PILOT'S INFORMATION MANUAL

TB 20

EADS SOCATA

TB20

from S/N 948

P/N : T00. 18430320E2

PILOT'S INFORMATION MANUAL

CAUTION

THIS INFORMATION MANUAL IS A NON-OFFICIAL COPY OF THE PILOT'S OPERATING HANDBOOK AND MAY BE USED FOR GENERAL INFORMATION PURPOSES ONLY.
IT IS NOT KEPT CURRENT AND THEREFORE CANNOT BE USED AS A SUBSTITUTE FOR AIRWORTHINESS AUTHORITIES APPROVED MANUAL WHICH IS THE ONLY ONE INTENDED FOR OPERATION OF THE AIRPLANE.

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SECTION 1

GENERAL

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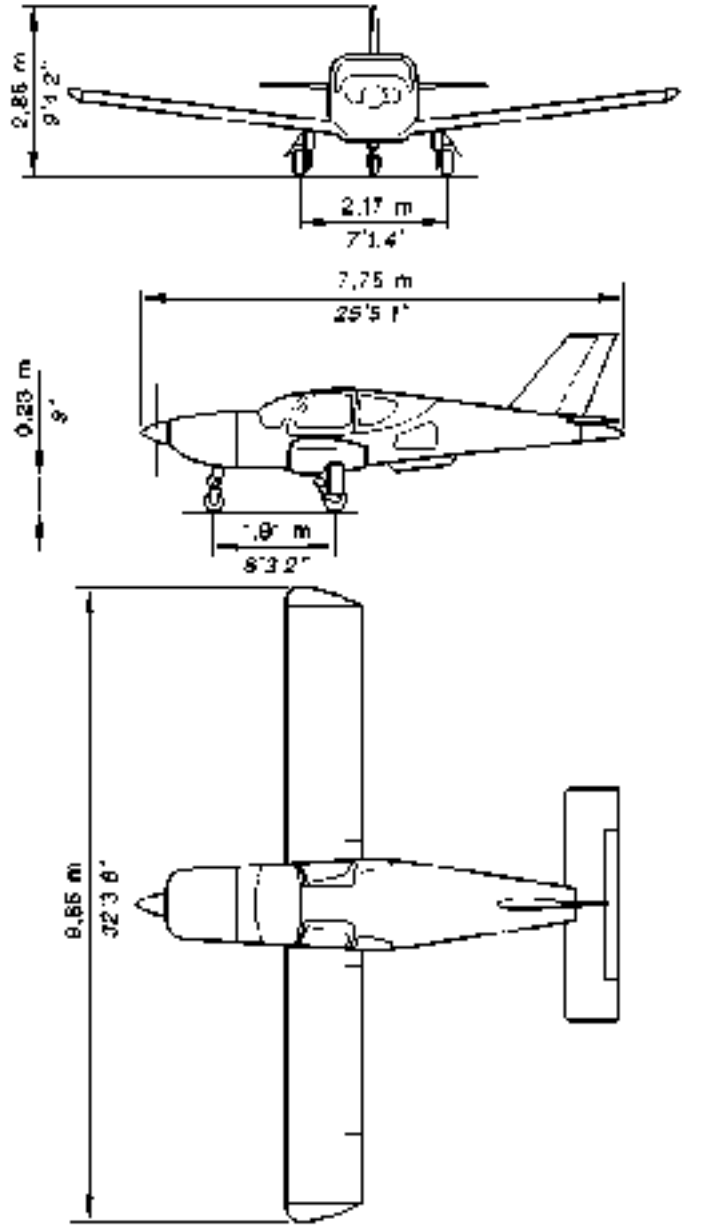

