMETER
- VOR/ILS RECEIVER, INDICATORS, AND FLAGS (2)

RIGHT 115/200-VOLT AC BUS

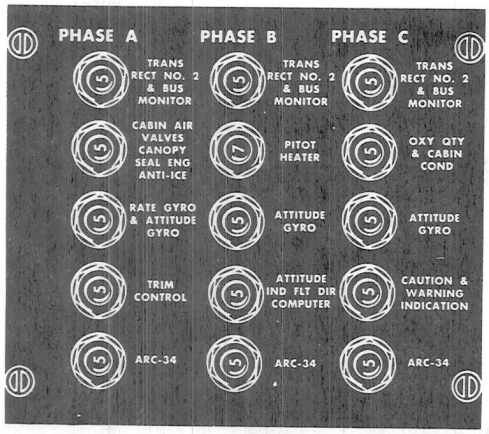
- ADI STEERING BARS (3)
- ATTITUDE SPHERE
- BEARING POINTER (3)
- CABIN AIR-CONDITIONING
- CANOPY SEAL
- CAUTION, WARNING, AND INDICATOR LIGHTS-DIM
- COMPASS CARD (SLAVING REQUIRES DC)
- ENGINE ANTI-ICE
- EQUIPMENT COMPARTMENT COOLING
- (3) FLAP MOTORS
- FLOODLIGHTS (NORMAL)
- FUEL LOW WARNING
- OXYGEN QUANTITY AND LOW-LEVEL WARNING CIRCUIT
- PITOT HEATER
- (1) RIGHT AUTOSYN INDICATORS
- RIGHT FUEL BOOST PUMP
- RIGHT FUEL QUANTITY INDICATOR
- SEAT ADJUSTMENT
- SMOKE SYSTEM (3)
- TACAN (3)
- TRIM CONTROL
- UHF ANTENNA SELECTION
- UHF COMMAND RADIO
- UTILITY LIGHTS
- VOR/ILS RECEIVER, INDICATORS, AND FLAGS (3)

T-38A (TB) 1-13

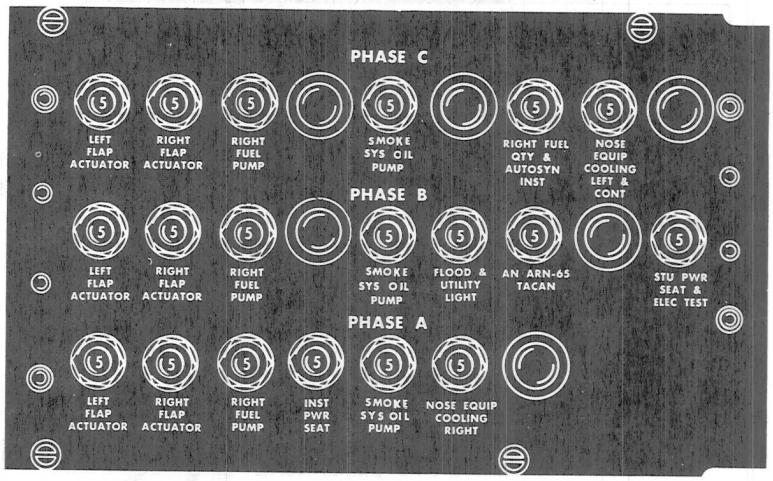
Figure 1-11.

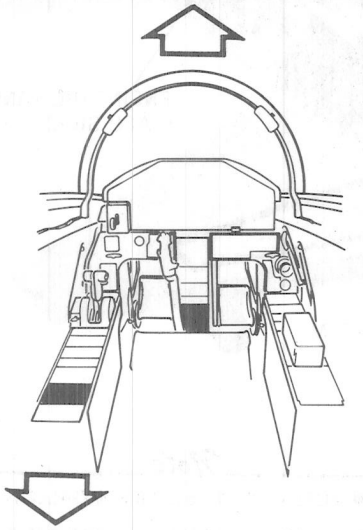
CIRCUIT BREAKER PANELS

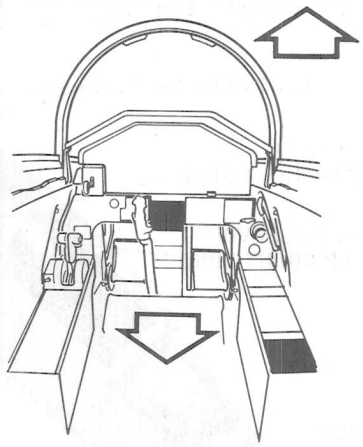
PEDESTAL – FRONT COCKPIT
(NORMALLY POWERED BY RIGHT AC BUS)



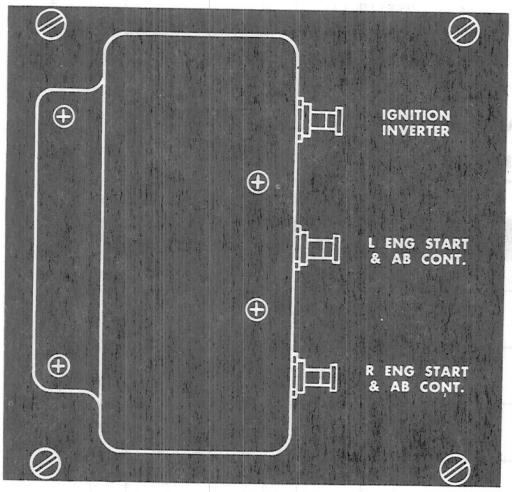
RIGHT CONSOLE – REAR COCKPIT
(NORMALLY POWERED BY RIGHT AC BUS)



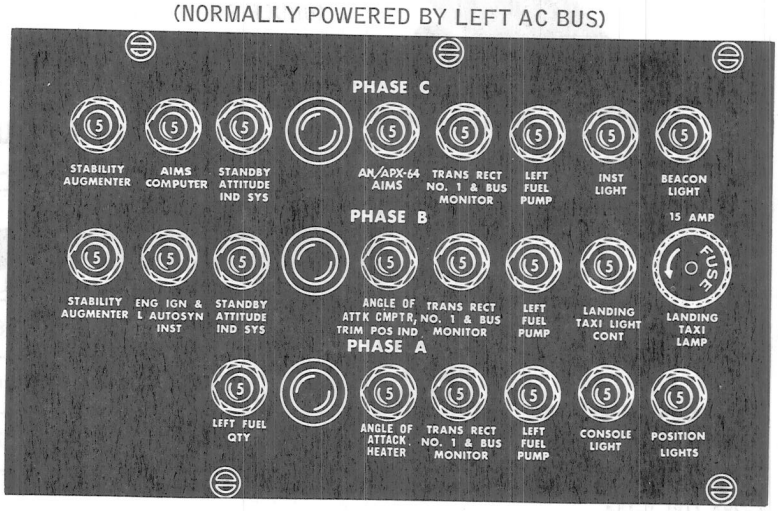




LEFT CONSOLE – FRONT COCKPIT



PEDESTAL – REAR COCKPIT
(NORMALLY POWERED BY LEFT AC BUS)



T-38A (TB) 1-14

Figure 1-12.

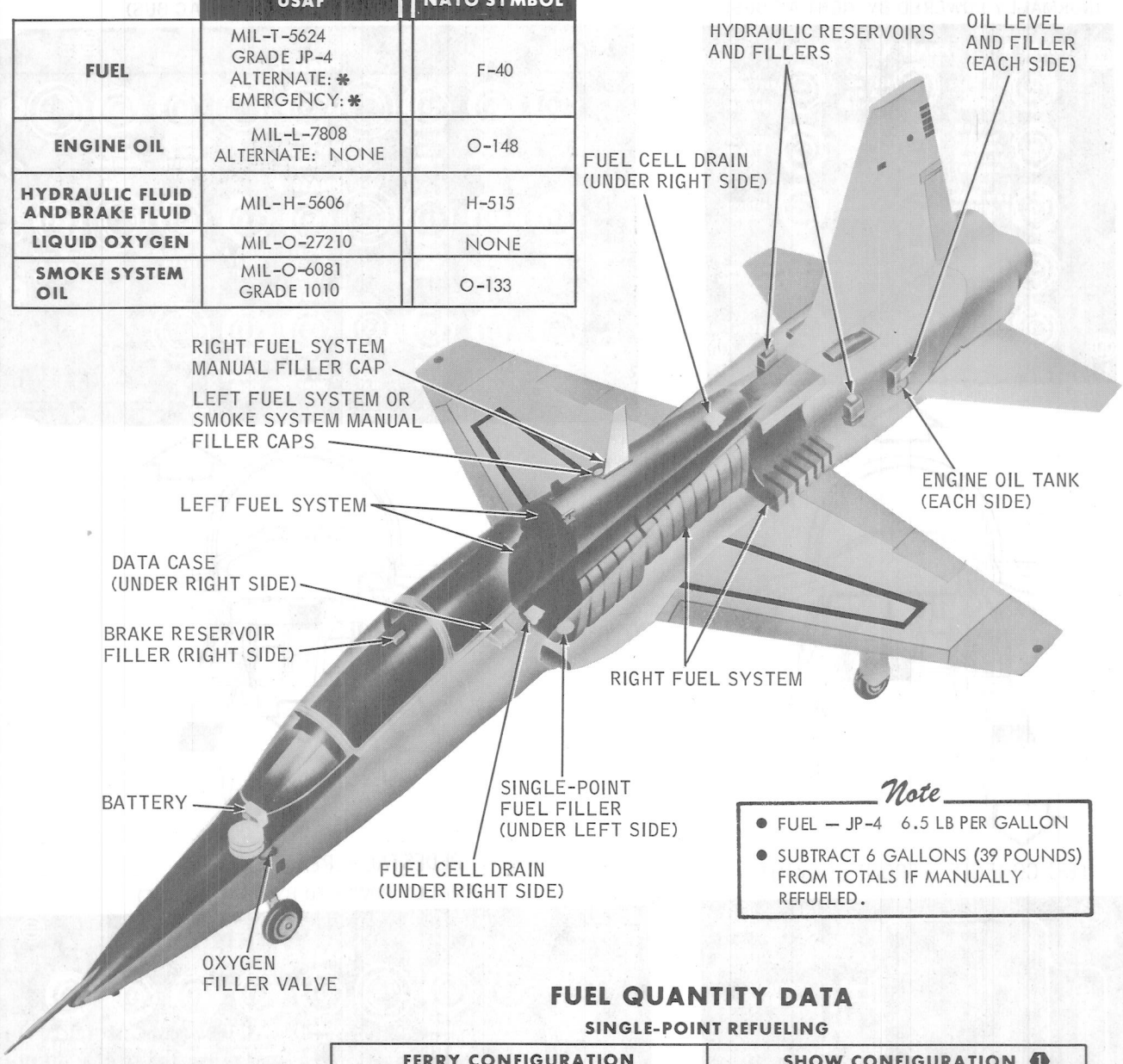
SERVICING DIAGRAM

*** Note**

REFER TO STRANGE FIELD PROCEDURES IN T.O. 1T-38A-1 SECTION II for ELECTRICAL UNITS, AIR-STARTING UNITS, ALTERNATE AND EMERGENCY FUEL OPERATING INFORMATION.

FLUID SPECIFICATION

	USAF	NATO SYMBOL
FUEL	MIL-T-5624 GRADE JP-4 ALTERNATE: * EMERGENCY: *	F-40
ENGINE OIL	MIL-L-7808 ALTERNATE: NONE	O-148
HYDRAULIC FLUID AND BRAKE FLUID	MIL-H-5606	H-515
LIQUID OXYGEN	MIL-O-27210	NONE
SMOKE SYSTEM OIL	MIL-O-6081 GRADE 1010	O-133



Note

- FUEL — JP-4 6.5 LB PER GALLON
- SUBTRACT 6 GALLONS (39 POUNDS) FROM TOTALS IF MANUALLY REFUELED.

FUEL QUANTITY DATA

SINGLE-POINT REFUELING

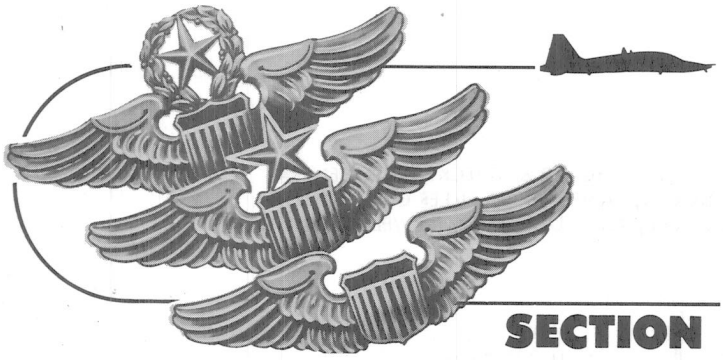
	FERRY CONFIGURATION				SHOW CONFIGURATION ❶			
	FULLY SERVICED		USABLE		FULLY SERVICED		USABLE	
	GALLONS	POUNDS	GALLONS	POUNDS	GALLONS	POUNDS	GALLONS	POUNDS
LEFT SYSTEM	293	1905	286	1859	244	1586	237	1540
RIGHT SYSTEM	305	1982	297	1931	305	1982	297	1931
TOTAL	598	3887	583	3790	549	3568	534	3471

DATA BASIS: **ACTUAL**
DATE: 1 JUNE 1974

❶ SMOKE SYSTEM CONTAINS 49 GALLONS OF OIL

T-38A (TB) 1-15A

Figure 1-13.



