SUPPLEMENT

FLIGHT MANUAL

F-104G

GAF AIRCRAFT ONLY

EQUIPPED WITH FLIGHT DATA RECORDER LEADS 200

Beachte: GAF TO 1F-104G-1DS-5 vom 30.11.83

THIS PUBLICATION SUPPLEMENTS GAF T.O. 1F-104G-1 AND REPLACES GAF T.O. 1F-104G-1D, DATED 20 JANUARY 1975. SEE INDEX GAF T.O. 0-1-1A FOR CURRENT STATUS OF FLIGHT MANUAL, SAFETY AND OPERATIONAL SUPPLEMENTS AND FLIGHT CREW CHECKLISTS.

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

PUBLISHED UNDER THE AUTHORITY OF THE BUNDESMINISTER DER VERTEIDIGUNG – FÜHRUNGSSTAB DER LUFTWAFFE – -(FüL)-

MBB 300

15 AUGUST 1980

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INTRODUCTION

This supplement contains the information required to operate the F-104G aircraft equipped with the LEADS 200 flight data recorder.

description

SECTION I

TABLE OF CONTENTS

PURPOSE

The LEADS 200 System (Leigh Electronic Airborne Data System) serves three purposes:

- It monitors and records aircraft and engine performance data including the voice communication of the entire flight (to a maximum of 3 hours) to facilitate the location and analysis of faults.
- It provides an additional voice warning to the pilot during flight in the event of a system failure.
- It records the aircraft and engine performance data and the voice communication of the last 50 minutes of flight at all times. These data are stored in an Airfoil Recorder which is expelled from the aircraft after a crash, ditching, or after the ejection seat was activated. After the Airfoil is released, a Crash Position Indicator transmits a distress signal on 243.0 MHz.

COMPONENTS

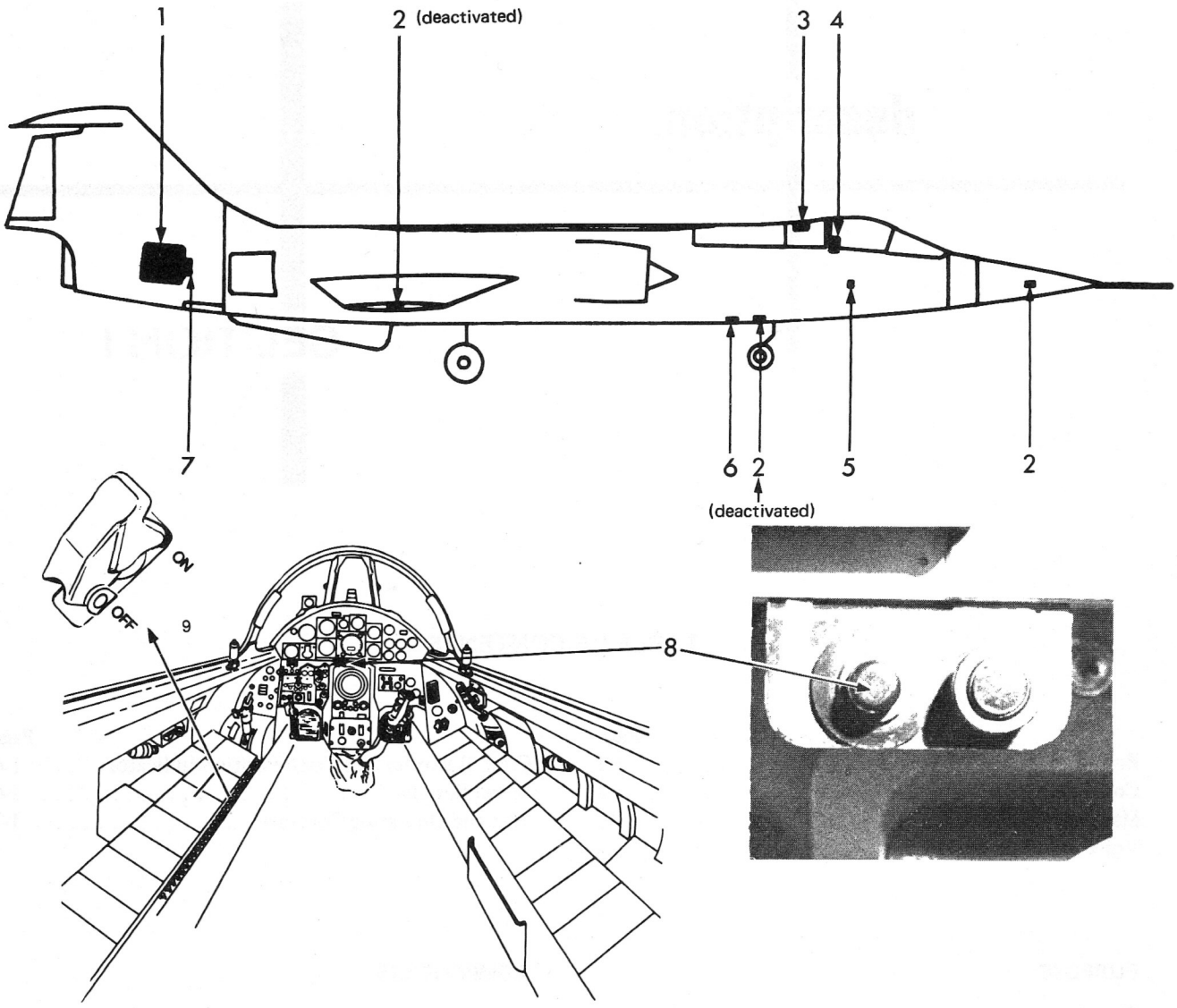
The LEADS 200 System consists of the following components (Fig. 1-1):