Figure 1.1 - THREE VIEW DRAWING

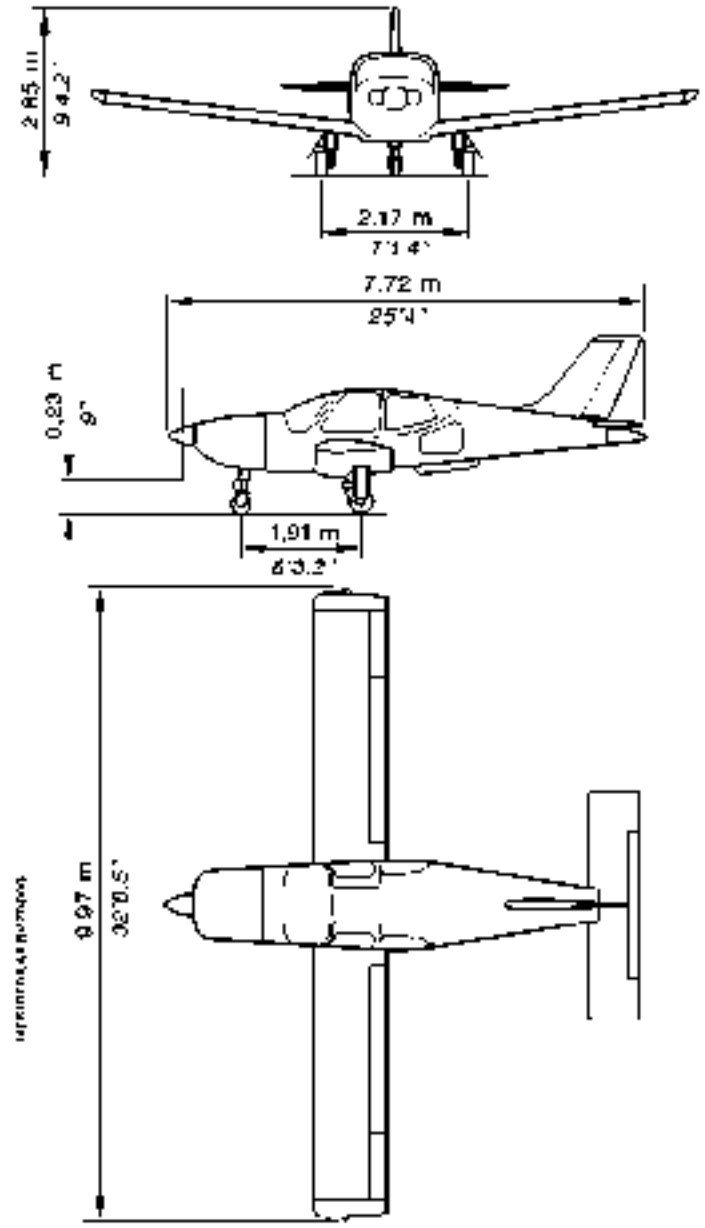

Figure 1.1A – THREE VIEW DRAWING

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GENERAL

This handbook contains 9 sections, and includes the material required by FAR Part 23 to be furnished to the pilot for operation of SOCATA Model TB 20 airplane. It also contains supplemental data supplied by SOCATA.

This section provides basic data and information of general interest. It also contains definitions or explanations of abbreviations and terminology commonly used.

The general for optional systems are given in Section 9 "Supplements" of this Manual and any airplane/country specifics are given in Section "Specifics" hereto

DESCRIPTIVE DATA

ENGINE

Number of engines : 1
Engine Manufacturer : AVCO LYCOMING
Engine Model Number : IO-540-C4 D6D or IO-540-C4 B5D
Engine Type :
Six-cylinder, horizontally opposed, direct drive, air-cooled
Engine rated a: 250 BHP at 2575 RPM.

PROPELLER

Number of propellers : 1
Propeller Manufacturer : HARTZELL
Propeller Model Number : HC-C2YK-1BF/F8477-4
Number of blades : 2
Propeller Diameter :
Maximum : 80 inches (2.03 m)
Minimum : 78 inches (1.98 m)
Propeller Type :
Constant-speed, hydraulically-actuated
Propeller Governor : WOODWARD M 210 681 or C210 761 or F210 761

FUEL

Approved Fuel Grades (and Colors) :
100 LL Grade Aviation Fuel (Blue)
100 (Formerly 100 / 130) Grade Aviation Fuel (Green)

Total capacity : 88.8 U.S Gallons (336 Litres)
Total capacity each tank : 44.4 U.S Gallons (168 Litres)
Total usable : 86.2 U.S Gallons (326 Litres)

NOTE.
Isopropyl alcohol or ethylene glycol monomethyl ether may be added to the fuel supply. Additive concentrations shall not exceed 1 % for isopropyl alcohol or 0.15 % for ethylene glycol monomethyl ether. Refer to Section 8 "Handling, servicing and maintenance" for additional information.