NORMAL PROCEDURES

SECTION II

T-38A (TB) 1-24

TABLE OF CONTENTS

PREFLIGHT CHECK.

BEFORE EXTERIOR INSPECTION.

1. Form 781—Check aircraft status and servicing.
2. Seat and Canopy Safety Pins—Installed.
   If safety pins other than seat and canopy pins are installed, do not remove until the status of the ejection system has been checked with maintenance personnel.
3. Seat Attach Bolts—Check.

WARNING

The two attach bolts must be aligned with the reference line (or shoulder) of catapult head.

4. Publications—Check to ensure that all required navigational publications are on board.
5. Aft Dorsal Tank Switch—As Required.
6. Fuel and Oxygen Quantity—Check.

Note

The left fuel system will indicate 400 pounds low when the aft dorsal cell is filled with oil for show configuration

7. Wing Flap Lever—UP.

Note

If the flaps are other than fully up, the flap switch must be set to correspond with the actual flap position. Otherwise, inadvertent flap extension/retraction will occur when ac power is applied.

8. Smoke Switch—OFF.

EXTERIOR INSPECTION.

Conduct the exterior inspection as shown in figure 2-1.

INTERIOR INSPECTION.

Rear Cockpit (Solo Flights).

1. Seat and Canopy Safety Pins—Check Installed.
2. Survival Kit—Remove, or Secure.

WARNING

Seat safety belt and shoulder harness do not provide adequate restraint for survival kit during zero or negative-G maneuvers.

3. Safety Belt, Shoulder Harness, Oxygen Hose, and Man-Seat Separator Straps—Secure and Lock.

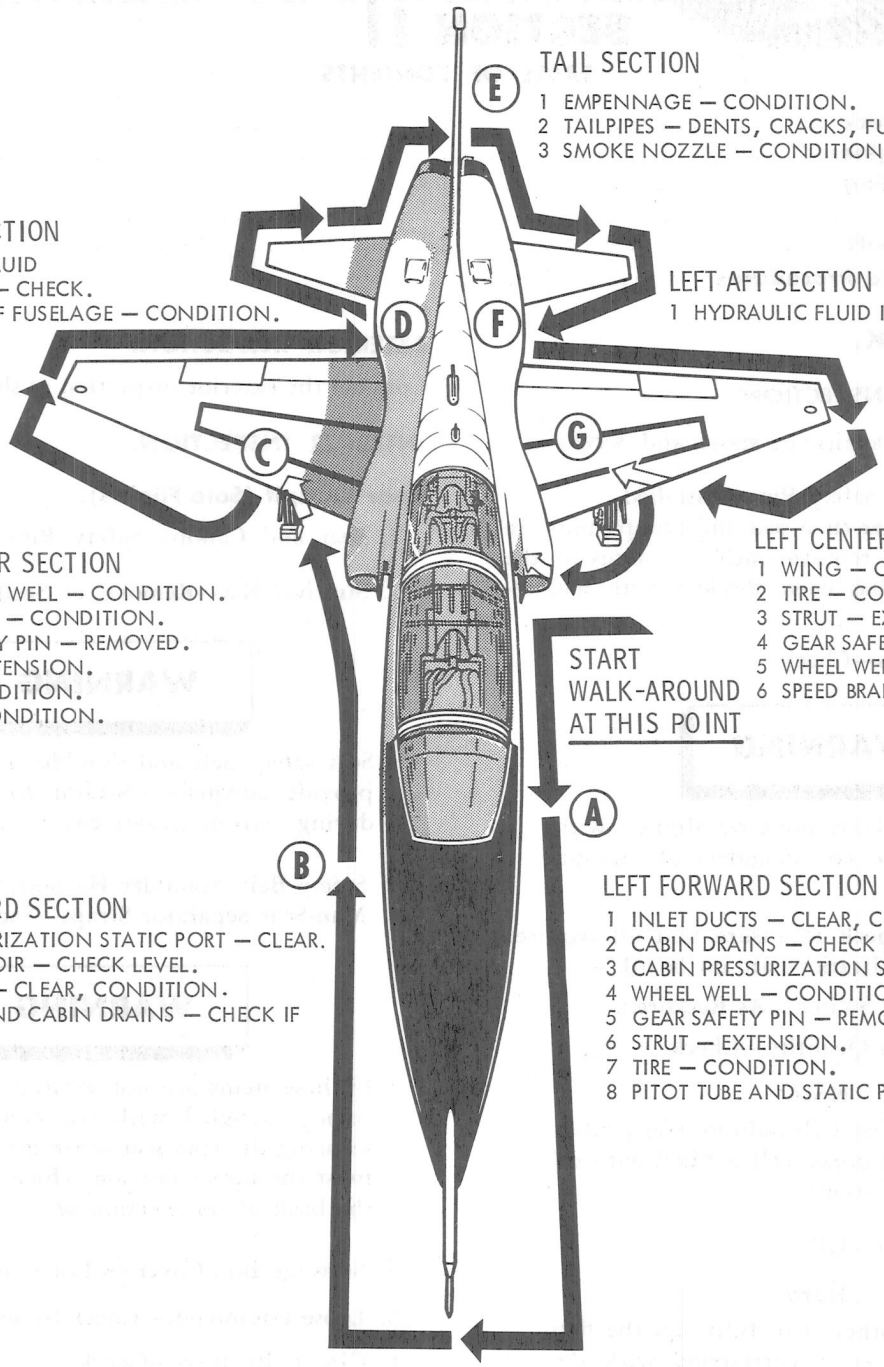
WARNING

If these items are not secured, they may become entangled with the control stick. In securing the man-seat separator straps, do not twist the upper portion which is reeled into the back of the ejection seat.

4. Stowage Box Cover—Closed and Secured.
5. Loose Equipment—Check Securely Stowed.
6. Circuit Breakers—Check.
7. Lights—OFF.
8. Oxygen—NORMAL; 100%; ON.
9. Canopy—Closed and locked.

EXTERIOR INSPECTION

DURING THE EXTERIOR INSPECTION, THE AIRCRAFT SHOULD BE CHECKED FOR GENERAL CONDITION, WHEELS CHOCKED, ACCESS DOORS, PANELS, AND FILLER CAPS SECURED, GROUND WIRES REMOVED, FOR HYDRAULIC, OIL, AND FUEL LEAKS, AS WELL AS FOR THE FOLLOWING SPECIFIC ITEMS.



TAIL SECTION

1 EMPENNAGE — CONDITION.
2 TAILPIPES — DENTS, CRACKS, FUEL.
3 SMOKE NOZZLE — CONDITION.

RIGHT AFT SECTION

1 HYDRAULIC FLUID INDICATORS — CHECK.
2 UNDERSIDE OF FUSELAGE — CONDITION.

LEFT AFT SECTION

1 HYDRAULIC FLUID INDICATORS — CHECK.

RIGHT CENTER SECTION

1 SPEED BRAKE WELL — CONDITION.
2 WHEEL WELL — CONDITION.
3 GEAR SAFETY PIN — REMOVED.
4 STRUT — EXTENSION.
5 TIRE — CONDITION.
6 WING — CONDITION.

LEFT CENTER SECTION

1 WING — CONDITION.
2 TIRE — CONDITION.
3 STRUT — EXTENSION.
4 GEAR SAFETY PIN — REMOVED.
5 WHEEL WELL — CONDITION.
6 SPEED BRAKE WELL — CONDITION.

START WALK-AROUND AT THIS POINT

RIGHT FORWARD SECTION

1 CABIN PRESSURIZATION STATIC PORT — CLEAR.
2 BRAKE RESERVOIR — CHECK LEVEL.
3 INLET DUCTS — CLEAR, CONDITION.
4 STICK WELL AND CABIN DRAINS — CHECK IF APPLICABLE.

LEFT FORWARD SECTION

1 INLET DUCTS — CLEAR, CONDITION.
2 CABIN DRAINS — CHECK IF APPLICABLE.
3 CABIN PRESSURIZATION STATIC PORT — CLEAR.
4 WHEEL WELL — CONDITION.
5 GEAR SAFETY PIN — REMOVED.
6 STRUT — EXTENSION.
7 TIRE — CONDITION.
8 PITOT TUBE AND STATIC PORTS — CLEAR.

T-38A (TB) 1-16

Figure 2-1.

Cockpit (All Flights).

On dual flights, all items marked with an asterisk should also be checked in the rear cockpit.

1. Battery/External Electrical Power—As Required.

CAUTION

If external power is connected, the battery should be turned off to prevent battery damage.

*2. Intercom Switches—As Required.

3. Crew Retractable Steps—Assure Stowed.

If steps are used, the pilot will assure that they are stowed to prevent flight with the steps extended.

*4. Survival Kit—Attached (if applicable).

*5. Safety Belt, Shoulder Harness, Parachute Arming Lanyard Anchor, Zero-Delay Hook, Beacon Actuator Tab, Oxygen Connectors, Hose Retention Strap, and Helmet Chin Strap—Fasten and Adjust.

*6. Seat and Canopy Safety Pins—Remove, display to ground crew, and stow.

CAUTION

Care should be taken to prevent inadvertent pulling of the canopy T-handle when removing the safety pin.

WARNING

- Failure to attach personnel equipment correctly may prevent separation from seat after ejection. The HBU-2B/A safety belt can be inadvertently opened by full aft and then full left movement of the control stick. This condition can be alleviated if the safety belt buckle is positioned so the shoulder harness loops are centered on the individual, which will offset the safety belt buckle to the left of center.
- Assure that hose retention strap is adjusted to preclude hose separation from oxygen-disconnect on parachute harness.
- The oxygen hose from the mask to the disnect should be routed under the right shoulder harness strap before connecting to the disconnect. This helps keep the shoulder harness clear of the connector and prevents the harness from being snagged between the connector and its mounting plate during seat separation.

*7. Ejection Seat Handgrips—Push (to ensure fully down).

*8. Oxygen System—Check (PRICE).

*9. Circuit Breakers—Check.

10. Gear Door Switch—NORMAL.

11. Flight Director Switch—ON.

12. Aux Flap Switch—EMERGENCY.

13. Rudder Trim Knob—As Required.

*14. Throttles—OFF.

15. Smoke Switch—OFF.

16. Speed Brake Switch—OPEN.

17. Compass Switch—MAG.

18. Fuel Shutoff Switches—NORMAL (guarded position).

19. Landing Gear Alternate Release Handle—IN.

20. Landing-Taxi Light Switch—OFF.

*21. Landing Gear Lever—LG DOWN.

*22. Airspeed-Mach Indicator—Check.

*23. Accelerometer—Check.

*24. Clock—Set.

25. Steering Mode Switch—NORMAL.

26. Navigation Mode Switch—TACAN.

*27. Marker Beacon Light—Test.

28. Comm Antenna Switch—UPPER.

29. Comm XMT Switch:
    a. Demonstrations—VHF.
    b. Other:
        (1) Leader—VHF.
        (2) Others—UHF.

30. UHF—ON:
    a. Demonstrations: ADS discrete frequency selected. Function knob: Leader and Solo—Both; Others—Main. Manual frequency: ADS discrete.
    b. Deployments: Destination tower frequency set in manual windows. ADS discrete preset frequency selected. Function knob: As above.

31. VHF Comm/Nav—ON.
    a. Nav: Local VOR Freq.
    b. Comm:
        (1) Demonstrations: ADS.
        (2) Other: Local Discrete Clearance Delivery.

32. TACAN—ON; Local Channel selected.

33. Magnetic Compass—Check.

*34. Altimeter—Set.

*35. Vertical Velocity Indicator—Check.

36. Cabin Altimeter—Check.

37. Cabin Pressure Switch—CABIN PRESS.

38. Cabin Air Temperature Switch—AUTO.

39. Pitot Heat Switch—OFF.

40. Engine Anti-Ice Switch—OFF.

41. Fuel Boost Pump Switches—As Required.

42. Crossfeed Switch—As Required.

43. Generator Switches—ON.

44. MXU Recorder Switch—ON.

45. IFF/SIF—STBY.

*46. Warning Test Switch—TEST.

*47. Interior and Position Lights—As Required.

48. Forms/Publications—Stowed.

STARTING ENGINES.

LEFT ENGINE.