Component	Location
Recorder Electronics Unit REU-10B	Hatch of Electronic Bay
Maintenance Recorder RTD-3A	Right rail of ejection seat
Airfoil RBA-9C and Dispenser Group including – Crash Recorder RTC-9F – Crash Position Indicator – Battery Shut Off BSO-1	Right side of rear fuselage behind the speedbrake

NOTE

The Airfoil is held in the Dispenser Group by a release unit. The Crash Recorder and

MAIN COMPONENTS LOCATION



1 Airfoil RBA-9C with Dispenser Group
— Crash Recorder RTC-9F
— Crash Position Indicator
— Battery Shut Off BSO-1
2 Frangible Switches (4 x) (Crash Switches)
3 Recorder Electronics Unit REU-10B
4 Maintenance Recorder RTD-3A
5 Ejection Seat Switch
6 ~~Hydrostatic Switch (Nose wheel well)~~ deleted (OS-5)
7 Thermo Switch
8 Pilot's Event Marker
9 Voice Emergency Cutout Switch

Fig. 1-1

the Crash Position Indicator are incorporated in the Airfoil. The Battery Shut Off is plugged into the Airfoil during ground operation. During flight the Battery Shut Off is stored in the bag for LEADS-200-ground safety pins.

MAINTENANCE RECORDER

The Maintenance Recorder RTD-3A of the LEADS 200 (Fig. 1-2) monitors and records 63 aircraft or engine parameters listed in Fig. 1-3.