OIL

CAUTION

DO NOT MIX DIFFERENT BRANDS OR TYPES OF OIL

Oil grades (specifications) and Viscosity (Reference : TEXTRON LYCOMING Service Bulletin No. 480 at last revision)

Outside Air Temperatures	MIL-L-6082 Spec. Mineral Grades 50 first hours	MIL-L-22851 Spec. Dispersant Grades after 50 hours
All temperatures	.....	SAE 15W50 or SAE 20W50
Above 80°F (27°C:	SAE 60	SAE 60
Above 60°F (15°C:	SAE 50	SAE 40 or SAE 50
30°F (-1°C) to 90°F (32°C)	SAE 40	SAE 40
0°F (-18°C: to 70°F (21°C)	SAE 30	SAE 30, SAE 40 or SAE 20W40
0°F (-18°C) to 90°F (32°C)	...	SAE 20W50 or SAE 15W50
Below 10°F (-12°C)	SAE 20	SAE 30 or SAE 20W30

Oil Capacity :

Sump : 12 Quarts (11.3 Litres)
Total : 13.3 Quarts (12.6 Litres)
Maximum oil consumption 0.83 qt/hr

Do not operate on less than 6 U.S. qt (5.7 litres). To minimize loss of oil through breather, fill to 9 U.S. qt (8.5 litres) for normal flights of less than 3 hours. For extended flights, fill to 12 U.S. qt (11.3 litres). These quantities refer to oil dipstick level readings. During oil and filter changes 1.3 additional U.S. qt (1.2 litres) is required for the filter.

MAXIMUM CERTIFICATED WEIGHTS

Take-off : 3086 lbs (1400 kg)
Landing : 3086 lbs (1400 kg)
Weight in Baggage Compartment : 143 lbs (65 kg) ; refer to Section 6 for cargo loading instructions.

AIRPLANE WEIGHTS

Refer to the Weight sheet included in the I.I.R. (Individual Inspection Record).

NOTE :
Maximum useful load of your airplane must be calculated according to the weight given on the Weight sheet.

CABIN AND ENTRY DIMENSIONS

	Pre-MOD.151	Post-MOD.151
Maximum Cabin Width :	4.20 ft (1.28 m)	4.20 ft (1.28 m)
Maximum Cabin Length :	8.30 ft (2.53 m)	8.30 ft (2.53 m)
Maximum Cabin Height :	3.67 ft (1.12 m)	3.94 ft (1.20 m)
Number of Cabin Entries :	2	2
Maximum Entry Width :	3.45 ft (1.05 m)	3.48 ft (1.06 m)
Minimum Entry Width :	2.62 ft (0.80 m)	2.62 ft (0.86 m)
Maximum Entry Height :	2.30 ft (0.70 m)	2.46 ft (0.75 m)

BAGGAGE SPACE AND ENTRY DIMENSIONS

	Pre-MOD.151	Post-MOD.151
Maximum Compartment Width :	4.10 ft (1.25 m)	4.10 ft (1.25 m)
Minimum Compartment Width :	3.45 ft (1.05 m)	3.45 ft (1.05 m)
Maximum Compartment Length :	2.95 ft (0.90 m)	2.95 ft (0.90 m)
Minimum Compartment Length :	2.20 ft (0.67 m)	2.20 ft (0.67 m)
Maximum Compartment Height :	2.03 ft (0.62 m)	2.03 ft (0.62 m)
Minimum Compartment Height :	1.35 ft (0.41 m)	1.35 ft (0.41 m)
Entry Width :	2.10 ft (0.64 m)	2.10 ft (0.64 m)
Entry Height :	1.44 ft (0.44 m)	1.80 ft (0.55 m)

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SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

KCAS : ***Knots Calibrated Airspeed*** is indicated airspeed corrected for position and instrument error and expressed in knots. Knots calibrated airspeed is equa to KTAS in standard atmosphere at sea level

MPH CAS : ***Miles per Hour Calibrated Airspeed***

KIAS : ***Knots Indicated Airspeed*** s the speed shown on the airspeed indicator and expressed in knots

MPH IAS : ***Miles per Hour Indicated Airspeed***

KTAS : ***Knots True Airspeed*** is the airspeed expressed in knots relative to undisturbed air which s KCAS corrected for altitude, temperature and compressibility

V_A : ***Maneuvering Speed*** is the maximum speed at which full or abrupt control movements may be used.