Start the left engine first, using the following procedure:

1. Signal for air supply.
2. Engine Start Button—Push momentarily.
3. Throttle—Advance to IDLE at 12% minimum rpm.

CAUTION

- Prior to moving throttle to IDLE, assure that EGT OFF flag (front cockpit only) is out of view. An engine start cannot be properly monitored with OFF flag in view.
- If ignition does not occur before fuel flow reaches 350 lb/hr, retard throttle to OFF. Maintain airflow to permit fuel and vapors to be purged from engine. Wait at least 2 minutes to permit fuel to drain before attempting another start.
- If EGT does not begin to rise within 5 seconds after the first indication of fuel flow, abort the start. If engine light is normal but RPM do not reach generator cut-in speed before termination of the start cycle, push the engine start button to assure aircraft electrical power is available to monitor the start.

Note

Engine speed must reach a minimum of 12% rpm within 15 seconds. If engine speed does not reach 12% rpm within 15 seconds, abort the start and change start carts before attempting another start.

4. Engine Instruments—Check.
5. Hydraulic Pressure—Check.
6. Caution Light Panel—Check.

RIGHT ENGINE.

1. Right Engine—Start Same as Left Engine.
2. Signal ground crew to disconnect external power and/or air supply.
3. Battery Switch—Check ON.

CROSSBLEED START.

To start the right engine using the crossbleed start system, use the following procedure:

1. External power and/or air supply—As Required.
2. Battery Switch—Check ON.
3. Throttle (Left Engine)—Advance to 85% to 90% rpm.
4. Right Engine Start Button—Push momentarily.
5. Throttle (Right Engine)—Advanced to IDLE at 12% minimum rpm.
6. Engine Instruments—Check.
7. Throttle (Left Engine)—Retard to IDLE after right engine reaches idle rpm.
8. Hydraulic Pressure—Check.
9. Caution Light Panel—Check.

BEFORE TAXIING.

On dual flights, all items marked with an asterisk should also be checked in the rear cockpit.

1. Canopy Defog, Cabin Temp, and Pitot Heat—Check (check pitot heat if required).

WARNING

For night or anticipated weather operation with conditions of high humidity and narrow temperature-dewpoint spread, the canopies should be closed and the cockpit temperature increased to the 100° AUTO positon to preheat all flight instruments and canopy surfaces. Return temperature control to a comfortable in-flight setting after completion of the line-up check.

*2. Circuit Breakers—Check.

3. Yaw Damper Switch—YAW.

4. Flight Trim Switch—Check.

5. Horizontal Tail Trim—Set as Required.
6. Communication and Navigation Equipment—Check.

   Set communications frequencies as briefed. Check for proper operation of the ADI, HSI, standby attitude indicator, TACAN, VOR, ILS, and flight director system. If systems are not stabilized, press and hold fast erect button until ADI sphere stabilized or place the compass switch at FAST SLAVE to stabilize the HSI. Refer to section IV for description of proper system operation.

*7. AAU-19/A Altimeter—Check.

   After setting the current field barometric pressure, place the AAU-19/A altimeter function switch momentarily in the STBY position. Check that the indicated altitude is within ±75 feet of the field elevation. Place function switch momentarily in RESET position. Check that STBY is not visible and that indicated altitude is within ±75 feet of field elevation. The indicated altitudes in the STBY and RESET positions must be within ±75 feet of each other.

CAUTION

Do not rotate the barometric set knob at a rapid rate or exert force to overcome momentary binding. If binding should occur, the required setting may be established by rotating the barometric set knob a full turn in the opposite direction and then approaching the desired setting carefully.

8. Fuel/Oxygen Check Switch—FUEL & OXY GAGE TEST.
9. Speed Brake—Closed.
10. Wing Flaps—Down, then As Required. (Check)

    Check visually for trailing-edge movement of horizontal tail as flaps are actuated. Trailing edge moves down as flaps are lowered, up as flaps are retracted. To ascertain proper horizontal tail position for takeoff trim, verify with the Crew Chief that the leading edge of the horizontal tail has repositioned properly.

WARNING

If the horizontal tail does not reposition to the proper position, do not attempt flight.

11. Flight Controls—Check.

    With normal movement, hydraulic pressure should not drop below 1500 psi.

*12. Brakes—Check Pedal Pressure.
13. Chocks—Removed.

TAXIING.

WARNING

If carbon monoxide contamination is suspected during ground operation, use 100% oxygen.

CAUTION

- Allow 3½ minutes to elapse after power has been applied to the attitude gyro control assembly before taxiing.
- If brake drag is encountered or suspected, the aircraft should be aborted.
- Simultaneous use of wheel brakes and nosewheel steering to effect turns results in excessive nosewheel tire wear. Nosewheel tires are severely damaged when maximum deflection turns are attempted at speeds in excess of 10 knots.
- A low nose gear strut indicates insufficient strut pressure and may result in a cocked nosewheel and/or damage to the nosewheel well during retraction. Do not fly the aircraft if the nose gear strut is deflated or if the strut "bottoms" during taxiing.

1. Nose Wheel Steering—Engage.
2. Turn and Slip Indicator—Check.
3. HSI—Check Correct Movement in Turns.
4. Crossfeed/Boost Pump Switches—As Required.

BEFORE TAKEOFF.

1. Battery Switch—Check ON.
2. Canopy Defog, Cabin Temp, and Pitot Heat—As Required.
3. Engine Anti-Ice—As Required.
4. Rotating Beacon—As Required.

*5. Parachute Arming Lanyard and Zero-Delay Lanyard—Check Attached.

*6. Cockpit Loose Items—Check Secured.

CAUTION

Both cockpits should be checked for loose items (cockpit utility light, safety pins, knee boards, publications, etc.). Check secured before closing canopy.

7. Takeoff Data—Review.
*8. Canopy—Closed, Locked; Warning light—Out.
9. Aileron Trim—Check.
10. Flaps—Set.

WARNING

Adjust seat to ensure ability to assume ejection position.

CAUTION

Should the canopy jam in the fully open position, the aircraft should not be taxied or towed until cleared by qualified maintenance personnel. Efforts to close the canopy or vibrations set up by aircraft movement could result in canopy separation.

LINEUP CHECK.

1. Nosewheel Steering—As Desired.
2. IFF/SIF—As Required.
3. Throttles—MIL.
4. Master Caution Light—Out.
5. Engine Instruments—Check.
6. Hydraulic Pressure—Check.
7. Flaps—Set As Required.

TAKEOFF.

Refer to T.O. 1T-38A-1.

AFTER TAKEOFF.

1. Landing Gear Lever—LG UP, when definitely airborne.

CAUTION

Check the red light in the gear handle out prior to 240 KIAS.

2. Wing Flap Lever—UP.
3. Aux Flap Switch—Normal.
4. Cross-Feed/Boost Pump Switches—As Required.

CLIMB.

Refer to T.O. 1T-38A-1.

AFTER LANDING (CLEAR OF RUNWAY).

1. Cabin Altimeter—Check.

   If reading is below field elevation, place cabin pressure switch at RAM DUMP before opening either canopy.

*2. Cockpit Loose Items—Check Secured (before opening canopy).

CAUTION

Ensure that instrument hood bungee cords are hooked before opening rear canopy.

3. Takeoff Trim—Set.
*4. Wing Flaps—UP.
5. Speed Brake—CLOSED.
6. Landing-Taxi Light—As Required.
7. Pitot Heat—OFF.
*8. TACAN, ILS, IFF/SIF—OFF.
9. Rotating Beacon—OFF.

ENGINE SHUTDOWN.

1. Position Lights—OFF.
*2. Canopy—Unlocked.

Note

The canopy seals will remain inflated if engines are shut down with both canopies locked.

3. Cabin Pressure Switch—CABIN PRESS.

Note

Allow 10 seconds for landing-taxi light retraction and/or closure of ram dump door prior to engine shutdown.

4. Operate engines at 70% RPM or below for a minimum of 1 minute.
5. Speed Brake—OPEN.
6. Throttles—OFF.
*7. Seat and Canopy Safety Pins—Install.

CAUTION

Check that all safety pins are fully inserted and seated.

*8. All Unguarded Switches–OFF.

*9. Oxygen–100%.

10. Wheels–Chocked.

11. Battery–OFF.

12. Flight Director Switch–OFF.

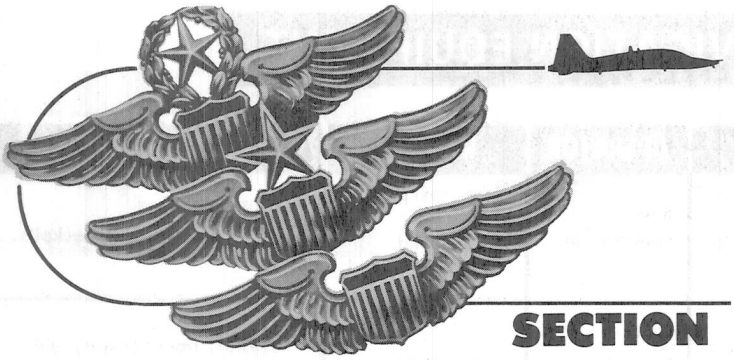
STRANGE FIELD PROCEDURES.

1. Fueling: Use MIL-T-5624, Grade JP-4 (NATO F-40).

2. Alternate Fuels: If alternate fuels are used, adjustment of the main fuel control density setting must be made when changing fuel types. Failure to do so will impair engine starting and acceleration limits. Based on known characteristics of Jet B, JP-4, Jet A-1, and JP-5, Jet B is most similar to JP-4 and Jet A-1, Jet A and Jet A-50 are most similar to JP-5. When using Jet B type fuel, the main fuel control density adjustment should be set at JP-4. The JP-5 setting is applicable for Jet A-1 type fuel. It is not necessary to make afterburner fuel control density settings for the normal Thunderbird mission. If the afterburner control density setting adjustments are not made, the setting for JP-4 is recommended. The richer fuel schedules that occur will result in some degradation in afterburner initiation at high altitude and low mach number conditions.

SECTION III

Refer to T.O. 1T-38A-1.



AUXILIARY EQUIPMENT

SECTION IV

T-38A (TB) 1-26

TABLE OF CONTENTS

COMMUNICATION AND NAVIGATION EQUIPMENT.

Communication and navigation equipment installed in the aircraft is listed in figure 4-1. Refer to figure 1-11 for electrical power requirements to operate the communication and navigation equipment and the associated controls.

VHF COMMAND RADIO SYSTEM 618M-2D.

The VHF command radio set provides voice transmission and reception within the 116.00 to 151.975 megahertz range. Radio transmissions may be made from either cockpit; however, reception is limited to the front cockpit.

VHF COMMAND RADIO CONTROLS.

The VHF command radio controls are on the VHF communication and navigation control panel (figure 4-2) on the pedestal of the front cockpit.

Communication Frequency Select Knobs.

The communication frequency select knobs (figure 4-2) select the VHF frequency which is displayed in the communication frequency select window.

Communication Power Control Knob.

The communication power control knob (figure 4-2) is concentric with the left communication frequency select knob. The knob has three placarded positions; OFF, PWR, and TEST. In the OFF position, power is removed from the VHF command radio. In the PWR (power) position, electrical power is applied to the set, and the system is activated. In the TEST position, the VHF communication receiver operation may be checked. With knob in the TEST position, the receiver squelch circuitry is disabled so that receiver background noise is heard when the receiver is operating.

Communication Volume Control Knob.

The communication volume control knob (figure 4-2) is concentric with the right communication frequency select knob. The knob adjusts the volume level of the VHF command radio. Clockwise rotation increases the volume; counterclockwise rotation decreases the volume.

Communication Frequency Select Window.

The communication frequency select window (figure 4-2) displays the frequency selected by the communications frequency select knobs on which the VHF command radio is transmitting and receiving.

VHF RADIO NAVIGATION SYSTEM 51RV-2B (VOR/ILS).

The VHF radio navigation set provides radio reception to the front cockpit only within the 108.00 to 117.95 megahertz range. These frequencies span the band of frequencies used in the navigation system of the VOR (VHF Omnidirectional Range) and the ILS (Instrument Landing System).

COMMUNICATION AND NAVIGATION EQUIPMENT

TYPE	DESIGNATION	USE	OPERATOR	RANGE	CONTROL LOCATION
INTERPHONE	AN/AIC-18	Crew intercommunication; flight crew and ground personnel intercommunication when aircraft is parked.	Both crewmembers	Either cockpit and exterior when ground receptacle is used.	Left subpanel — both cockpits.
UHF COMMAND RADIO	AN/ARC-34	Air-to-air and air-to-ground communication.	Front cockpit crewmember.	Line of sight.	Pedestal, front cockpit, and left subpanel — both cockpits.
VHF COMMAND RADIO	618M-2D	Air-to-air and air-to-ground communication.	Front cockpit crewmember.	Line of sight.	Pedestal and left subpanel — front cockpit.
TACAN	AN/ARN-65	Bearing and range information. Reception of identification signals.	Front cockpit crewmember.	Line of sight.	Pedestal, front cockpit, and left subpanel and instrument panel — both cockpits.
VOR/ILS (LOCALIZER, GLIDE SLOPE)	51RV-2B	Bearing information. Reception of identification signals. Vertical and horizontal guidance during approach.	Front cockpit crewmember.	Localizer — 18 miles. Glide slope — 10 miles.	Pedestal, front cockpit, and instrument panel — both cockpits.
MARKER BEACON	R844/ARN-58	Reception of marker beacon light signals.	Front cockpit crewmember.	Marker beacon — vertical.	Instrument panel — both cockpits.
AIMS	AN/APX-64	Automatic coded replies to ground interrogation for aircraft identification, altitude reporting, and air traffic control.	Front cockpit crewmember.	Line of sight.	Right console — front cockpit.