MAINTENANCE RECORDER RTD-3A

Fig. 1-2

PARAMETERS CONTINUOUSLY RECORDED

No.	PARAMETER	No.	PARAMETER
1	Nozzle Position	33	Main Landing Gear Indic. Right
2	Hydraulic Pressure 2	34	Nose Wheel Indication
3	Oil Pressure	35	Main Landing Gear Left Down
4	Main Fuel Flow	36	Main Landing Gear Right Down
5	Magnetic Heading	37	Nose Wheel Down Locked
6	Pitch Attitude	38	Warning Light Test
7	Roll Attitude	39	Pilots Event Marker
8	Angle of Attack (Left APC-Vane)	40	Fire Warning
9	Pressure Altitude Coarse	41	EGT Warning
10	Pressure Altitude Fine	42	Compressor Inlet Temp.
11	Vertical Acceleration	43	Oil Low Warning Light
12	Indicated Air Speed	44	Fuel Low Warning
13	Stabilator Position	45	Fuel Boost Pumps Failed
14	Aileron Position	46	Fuel Shut Off Valve
15	Rudder Position	47	RPM Warning
16	Throttle Position	48	Ignition No. 1
17	EGT	49	Ignition No. 2
18	Compressor Discharge Pressure	50	Anti-Ice Warning
19	Temperature total	51	Canopy Unsafe Warning
20	IGV Angle	52	Cabin Pressure Switch
21	A/C Number (program.)	53	Oleo Leg Extended
22	Elapsed Time	54	Auto Pilot Disengaged
23	RPM	55	Master Caution Light
24	Trailing Edge Flap UP	56	APC Warning
25	Trailing Edge Flap DOWN	57	Hydraul. Pressure 1 Low
26	Trailing Edge Flap TAKE OFF	58	Hydraul. Pressure 2 Low
27	Flaps Asymmetry	59	AC Generator No. 1 Failed
28	Speed Brakes EXT.	60	AC Generator No. 2 Failed
29	Speed Brakes RETRACT	61	Primary DC Failed
30	SPL WPN Unlocked Indication	62	Instr. on Emergency
31	SPL WPN Release Indication	63	LN 3 Failed
32	Main Landing Gear Left		

Fig. 1-3

MAINTENANCE RECORDER ACCESSIBLE TO GROUND CREW

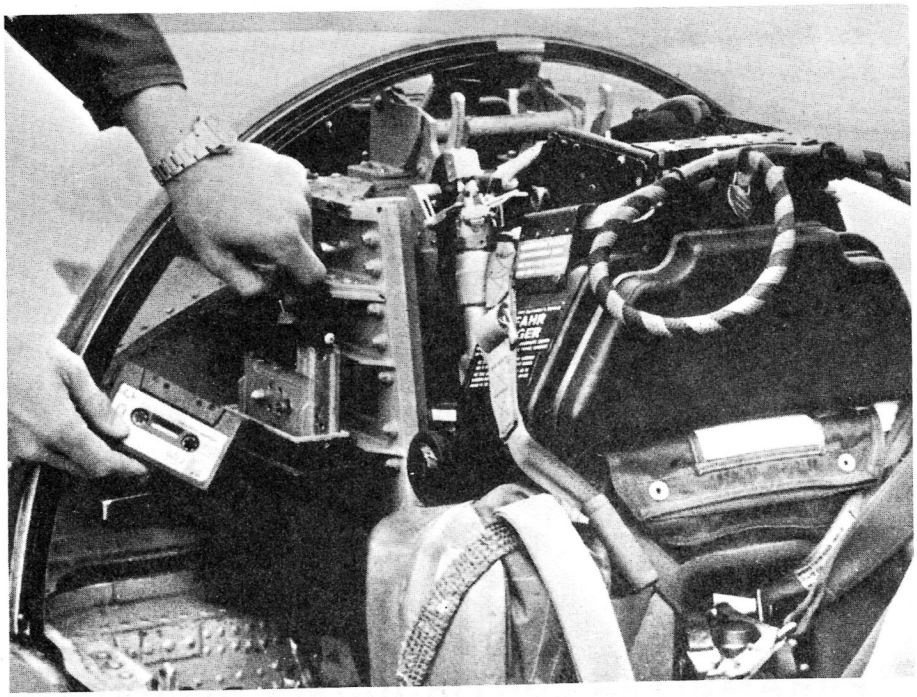


Fig. 1-4

In addition of these parameters all cockpit communication is recorded. The Maintenance Recorder uses a commercial type cassette and operates up to a total of three hours. It is easily accessible to the ground crew on the right rail of the ejection seat (Fig. 1-4).

The Recorder Electronics Unit includes 21 maintenance indicators that give ground personnel further significant maintenance information (Fig. 1-5).

The maintenance indicators show white whenever a system fails. Correction of this failure will not reset the indicator, in order to provide ground personnel with information on system failures during flight.

VOICE WARNINGS

In addition to the warning lights on the annunciator panel voice warnings are given to the pilot headsets when any of the situations listed in Fig. 1-6 will occur.

To each system a priority number is assigned. When more than one system fails at the same time, only the voice warning with the higher priority will be heard. The voice warnings duplicated on the annunciator panel appear in 3 sec. intervals until

- the Master Caution is reset;
- the failed system is corrected;
- a system with a higher priority fails.