ANTENNA LOCATIONS

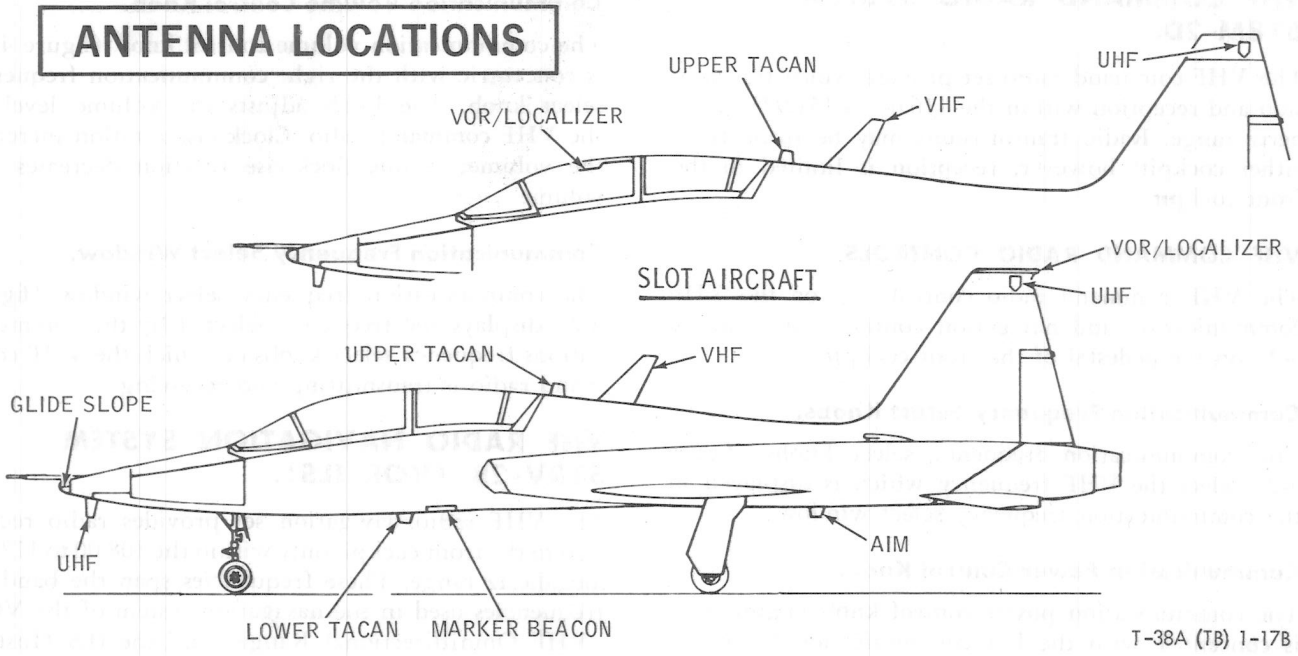
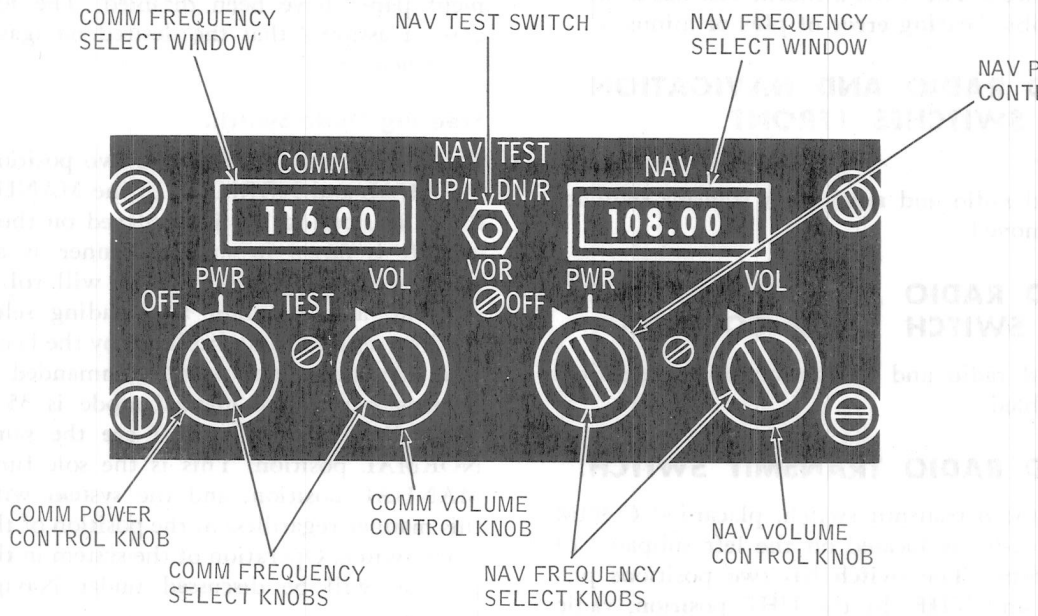


Figure 4-1.

VHF COMMUNICATION AND NAVIGATION CONTROL PANEL



T-38A (TB) 1-18

Figure 4-2.

VHF RADIO NAVIGATION CONTROLS.

The VHF radio navigation controls are located on the VHF communication and navigation control panel (figure 4-2) on the pedestal of the front cockpit.

Navigation Frequency Select Knobs.

The navigation frequency select knobs (figure 4-2) select the VHF frequency which is displayed in the navigation frequency select window.

Navigation Power Control Knob.

The navigation power control knob (figure 4-2) is concentric with the left navigation frequency select knob. The knob has two placarded positions; OFF and PWR. In the OFF position, power is removed from the VHF navigation radio receiver. In the PWR (power) position, electrical power is applied to the set, and the system is activated.

Navigation Volume Control Knob.

The navigation volume control knob (figure 4-2) is concentric with the right navigation frequency select knob. The knob adjusts the volume level of the VHF navigation radio receiver. Clockwise rotation increases the volume; counterclockwise rotation decreases the volume.

Navigation Frequency Select Window.

The navigation frequency select window (figure 4-2) displays the frequency selected by the navigation frequency select knobs on which the VHF navigation radio is receiving.

Navigation Test Switch.

The navigation test switch placarded NAV TEST (figure 4-2) on the top center of the VHF communication and navigation control panel is used to test the accuracy of the ILS and VOR operation. The navigation test switch is a four-position toggle switch with three placarded positions; UP/L, DN/R, and VOR. The switch is spring-loaded to a center unmarked position which turns the test function off. The ILS test is performed when the VHF navigation radio frequency is set to an odd frequency within the 108.1 to 111.9 megahertz range and the NAV TEST switch is placed and held in UP/L (up left) or DN/R (down right) position. In the UP/L position, the glide-slope indicator of the ADI deflects upward and the bank steering bar of the ADI and course deviation indicator of the HSI deflect to the left. When DN/R position is selected, a corresponding deflection of the glide-slope indicator, bank steering bar, and course deviation indicator should be noted. The VOR test is performed when the VHF navigation radio frequency is set to an even frequency within the 112.0 to 118.0 megahertz range and the NAV TEST switch is placed and held in the VOR position. The bearing pointer of the HSI should indicate 180°. Setting the course set knob to 180°, a "to" appears on the "to/from" indicator and the course deviation indicator on the HSI and bank steering bar of the ADI should center. The maximum permissible

indicated bearing error is plus or minus 4°. With the course set to 0°, the "to/from" indicator should indicate "from" and the course deviation indicator of the HSI and bank steering bar of the ADI should center within plus or minus 4°. The VOR test can be used as an airborne check. The VOR airborne test has a maximum permissible bearing error of plus or minus 6°.

COMMAND RADIO AND NAVIGATION TRANSFER SWITCHES (FRONT COCKPIT).

The command radio and navigation transfer switches have been removed.

COMMAND RADIO AND NAVIGATION OVERRIDE SWITCH (REAR COCKPIT).

The command radio and navigation override switch has been disabled.

COMMAND RADIO TRANSMIT SWITCH.

A command radio transmit switch, placarded COMM XMT (figure 1-6), is located on the left subpanel of the front cockpit. The switch has two positions placarded UHF and VHF. In the UHF position, radio transmissions are on the UHF command radio; in the VHF position, the radio transmissions are on the VHF command radio. The switch does not have any effect upon the receiver portion of the UHF or VHF command radios. Both radios may be monitored, regardless of switch position.

INTERCOM PANEL.

An intercom panel (figure 1-6, 1-7) on the left subpanel of each cockpit contains four volume control knobs, placarded INTER (interphone), UHF COMM (UHF command radio), TACAN NAV (AN/ARN-65), and a DISABLED control knob. With the UHF command radio or TACAN equipment turned on, pulling out the corresponding control knob permits headset reception of signals of the applicable equipment in the cockpit. Pulling out either interphone knob actuates the interphone system, providing interphone communications between crewmembers without the use of microphone switches. Volume in each cockpit is controlled by pulling out and rotating the applicable knob; the volume control knobs on the UHF command radio and TACAN control panels are inoperative.

FLIGHT DIRECTOR SYSTEM.

The controls for the flight director system are in the front cockpit. Refer to T.O. 1T-38A-1 for discussion of the controls. The instrument presentation is identical in both cockpits. The VHF radio navigation system has been incorporated into the flight director system to provide VOR/ILS capability.

STEERING MODE SWITCH AND NAVIGATION MODE SWITCH.

A steering mode switch and a navigation mode switch (figure 1-4) are located on the instrument panel of the front cockpit. The switches on the rear cockpit instrument panel have been disabled. The following discussion assumes that the desired navigation facilities are tuned in.

Steering Mode Switch.

The steering mode switch has two positions placarded MANUAL and NORMAL. In the MANUAL position, the bank steering bar is displayed on the ADI. If the aircraft is flown in such a manner as to center the bank steering bar, the aircraft will roll in, turn to, roll out, and maintain the heading selected by the heading set knob and displayed by the heading marker. The maximum bank angle commanded by the bank steering bar in the manual mode is 35 degrees. All other displays on the ADI are the same as in the NORMAL position. This is the sole function of the MANUAL position, and the system will operate in this manner regardless of the position of the navigation mode switch. Operation of the system in the NORMAL position will be discussed under Navigation Mode Switch.

Navigation Mode Switch.

The navigation mode switch has five placarded positions; TCN (TACAN), TCN/LOC, TCN/ILS, VOR/LOC, and VOR/ILS. The following discussion of switch selections assumes that the steering mode switch is in the NORMAL position.

TACAN Selected. When TACAN is selected, the bearing pointer indicates magnetic bearing to the TACAN station. The course arrow and course window, which are set simultaneously with the course set knob, indicate the TACAN course selected. The course deviation indicator will show the aircraft position relative to the selected TACAN course, and the range indicator indicates range to the TACAN station in nautical miles. The "to/from" indicator indicates whether the course selected, if intercepted and flown, will lead the aircraft "to" or "from" the station. No steering bars are in view.

TACAN/LOC Selected. When TACAN/LOC is selected, the bearing pointer indicates the magnetic bearing to the TACAN station. The course arrow and course window, which are set simultaneously with the course set knob, indicate the localizer course selected. The course deviation indicator will show the aircraft position relative to the localizer course when ILS frequencies are selected. The "to/from" indicator indicates whether the localizer course selected, if intercepted and flown, will lead the aircraft "to" or "from"

the TACAN station. The range indicator indicates the range to the TACAN station in nautical miles. The bank steering bar will be in view when ILS frequencies are selected. The pitch steering bar is out of view. If within the area of glide-slope reception, the glide-slope flag will be out of view and the glide-slope indicator will provide indications of the aircraft position relative to the glide slope. When VOR frequencies are selected the course deviation indicator is centered and inactive. No steering bars are in view.

TACAN/ILS Selected. When TACAN/ILS is selected, the bearing pointer indicates the magnetic bearing to the TACAN station. The course arrow and course window, which are set simultaneously with the course set knob, indicate the localizer course selected. The course deviation indicator will show the aircraft position relative to the localizer course when ILS frequencies are selected. The "to/from" indicator indicates whether the localizer course selected, if intercepted and flown, will lead the aircraft "to" or "from" the TACAN station. When ILS frequencies are selected, the bank steering bar, pitch steering bar, and glide-slope indicator will be in view. The bank required to center the bank steering bar is reduced from a maximum of 35 degrees to 15 degrees. The glide-slope indicator will provide indications of the aircraft position relative to the glide-slope, and the pitch steering bar will provide pitch steering relative to the glide slope. When VOR frequencies are selected, the course deviation indicator is centered and inactive. No steering bars are in view.