A voice warning not duplicated on the annunciator panel shall be heard at the same intervals until

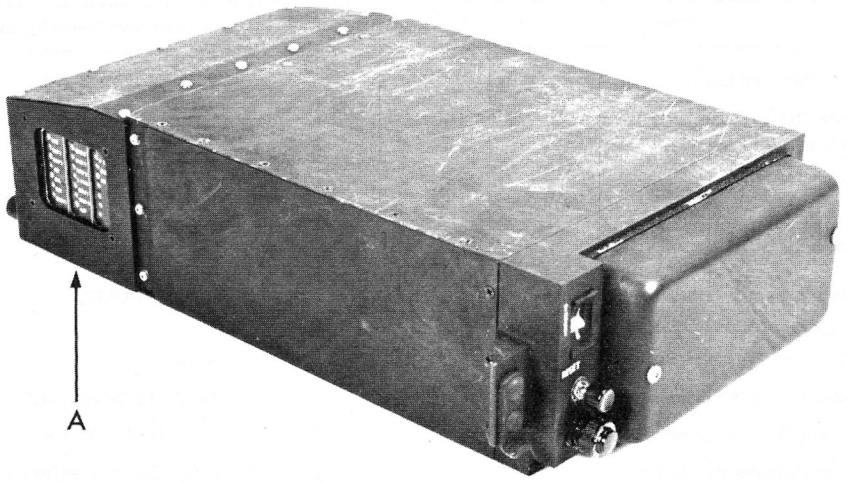
- the failed system is corrected or
- a system with a higher priority fails.

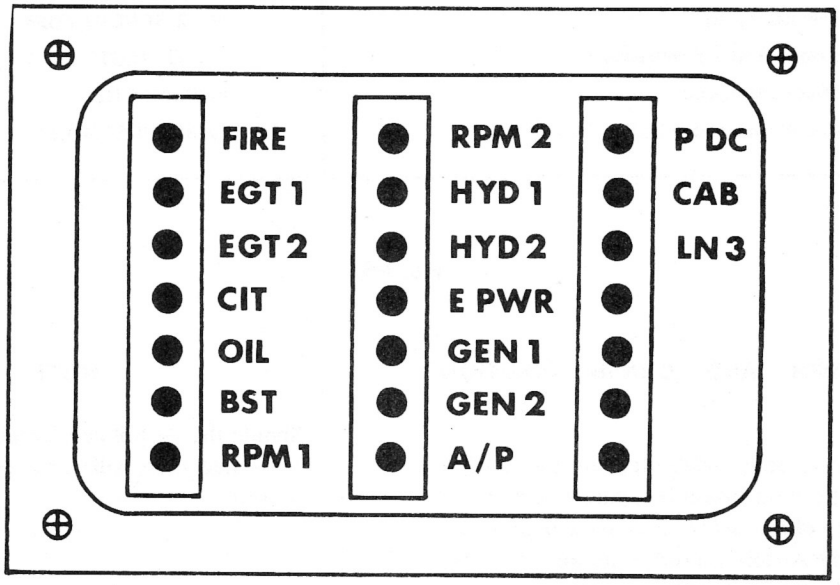
The voice warning messages are generated in the Recorder Electronics Unit. The voice warning circuits can be tested by placing the WARNING LIGHT SYSTEM TEST switch on the right forward panel to the WARNING LIGHTS TEST position. The voice warning with the highest priority will be heard. Subsequent pressing of the Master Caution Light will cancel the warning so that the warning with the next highest priority can be heard. By repeating this procedure, all the voice warnings can be tested.

VOICE EMERGENCY CUTOUT SWITCH

The voice emergency cutout switch, located on the left console in front of the gun circuit breaker, is a 2-position toggle switch used to switch off any voice warning in case it disturbs radio communication. The switch is labelled VOICE EMER and protected by a red cover which is safety wired to prevent inadvertent actuation. To actuate the voice emergency cutout switch the red cover has to be raised breaking the safety wire and the toggle switch has to be placed in the OFF (rear) position.