VOR/LOC Selected. When the VOR/LOC is selected and a VOR frequency is tuned in, the bearing pointer indicator indicates the magnetic bearing to the VOR station. The course arrow and course window, which are set simultaneously with the course set knob, indicate the VOR course selected. The course deviation indicator will show the aircraft position relative to the VOR course selected. The "to/from" indicator indicates whether the course selected, if intercepted and flown, will lead the aircraft "to" or "from" the VOR station. When the VOR station is equipped with DME or TACAN, the range indicator indicates the range to the station in nautical miles. No steering bars are in view. When an ILS frequency is selected, the bearing pointer is locked at the 3-o'clock position. The course deviation indicator will show the aircraft position relative to the localizer course. The "to/from" indicator is out of view. The bank steering bar will be in view. The pitch steering bar will be out of view. If within the area of glide-slope reception, the glide-slope flag will be out of view and the glide-slope indicator will provide indications of the aircraft position relative to the glide slope.

VOR/ILS Selected. When VOR/ILS is selected and an ILS frequency is tuned in, the bearing pointer is locked at the 3-o'clock position. The course arrow and course window, which are set simultaneously with the course set knob, indicate the localizer course selected. The course deviation indicator will show the aircraft position relative to the localizer course selected. The "to/from" indicator is out of view. The bank steering bar, pitch steering bar, and glide-slope indicator will be in view. The bank required to center the bank steering bar is reduced from a maximum of 35 degrees to 15 degrees. The glide-slope indicator will provide indications of the aircraft position relative to the glide slope, and the pitch steering bar will provide pitch steering relative to the glide slope. When a VOR frequency is selected, the bearing pointer indicates the magnetic bearing to the VOR station. The course deviation indicator will show the aircraft position relative to the VOR course selected. The "to/from" indicator indicates whether the course selected, if intercepted and flown, will lead the aircraft "to" or "from" the VOR station. When the VOR station is equipped with DME or TACAN, the range indicator indicates the range to the station in nautical miles. No steering bars are in view.

FLIGHT DIRECTOR OPERATION.

Refer to AFM 51-37, INSTRUMENT FLYING, for course interception using the flight director system. Refer to table 1 for Flight Director System Operational Chart.

ANGLE-OF-ATTACK SYSTEM.

The angle-of-attack system has been removed from the aircraft.

ANTI-G SUIT SYSTEM.

The anti-G suit system has been removed from the aircraft.

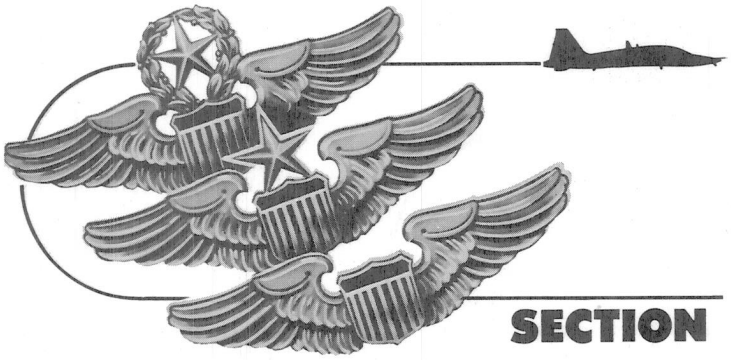
MXU RECORDER.

An MXU recorder has been installed in two aircraft to record VGH, strain, pitch, and roll rates.

Table 1. Flight Director System Operational Chart

NAVIGATION MODE SWITCH	STEERING MODE SWITCH	VOR/ILS FREQUENCY	HSI: HEADING MARKER	HSI: COURSE ARROW & COURSE SELECTOR WINDOW	HSI: BEARING POINTER	HSI: COURSE DEVIATION INDICATOR	HSI: TO/FROM INDICATOR	HSI: RANGE INDICATOR	ADI: BANK STEERING BAR	ADI: PITCH STEERING BAR	ADI: GLIDE-SLOPE INDICATOR	ADI: COURSE WARNING FLAG	ADI: GLIDE-SLOPE WARNING FLAG	ADI: ATTITUDE WARNING FLAG
TCN	NORMAL	ANY FREQUENCY	MANUALLY SET TO COMMAND HEADING	MANUALLY SET TO TACAN COURSE	BEARING TO TACAN STATION	TACAN COURSE DEVIATION	COURSE SET TO OR FROM TACAN STATION	DISTANCE FROM TACAN STATION	OUT OF VIEW	OUT OF VIEW	OUT OF VIEW	OUT OF VIEW	OUT OF VIEW	OUT OF VIEW WHILE ATTITUDE INDICATION IS RELIABLE
TCN	MANUAL								COMMAND HEADING AND ROLL					
TCN/LOC	NORMAL	ILS		MANUALLY SET TO LOCALIZER COURSE		LOCALIZER COURSE DEVIATION			ROLL, COMMAND COURSE, AND LOCALIZER DEVIATION		GLIDE-SLOPE DEVIATION	OUT OF VIEW WHILE LOCALIZER SIGNAL IS RELIABLE	OUT OF VIEW WHILE GLIDE-SLOPE SIGNAL IS RELIABLE	
		VOR				CENTERED (INACTIVE)			OUT OF VIEW		OUT OF VIEW	IN VIEW	IN VIEW	
TCN/LOC	MANUAL	ILS				LOCALIZER COURSE DEVIATION			COMMAND HEADING AND ROLL		GLIDE-SLOPE DEVIATION	OUT OF VIEW WHILE LOCALIZER SIGNAL IS RELIABLE	OUT OF VIEW WHILE GLIDE-SLOPE SIGNAL IS RELIABLE	
		VOR				CENTERED (INACTIVE)					OUT OF VIEW	IN VIEW	IN VIEW	
TCN/ILS	NORMAL	ILS				LOCALIZER COURSE DEVIATION			ROLL, LOCALIZER DEVIATION, AND LOCALIZER RATE	PITCH AND GLIDE-SLOPE DEVIATION	GLIDE-SLOPE DEVIATION	OUT OF VIEW WHILE LOCALIZER SIGNAL IS RELIABLE	OUT OF VIEW WHILE GLIDE-SLOPE SIGNAL IS RELIABLE	
		VOR				CENTERED (INACTIVE)			OUT OF VIEW		OUT OF VIEW	IN VIEW	IN VIEW	
TCN/ILS	MANUAL	ILS				LOCALIZER COURSE DEVIATION			COMMAND HEADING AND ROLL		GLIDE-SLOPE DEVIATION	OUT OF VIEW WHILE LOCALIZER SIGNAL IS RELIABLE	OUT OF VIEW WHILE GLIDE-SLOPE SIGNAL IS RELIABLE	
		VOR				CENTERED (INACTIVE)					OUT OF VIEW	IN VIEW	IN VIEW	
VOR/LOC	NORMAL	ILS			LOCKED AT 3 O'CLOCK	LOCALIZER COURSE DEVIATION	OUT OF VIEW		ROLL, COMMAND COURSE, AND LOCALIZER DEVIATION	OUT OF VIEW	GLIDE-SLOPE DEVIATION	OUT OF VIEW WHILE LOCALIZER SIGNAL IS RELIABLE	OUT OF VIEW WHILE GLIDE-SLOPE SIGNAL IS RELIABLE	
		VOR		MANUALLY SET TO VOR COURSE	BEARING TO VOR STATION	VOR COURSE DEVIATION	COURSE SET TO OR FROM VOR STATION		OUT OF VIEW		OUT OF VIEW	OUT OF VIEW	OUT OF VIEW	
VOR/LOC	MANUAL	ILS		MANUALLY SET TO LOCALIZER COURSE	LOCKED AT 3 O'CLOCK	LOCALIZER COURSE DEVIATION	OUT OF VIEW	DISTANCE FROM TACAN OR DME STATION WITH TACAN RECEIVER TUNED	COMMAND HEADING AND ROLL		GLIDE-SLOPE DEVIATION	OUT OF VIEW WHILE LOCALIZER SIGNAL IS RELIABLE	OUT OF VIEW WHILE GLIDE-SLOPE SIGNAL IS RELIABLE	
		VOR		MANUALLY SET TO VOR COURSE	BEARING TO VOR STATION	VOR COURSE DEVIATION	COURSE SET TO OR FROM VOR STATION				OUT OF VIEW	OUT OF VIEW	OUT OF VIEW	
VOR/ILS	NORMAL	ILS		MANUALLY SET TO LOCALIZER COURSE	LOCKED AT 3 O'CLOCK	LOCALIZER COURSE DEVIATION	OUT OF VIEW		ROLL, LOCALIZER DEVIATION, AND LOCALIZER RATE	PITCH AND GLIDE-SLOPE DEVIATION	GLIDE-SLOPE DEVIATION	OUT OF VIEW WHILE LOCALIZER SIGNAL IS RELIABLE	OUT OF VIEW WHILE GLIDE-SLOPE SIGNAL IS RELIABLE	
		VOR		MANUALLY SET TO VOR COURSE	BEARING TO VOR STATION	VOR COURSE DEVIATION	COURSE SET TO OR FROM VOR STATION		OUT OF VIEW		OUT OF VIEW	OUT OF VIEW	OUT OF VIEW	
VOR/ILS	MANUAL	ILS		MANUALLY SET TO LOCALIZER COURSE	LOCKED AT 3 O'CLOCK	LOCALIZER COURSE DEVIATION	OUT OF VIEW		COMMAND HEADING AND ROLL	OUT OF VIEW	GLIDE-SLOPE DEVIATION	OUT OF VIEW WHILE LOCALIZER SIGNAL IS RELIABLE	OUT OF VIEW WHILE GLIDE-SLOPE SIGNAL IS RELIABLE	
		VOR		MANUALLY SET TO VOR COURSE	BEARING TO VOR STATION	VOR COURSE DEVIATION	COURSE SET TO OR FROM VOR STATION				OUT OF VIEW	OUT OF VIEW	OUT OF VIEW	

T-38A (TB) 1-20



OPERATING LIMITATIONS

SECTION V

T-38A (TB) 1-27

TABLE OF CONTENTS

GENERAL.

Refer to the operating limitations in T.O. 1T-38A-1.

AIRSPEED LIMITATIONS.

LANDING GEAR.

CAUTION

Extension/retraction of landing gear at bank angles other than 0 to 45 degrees or inverted level flight at 180 degrees angle of bank, or at load factors greater than 1.5 G's can result in overstress failure of the main landing gear sidebrace trunnion and is prohibited.

LOAD FACTOR LIMITATIONS.

SYMMETRICAL FLIGHT.

Do not exceed −2.0 to +5.0 G's at gross weights above 12,000 pounds (limit 12,300 pounds) clean aircraft.

ASYMMETRICAL FLIGHT.

Do not exceed −1.0 to +4.0 G's at roll entry at gross weights above 12,000 pounds (limit 12,300 pounds) clean aircraft.

Roll Entry Load Factor (G's)	*Weight of Fuel Remaining (Pounds)*
−1.5 to +4.4	Fully fueled
−1.5 to +4.7	2700
−1.5 to +5.2	1400 or less

PROHIBITED MANEUVERS.

ROLLS.

Do not enter continuous aileron rolls at any load factor greater than 1.0 G or less than 0 G.

MISCELLANEOUS LIMITATIONS.

WEIGHT AND CENTER-OF-GRAVITY LIMITATIONS.

In the show configuration, the center of gravity moves forward approximately 0.4% MAC as the oil in the smoke system is expended.

ENGINE OIL SYSTEM.

Due to engine oil supply and pressure requirements, zero-G flight is restricted to 10 seconds and negative-G or inverted flight to 60 seconds. A momentary drop or loss of oil pressure may be experienced during negative-G or inverted flight.

SECTION VI

Refer to T.O. 1T-38A-1.

SYSTEMS OPERATION

SECTION VII

T-38A(TB) 1-29

TABLE OF CONTENTS

FUEL MANAGEMENT.

When the aircraft is in the show configuration, the left fuel system is 319 pounds lower than the right fuel system. Balance the fuel systems as soon as possible after starting the engines. Refer to T.O. 1T-38A-1, section V, for weight and center-of-gravity limitations.

EFFECT OF COMPRESSOR INLET TEMPERATURE (T_2 CUTBACK).

T_2 HEATER SYSTEM.