RECORDER ELECTRONICS UNIT REU-10B





DETAIL A

Maintenance Indicators

LEGEND:

FIRE	Fire Signal to Warning Light
EGT 1	EGT exceeds 702°C during ground start
EGT 2	EGT exceeds the time temperature curve during normal operation
CIT	CIT exceeds 121°C
OIL	Oil Pressure Low
BST	Boost Pumps failed
RPM 1	RPM exceeds 105 % for more than 60 seconds or 107 % for any period of time
RPM 2	RPM exceeds 105 % for more than 5 seconds
HYD 1	No. 1 Hydraul. System pressure low
HYD 2	No. 2 Hydraul. System pressure low
E PWR	Fixed Frequency Generator failed
GEN 1	No. 1 AC Generator failed
GEN 2	No. 2 AC Generator failed
A/P	Auto pilot automatically disengaged
P DC	Primary DC Bus deenergized or failed
CAB	Cabin pressure altitude above 38.000 ft
LN 3	Inertial Navigation Sys. failed

Fig. 1-5

VOICE WARNINGS

Event	Voice Warnings heard by pilot	Priority
Fire signal to Warning Light.	"FIRE WARNING"	1
EGT exceeds 702°C during ground start or the time temp. curve during normal operation.	"EGT"	2
CIT exceeds 121°C	"CIT"	3
Oil level in the tank drops below 22 pints and/or oil pressure drops	"OIL LOW"	4
All 4 fuel boost pumps failed.	"BOOST PUMPS"	5
RPM exceeds 105% for more than 5 seconds, or 107% for any period of time.	"RPM"	6
No. 1 Hydraulic System pressure low.	"No. 1 HYDRAULIC"	7
No. 2 Hydraulic System pressure low.	"No. 2 HYDRAULIC"	8
Fixed frequency generator failed.	"EMERGENCY POWER"	9
No. 1 AC generator failed.	"No. 1 GENERATOR"	10
No. 2 AC generator failed.	"No. 2 GENERATOR"	11
Auto pilot automatically disengaged.	"AUTO PILOT"	12
Primary DC bus deenergized.	"PRIMARY DC"	13
Cabin pressure altitude above 38.000 ft.	"CABIN PRESSURE"	14

Fig. 1-6

CRASH RECORDER AND CRASH POSITION INDICATOR

The Crash Recorder, fully integrated in the Airfoil (Fig. 1-7), records all aircraft and engine parameters and all voice communication of the last 50 minutes of flight on an endless loop tape. The Airfoil is aerodynamically shaped to guarantee a safe and soft landing after it is deployed into the airstream. The Airfoil is attached to the Airfoil Release Unit and is released upon receipt of a command signal from the crash sensing circuits. This signal is generated in the crash sensing network which consists of four frangible switches, a hydrostatic switch, a thermo switch and a switch on the ejection seat. The frangible switches are located in the wing tips, the nose wheel well, and the radome. The frangible switches located in the wing tips and the nose wheel well are deactivated. In case of a crash, deformation of the airframe activates these switches and the Airfoil is expelled. ~~The hydrostatic switch is located in the nose wheel well and generates the deploy command signal in case of ditching.~~ A thermo switch produces the deploy command signal, when overheat in the engine bay exists. When the ejection seat is activated, the ejection seat switch on the lower part of the seat rail is triggered and generates the deploy command signal.

(Description hydro switch deleted)
OS-5

NOTE

Should the Airfoil accidentally be released or jettisoned, there will be no degradation of A/C performance.

Additionally in the Airfoil a Crash Position Indicator is integrated. Immediately after release of the Airfoil from the aircraft, the Crash Position Indicator transmits a radio signal on the international distress frequency of 243.0 MHz for 24 hours (range 50 NM, when receiver is at 10.000 ft).