A T_2 heater system provides the engine inlet temperature sensor system (T_2) of each engine with the capability of improved system response. Eighth-stage compressor bleed air is directed on the sensor to improve response rate of the engine inlet guide vane and bleed valve systems during periods of rapid increase in inlet temperature. An air temperature probe, mounted on the fuselage dorsal, activates the system for approximately 15 seconds when a total temperature of 120°F or above is reached. The system compensates for rapid changes in temperature by increasing the response capability of the inlet guide vane system and thus providing adequate protection against compressor blade instability and compressor stall. A slight decrease in engine rpm during system operation at MIL or MAX range power will be observed.

SECTION VIII

CREW DUTIES

(Not Applicable)

SECTION IX

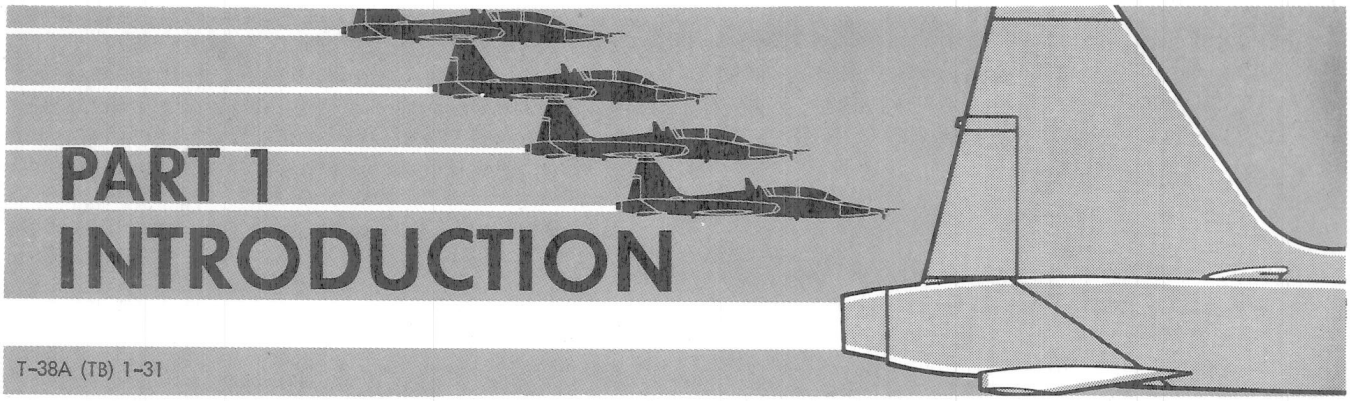
Refer to T.O. 1T-38A-1.

PERFORMANCE DATA

APPENDIX I

TABLE OF CONTENTS

* REFER TO BASIC FLIGHT MANUAL, T.O. 1T-38A-1.



PART 1
INTRODUCTION

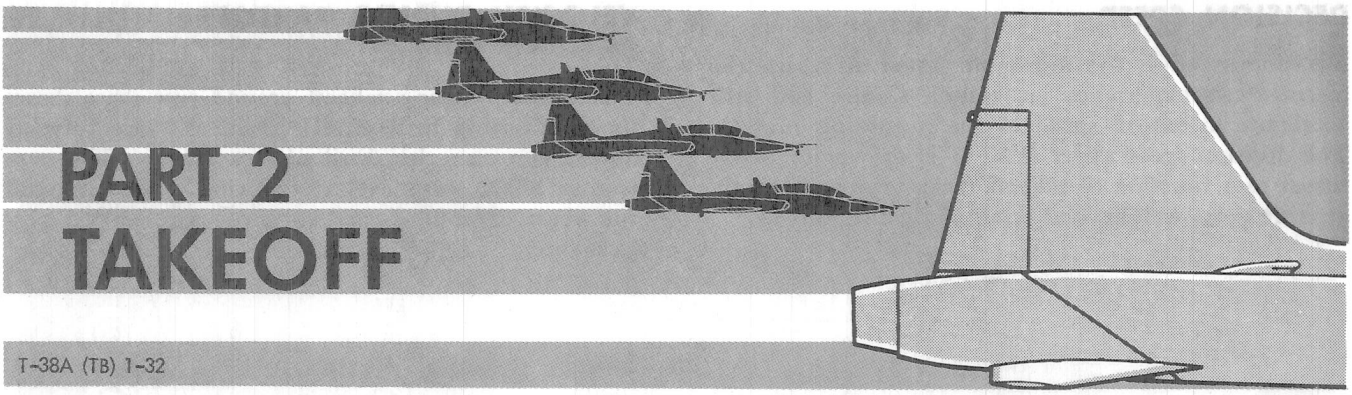
T-38A (TB) 1-31

TABLE OF CONTENTS

INTRODUCTION.

The flight performance charts provide the USAF Flight Demonstration Team with flight test data for planning formation takeoffs using no flaps. When individual takeoffs are to be made with flaps at 60%, refer to the takeoff charts in T.O. 1T-38A-1, Appendix I, part 2. Instrument error is assumed to be zero in all performance charts of this appendix.

ELECTRICAL SYSTEM



PART 2
TAKEOFF

T-38A (TB) 1-32

TABLE OF CONTENTS

FORMATION TAKEOFF.

The formation takeoff charts are based on flaps up and 10 percent margin above power-off stall speed at liftoff. Thrust is degraded approximately 4 percent in the 60% nozzle position indication.

TAKEOFF FACTOR.

The takeoff factor is a number which is common to all takeoff charts for a MAX thrust rating and given atmospheric conditions. The takeoff factor chart (FA2-1) shows the takeoff factor as a function of pressure altitude, runway air temperature, and thrust rating at maximum afterburner and 60% nozzle position indication.

TAKEOFF SPEED.

Takeoff speed is the speed at which the main gear lifts off the runway. The takeoff speed chart (FA2-2) enables the formation leader to determine the rotation speed, takeoff speed, and the climb speed to be attained to clear a 50-foot obstacle. The takeoff speed chart shows the rotation and takeoff speeds as a function of aircraft gross weight and the 50-foot obstacle speed as a function of takeoff factor and aircraft gross weight.

TAKEOFF DISTANCE.

Takeoff distance is ground run distance in feet to liftoff. Takeoff distance to clear a 50-foot obstacle is ground run distance in feet to liftoff plus the air distance to clear a 50-foot obstacle. The takeoff distance charts (FA2-3, FA2-4), show ground run distance and total distance to clear a 50-foot obstacle as a function of takeoff factor, gross weight, wind velocity, and runway slope for takeoff on a dry, hard surface runway. The charts show data for formation takeoff at MAX thrust, using the procedure described in Formation Takeoff.

CRITICAL FIELD LENGTH.

Critical field length is the total length required to accelerate with both engines operating to the critical engine failure speed, experience an engine failure, then either continue to takeoff or stop. The critical field length chart (FA2-5) is shown for MAX thrust as a function of takeoff factor, aircraft gross weight, wind along the runway, and runway condition reading (RCR).

REFUSAL SPEED.

Refusal speed is the maximum speed to which formation can accelerate and then stop in the remaining runway length. The refusal speed chart (FA2-6) is shown for MAX thrust as a function of takeoff factor, runway length, and runway condition reading (RCR).

CRITICAL ENGINE FAILURE SPEED.

Critical engine failure speed is the speed to which the aircraft will accelerate with both engines at MAX, experience an engine failure, and permit either acceleration to takeoff or deceleration to a stop in the same distance. The critical engine failure speed chart (FA2-6) is shown for MAX thrust as a function of takeoff factor, critical field length, and runway condition reading (RCR).

DECISION SPEED.

Decision speed is the minimum speed at which the aircraft can experience an engine failure and still accelerate to takeoff speed in the remaining runway. The decision speed chart (FA2-7) is shown for MAX thrust as a function of takeoff factor, runway length, aircraft gross weight, and wind along the runway.

VELOCITY DURING TAKEOFF GROUND RUN.

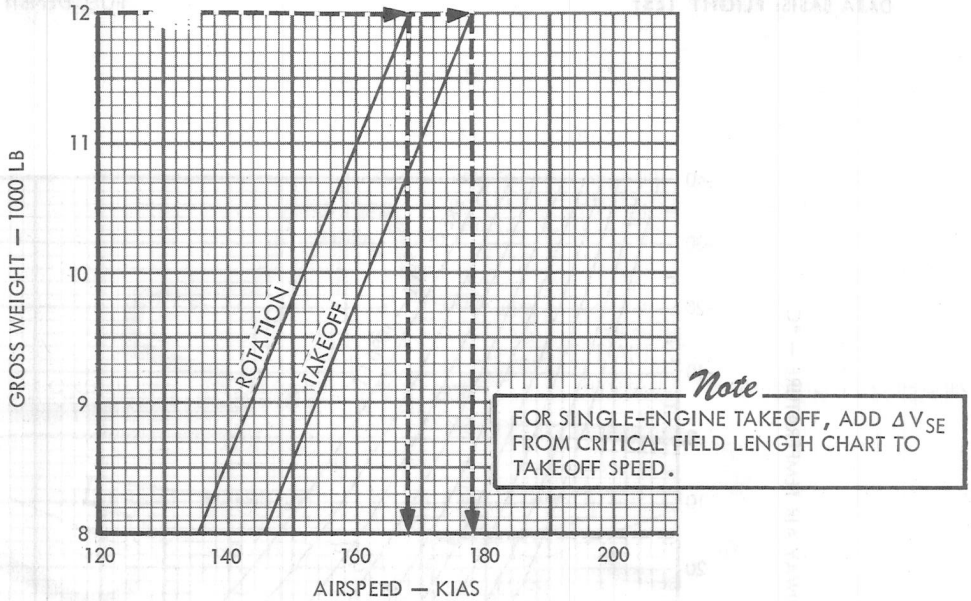
The velocity during takeoff ground run chart shows the relationship between KIAS and distance traveled during run on a dry, hard surface runway. The two-engine MAX thrust velocity during takeoff ground run chart (FA2-8) is used to check acceleration performance.

TAKEOFF SPEED

MAX THRUST
FLAPS — UP

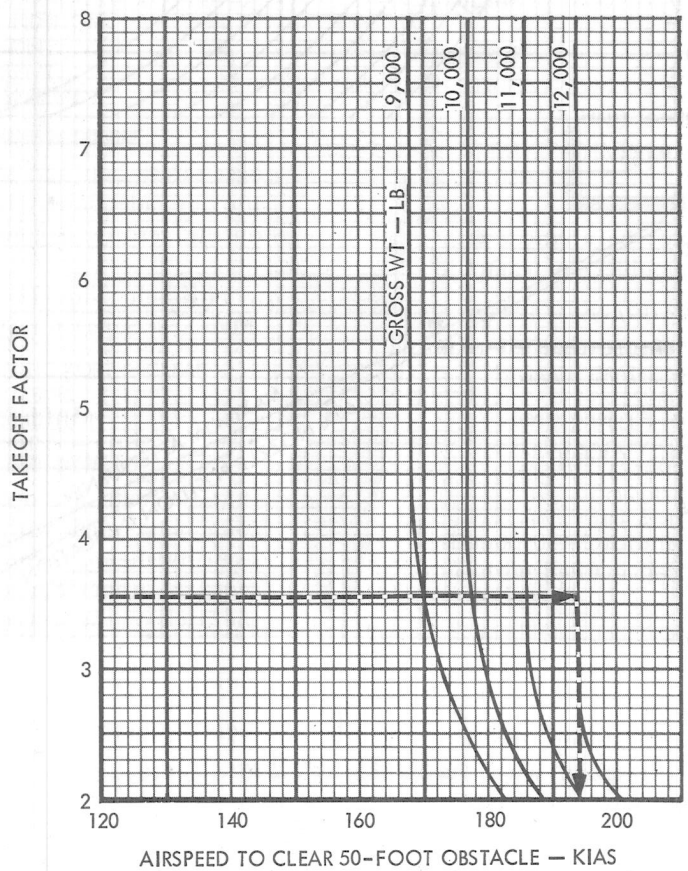
MODEL: T-38A THUNDERBIRD
DATE: 1 JUNE 1974
DATA BASIS: **FLIGHT TEST**

ENGINES: (2) J85-GE-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/US GAL



Note

FOR SINGLE-ENGINE TAKEOFF, ADD ΔV_{SE} FROM CRITICAL FIELD LENGTH CHART TO TAKEOFF SPEED.



T-38A (TB) 1-37B

FA2-2.