POWER SUPPLY

The LEADS 200 System is supplied with 115/200 Volt, 3-phase fixed frequency (400 cps) AC power from the primary fixed frequency bus, 28 Volt DC power from the no. 1 battery bus, 26 Volt AC power from engine instruments and indicator power, and 28 Volt DC from the no. 3 emergency DC bus. These circuits are protected by the following circuit breakers:

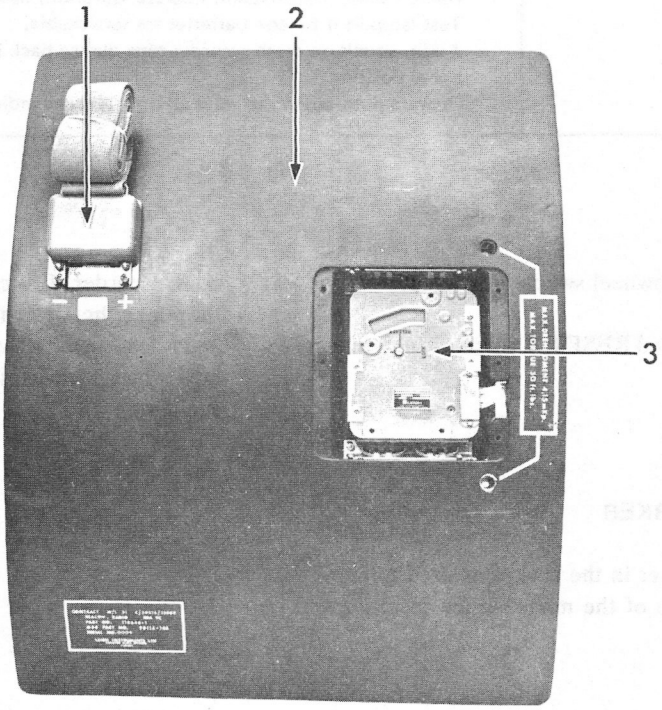
- REC FIX FREQ — in the AC Load Center
- BAT FLIGHT REC
- INST PWR FLIGHT REC
- EMER DC FLIGHT REC

} in the Junction Box

TEST AND OPERATING CONTROLS

On the forward end of the Recorder Electronics Unit are the following controls and indicators (Fig. 1-8) for Self Testing LEADS 200 during preflight inspection:

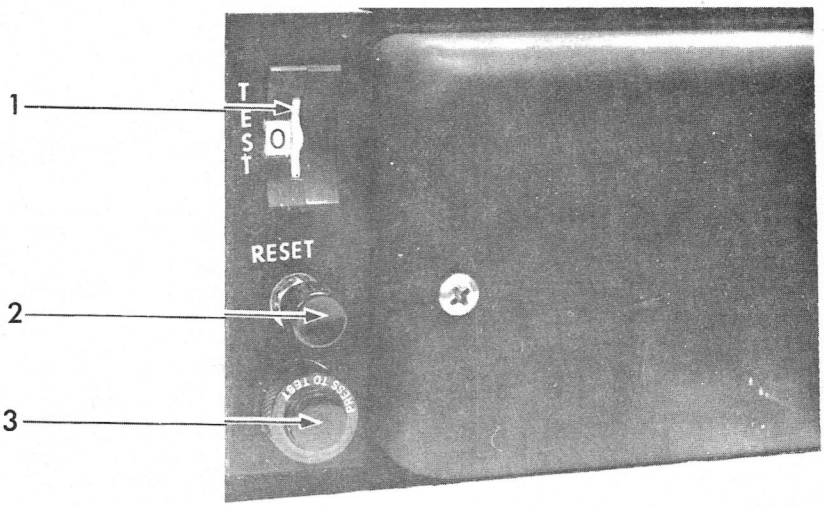
AIRFOIL WITH BATTERY SHUT OFF AND CRASH RECORDER



1 Battery Shut Off BSO-1
2 Airfoil RBA-9C
3 Crash Recorder RTC-9F

Fig. 1-7

TEST AND OPERATING CONTROLS OF THE RECORDER ELECTRONICS UNIT



1 Thumbwheel Switch
2 RESET Push-Button
3 TEST Lamp

Fig. 1-8

FUNCTIONS OF THUMBWHEEL POSITIONS

Thumbwheel Switch Position	Function
0	Normal flight condition.
1	Operate push-button to activate all maintenance indicators (indicators show white).
2	Spare position.
3	Audio signals in microphone played back after delay and is heard in headsets.
4	Recorded data stream monitored in headsets.
5	Radio beacon transmission (.33 sec. duration) heard in headsets.
6	Test lamp lit if beacon batteries are serviceable.
7	Audio signals on crash recorder tape played back in headsets.
8	Spare position.
9	Operate push-button to reset all maintenance indicators (indicators show black).