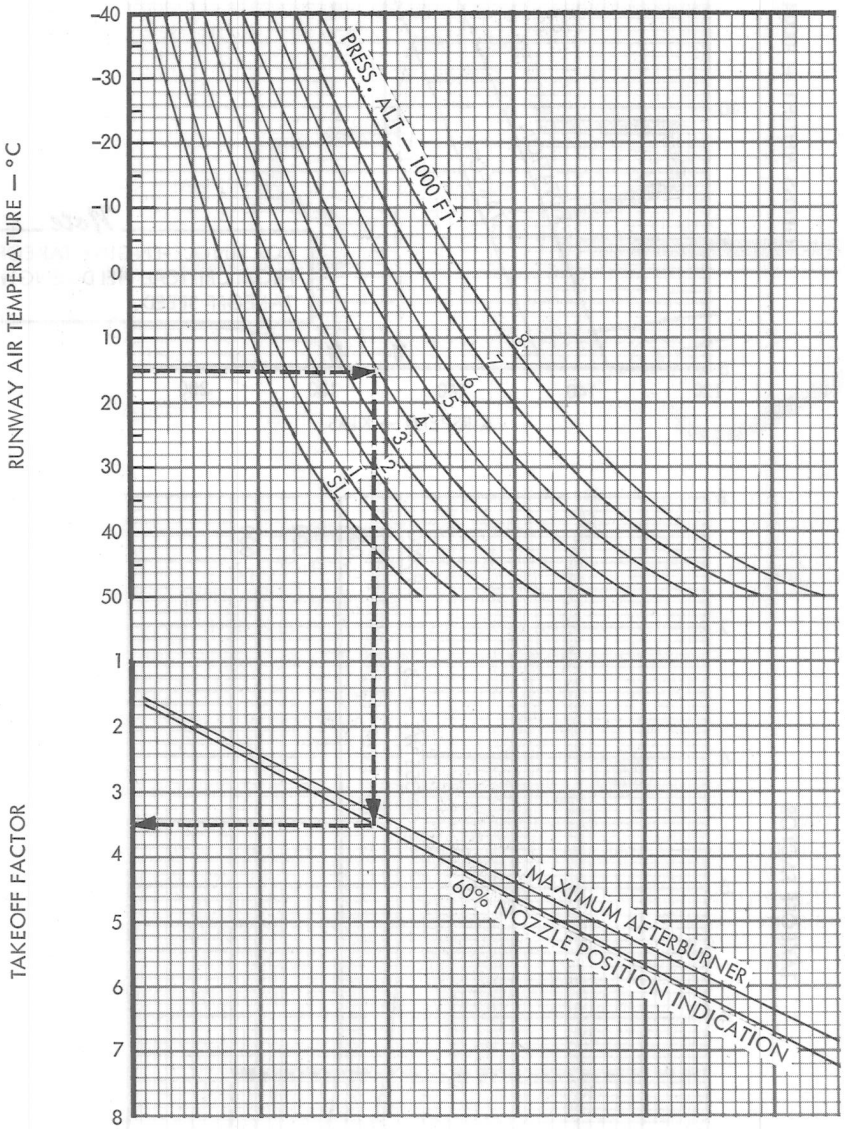
TAKEOFF FACTOR

MAX THRUST

FLAPS — UP

MODEL: T-38A THUNDERBIRD
DATE: 1 JUNE 1974
DATA BASIS: **FLIGHT TEST**

ENGINES: (2) J85-GE-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/US GAL



T-38A (TB) 1-36 A

FA2-1.

TAKEOFF DISTANCE

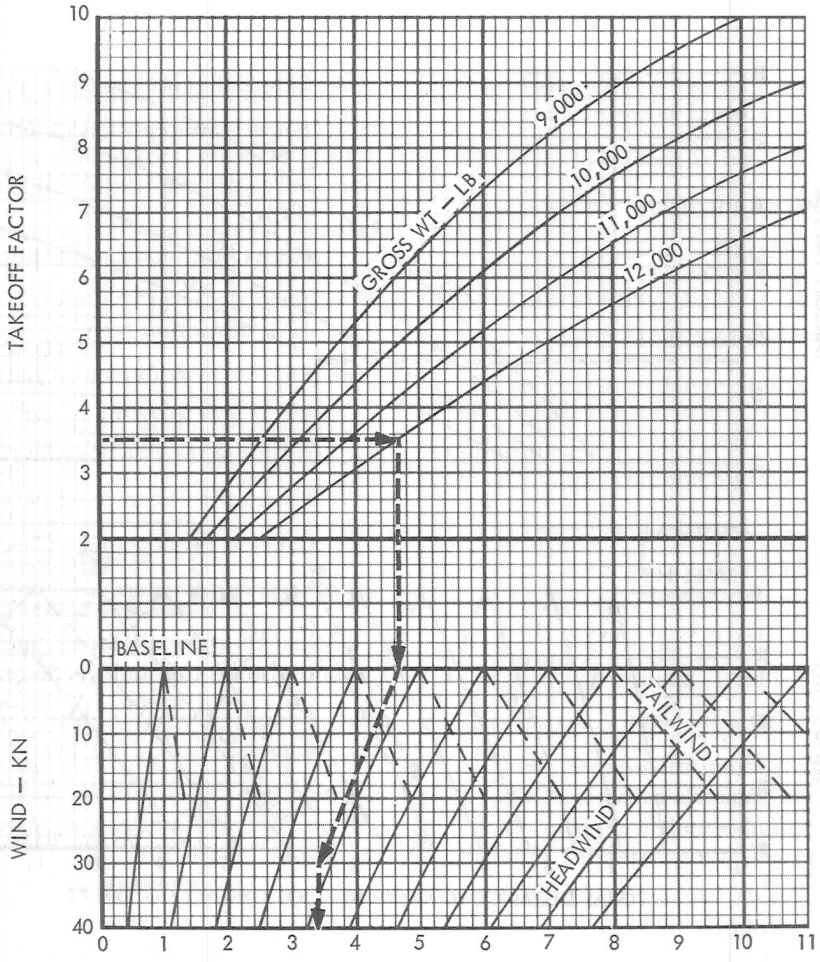
MAX THRUST

DRY, HARD-SURFACED RUNWAY

FLAPS — UP

MODEL: T-38A THUNDERBIRD
DATE: 1 JUNE 1974
DATA BASIS: **FLIGHT TEST**

ENGINES: (2) J85-GE-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/US GAL



Note

INCREASE GROUND RUN DISTANCE 5 PERCENT FOR EACH PERCENT OF UPHILL RUNWAY SLOPE.

T-38A (TB) 1-38A

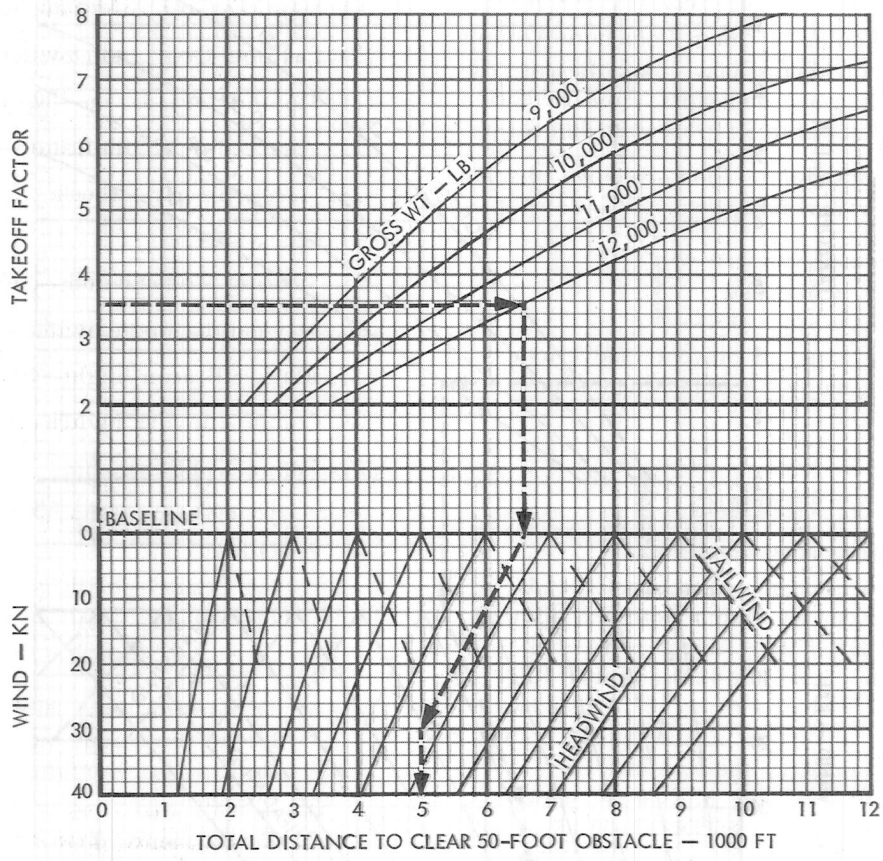
FA2-3.

TAKEOFF DISTANCE TO CLEAR 50-FOOT OBSTACLE

MAX THRUST
DRY, HARD-SURFACED RUNWAY
FLAPS — UP

MODEL: T-38A THUNDERBIRD
DATE: 1 JUNE 1974
DATA BASIS: **FLIGHT TEST**

ENGINES: (2) J85-GE-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/US GAL



Note

INCREASE TOTAL DISTANCE 5 PERCENT FOR EACH PERCENT OF UPHILL RUNWAY SLOPE.

T-38A (TB) 1-39A

FA2-4.

CRITICAL FIELD LENGTH

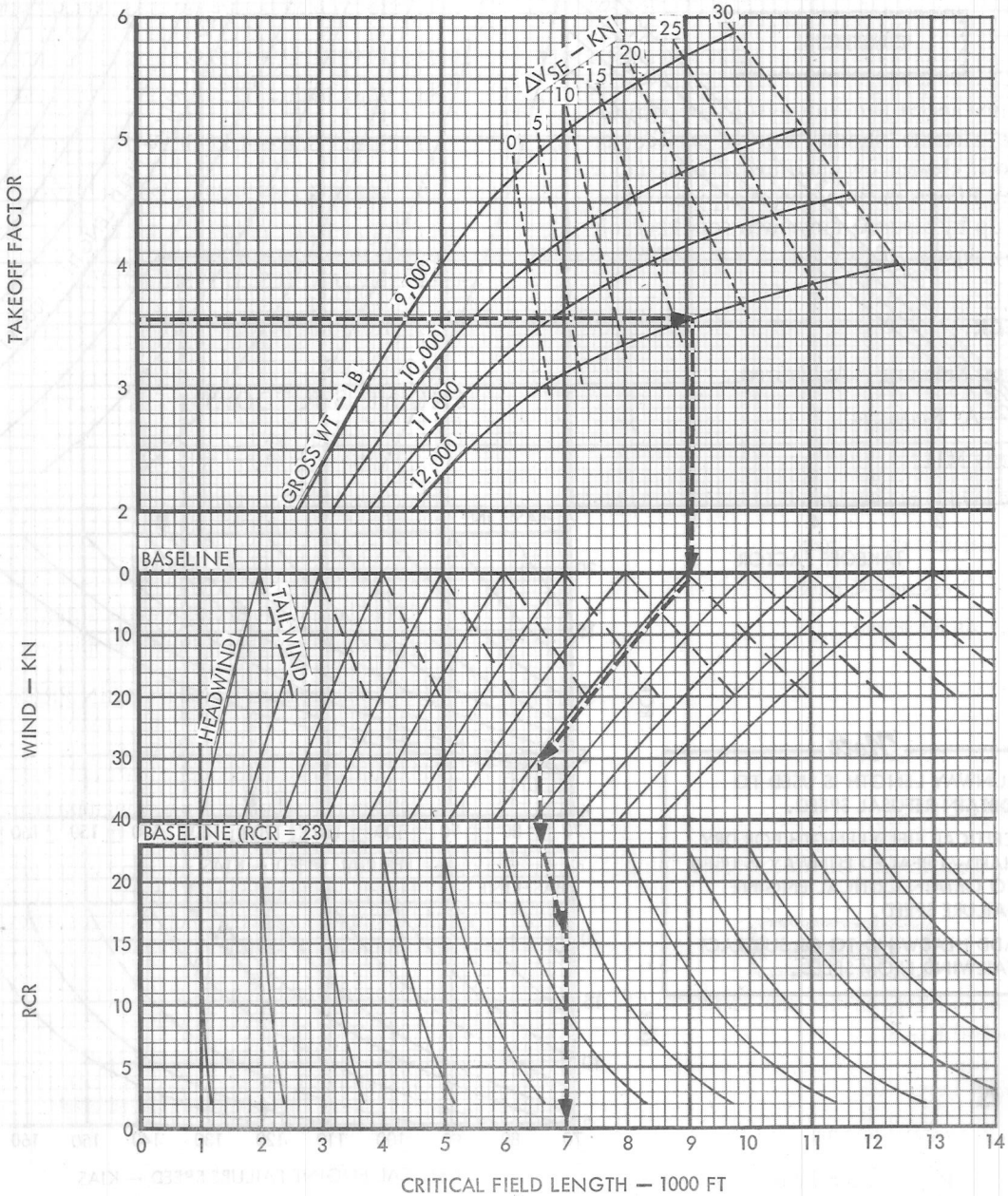
MAX THRUST
FLAPS – UP

MODEL: T-38A THUNDERBIRD
DATE: 1 JUNE 1974
DATA BASIS: **FLIGHT TEST**

ENGINES: (2) J85-GE-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/US GAL

Note

- FOR SINGLE-ENGINE TAKEOFF SPEED, ADD ΔV_{SE} TO TAKEOFF SPEED.
- INCREASE CRITICAL FIELD LENGTH 5 PERCENT FOR EACH PERCENT OF UPHILL RUNWAY SLOPE.



T-38A (TB) 1-40A

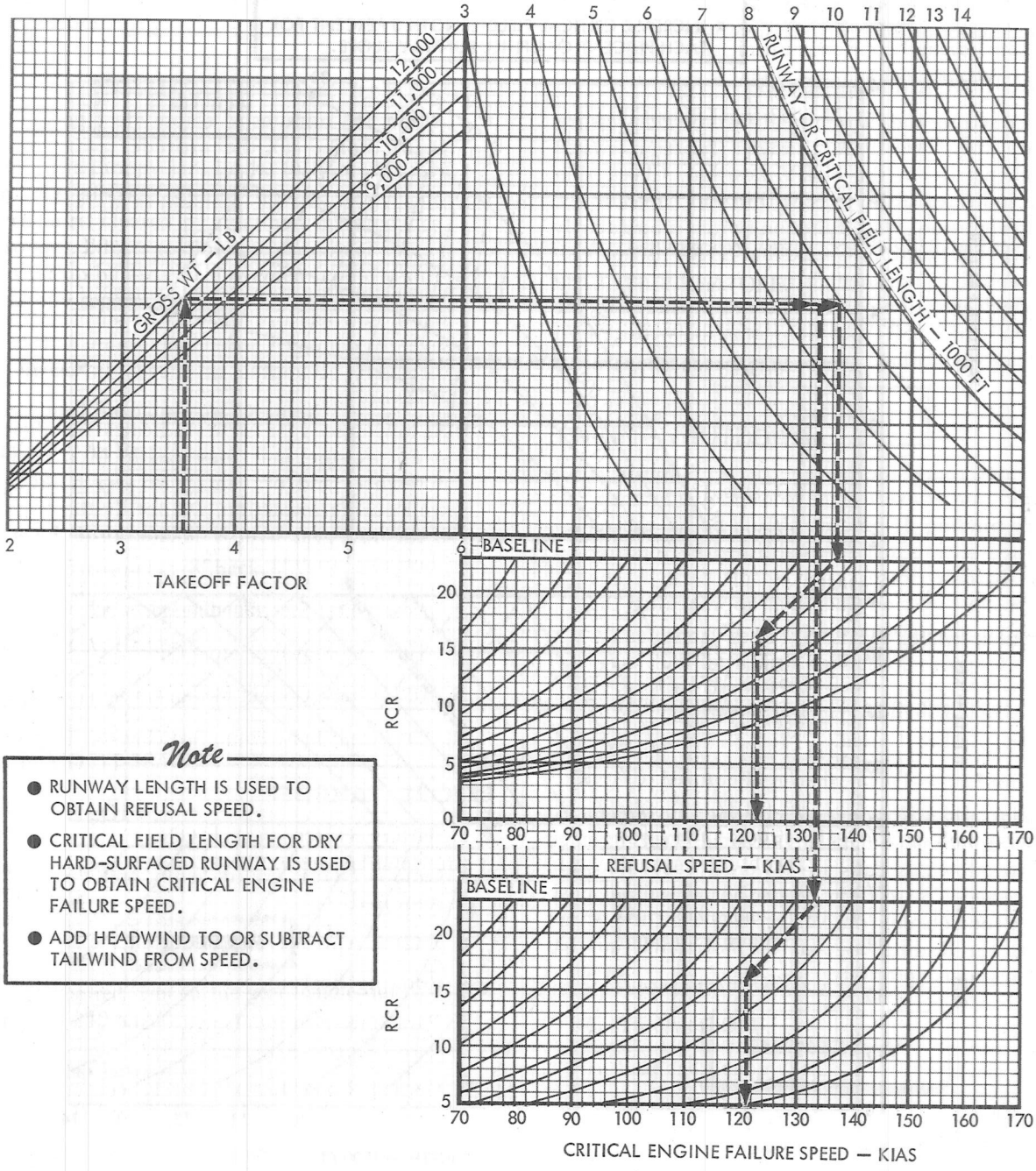
FA2-5.

REFUSAL SPEED OR CRITICAL ENGINE FAILURE SPEED

MAX THRUST
FLAPS — UP

MODEL: T-38A THUNDERBIRD
DATE: 1 JUNE 1974
DATA BASIS: **FLIGHT TEST**

ENGINES: (2) J85-GE-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/US GAL



Note

- RUNWAY LENGTH IS USED TO OBTAIN REFUSAL SPEED.
- CRITICAL FIELD LENGTH FOR DRY HARD-SURFACED RUNWAY IS USED TO OBTAIN CRITICAL ENGINE FAILURE SPEED.
- ADD HEADWIND TO OR SUBTRACT TAILWIND FROM SPEED.

T-38 (TB) 1-41A

FA2-6.

DECISION SPEED

MAX THRUST

DRY HARD — SURFACED RUNWAY

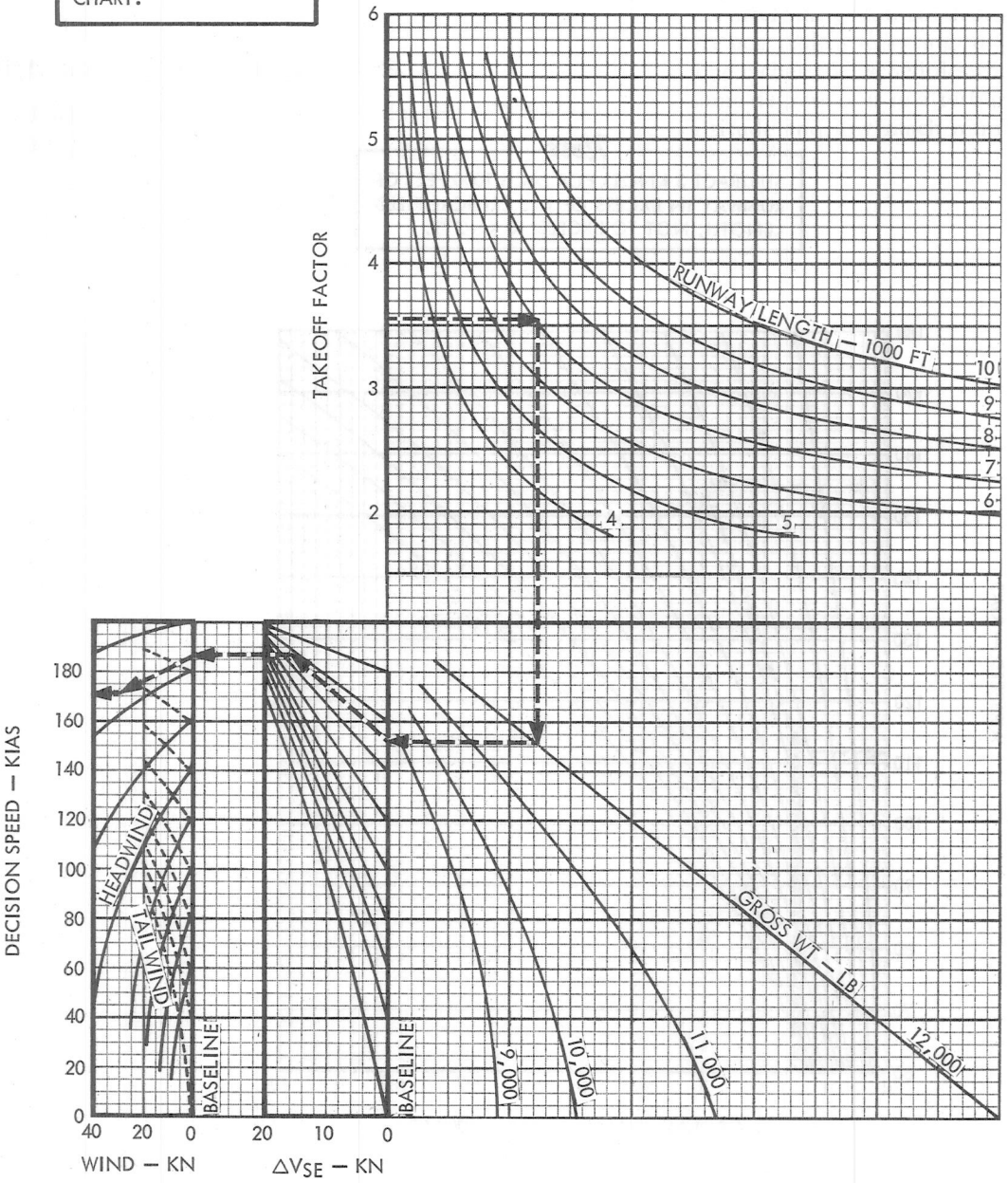
FLAPS — UP

MODEL: T-38A THUNDERBIRD
DATE: 1 JUNE 1974
DATA BASIS: **FLIGHT TEST**

ENGINES: (2) J85-GE-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/US GAL

Note

OBTAIN ΔV_{SE} FROM CRITICAL FIELD LENGTH CHART.



FA2-7.

VELOCITY DURING TAKEOFF GROUND RUN

DRY, HARD-SURFACED RUNWAY

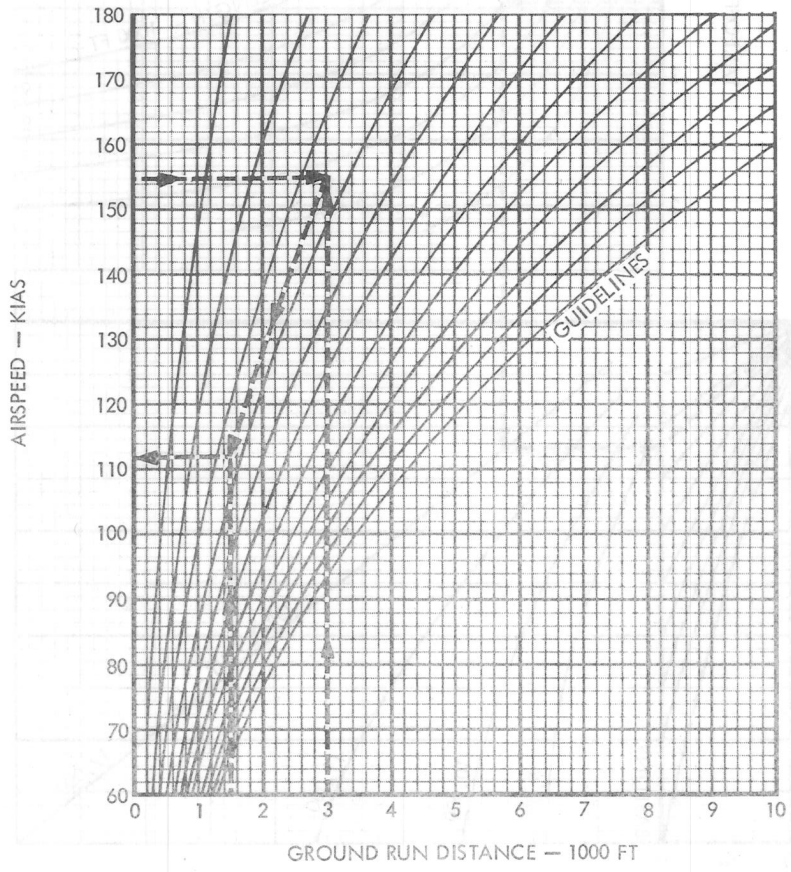
FLAPS — UP

MODEL: T-38A THUNDERBIRD
DATE: 1 JUNE 1974
DATA BASIS: **FLIGHT TEST**

ENGINES: (2) J85-GE-5
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/US GAL

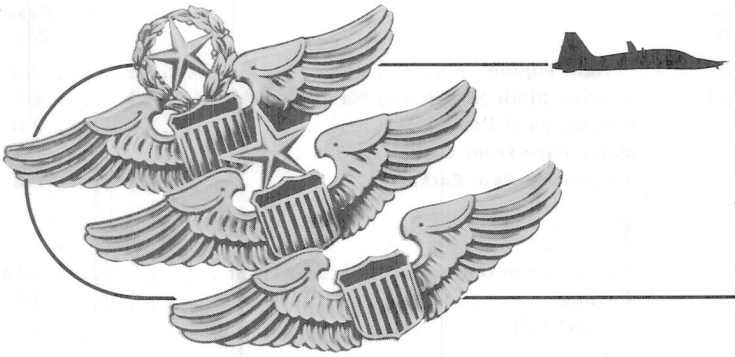
Note

SUBTRACT 3 KNOTS FOR EACH 1000 FEET OF RUNWAY IN EXCESS OF THE CRITICAL FIELD LENGTH, NOT TO EXCEED 10 KNOTS.



T-38A (TB) 1-43

FA2-8.



ALPHABETICAL INDEX

T-38A (TB) 1-35

(Boldface Type Denotes Illustration)

O

P

R

S

T

V