Fig. 1-9

- a 10-position thumbwheel switch labelled TEST
- a push-button labelled RESET, it resets all maintenance indicators
- a test lamp

PILOT'S EVENT MARKER

The pilot's event marker in the cockpit is used to mark a certain portion of tape of the maintenance recorder and crash recorder. This can be part of the data or a message of the pilot either of technical or tactical nature. Short pressing and releasing the pilot's event marker leaves a mark on the tape which facilitates locating this portion of tape during evaluation.

normal procedures

SECTION II

TABLE OF CONTENTS

PREFLIGHT-INSPECTION

Power is supplied to the aircraft

1. Safety caps from the circuit breakers EMER DC FLIGHT REC and BAT FLIGHT REC in junction box (Fig. 2-1) – remove and set circuit breakers.

2. Shut-Off-Battery – remove from Airfoil.

Before Starting Engine

3. Insert cassette into the Maintenance Recorder (side 1 out).

4. Maintenance Recorder Switch – EIN;

Before Taxiing

5. Electronic Unit Thumbwheel Switch – 9.

6. Electronic Unit Push-Button Reset Switch – push.

NOTE

After completion of reset of the electronic unit, activation of the WARNING LIGHTS TEST switch or the OIL WARNING TEST BUTTON will activate the indicators for CIT or OIL on the recorder electronics unit.

7. Electronic Unit Thumbwheel Switch – 0.

CAUTION

Position 0 is marked with orange colour. Position 7 of the electronics unit thumbwheel switch may deactivate the ground-air safety switch.

8. Safety caps, Shut-Off-Battery and spare tape cassette – store in bay for the LEADS 200 ground safety pins.

POSTFLIGHT INSPECTION

CAUTION

When landing on a strange airfield, it is the pilot's responsibility to ensure that the correct handling procedures for the LEADS 200 system are used.

After Shutdown

1. Maintenance Recorder Switch – AUS.

2. Shut-Off-Battery – Insert into Airfoil and fasten screws.

3. Recorder Circuit Breakers EMER DC FLIGHT REC and BAT FLIGHT REC in junction box – disconnect and secure with safety caps (Fig. 2-1).

NOTE

- Step 2 and 3 can be omitted when aircraft is to be refueled only.
- When the aircraft is parked with the Shut-Off-Battery inserted in the Airfoil and the circuit breakers EMER DC FLIGHT REC and BAT FLIGHT REC are disconnected and secured all aircraft systems can be operated normally.

CAUTION

In case of any doubt or maintenance problems on aircraft with the LEADS 200 System beyond the scope of NORMAL ground servicing (i. e. aircraft acceptance, preflight-, thruflight- and postflight inspection) the following office is to be contacted PRIOR to any maintenance on the aircraft:

German Air Force/Fighter Bomber Wing 34,
Memmingerberg
Civilian line: 08331/5061 Ext. 591
Military line FBW 34 Ext. 591

Telex: 041521 5800 JaboG 34 Memmingerberg
NATO teletype: RXFKFG (Routing Indicator) GAF FBW 34

SECURING OF THE CIRCUIT BREAKERS

Fig. 2-1

OPERATIONAL SUPPLEMENT

FLIGHT MANUAL

F/TF-104G

AIRCRAFT

This publication supplements GAF T.O. 1F-104G-1D

PUBLISHED UNDER AUTHORITY OF THE
BUNDESMINISTER DER VERTEIDIGUNG
– FÜHRUNGSSTAB DER LUFTWAFFE –
– (Fü L) –

MatALw 250

30 NOVEMBER 1982

eingearbeitet: Junghans,HB 20.01.83

Notice to Aircrews

Write the number of this Supplement alongside the affected portion of the Flight Manual.

SHORT TITLE: LEADS 200 sensor modification

I. PURPOSE

To inform aircrews about LEADS 200 modifications. (Removal of the hydro. switch)

II. INSTRUCTIONS

1. Minimum time for the release signal has been changed from 5 millisec. to 100 ms.

2. On page 1 - 2 delete No. 6 (hydro static switch).
On page 1 - 6, left paragraph, delete the description of the hydro. switch.