V_{FE} : ***Maximum Flap Extended Speed*** Is the highest speed permissible with wing flaps in a prescribed extended position.

V_{LE} : ***Maximum Landing Gear Extended Speed*** Is the maximum speed at which an airplane can be safely flown with the landing gear extended.

V_{LO} : ***Maximum Landing Gear Operating Speed*** is the maximum speed at which the landing gear can be safely extended or retracted.

V_{NE} : ***Never Exceed Speed*** is the speed limit that may not be exceeded at any time

V_{NO} : ***Maximum Structural Cruising Speed*** is the speed that should not be exceeded except in smooth air, and then only with caution.

V_{SO} : ***Stalling Speed or the minimum steady flight speed*** at which the airplane is controllable in the landing configuration.

V_{S1} : ***Stalling Speed or the minimum steady flight speed*** obtained in a specific configuration

METEOROLOGICAL TERMINOLOGY

ISA : **International Standard Atmosphere** : Its temperature is 59°F (15°C) at sea level pressure altitude and decreases by 3.6°F (2°C) for each 1000 ft of altitude.

OAT : **Outside Air Temperature** is the free air static temperature. It is expressed in either degrees Celsius or degrees Fahrenheit.

QNH : Setting at the pressure corresponding to the reading of actual airplane altitude.

Pressure Altitude :
Is the altitude read from an altimeter when the altimeter's barometric scale has been set to 29.92 inches of mercury (1013.2 hPa).

ENGINE POWER TERMINOLOGY

BHP : Brake Horsepower is the power developed by the engine.

MP : Manifold Pressure is a pressure measured in the engine's induction system and is expressed in inches of mercury (in.Hg).

RPM : Revolutions Per Minute is engine speed.

AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

Climb Gradient :
Is the demonstrated ratio of the change in height during a portion of climb, to the horizontal distance traversed in the same time interval.

Demonstrated crosswind velocity :
Is the velocity of the crosswind component for which adequate control of the airplane during take-off and landing was actually demonstrated during certification tests. The value shown is not considered to be limiting.

g : Is acceleration due to gravity.

Unusable Fuel :
Fuel remaining after a runout test has been completed in accordance with governmental regulations.

WEIGHT AND BALANCE TERMINOLOGY

Reference Datum :
Is an imaginary vertical plane from which all horizontal distances are measured for balance purpose.

Arm : Is the horizontal distance from the reference datum to the center of gravity (C.G.) of an item.

Moment : Is the product of the weight of an item multiplied by its arm. (Moment divided by the constant 1000 is used in this handbook to simplify balance calculations by reducing the number of digits).

Center of gravity (C.G.) :
Is the point at which an airplane, or equipment, would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.

C.G. Limits : *Center of Gravity Limits* are the extreme center of gravity locations within which the airplane must be operated at a given weight.

Useful Load : Is the difference between take-off weight and the airplane empty weight.

Maximum Take-off Weight :
Is the maximum weight approved for the start and the take-off run.

Maximum Weight at Landing :
Is the maximum weight approved for landing touch down.

GENERAL ABBREVIATIONS

A	:	Ampère
A/C CTL	:	Air conditioning control
A/C CLUTCH	:	Air conditioning clutch
AIR COND	:	Air conditioning
ALT or ALTr	:	Alternator
ALTr FLD	:	Alternator field (energization)
A/P	:	Autopilot
BAT	:	Battery
CHT	:	Cylinder head temperature
°C	:	Degree Celsius (Centigrade)
°F	:	Degree Fahrenheit
EGT	:	Exhaust gas temperature
ELT	:	Emergency Locator Transmitter
EVAP FAN	:	Evaporator fan
EXC	:	Energization
F. PRESS	:	Fuel pressure
ft	:	Foot (Feet)
ft/min	:	Feet per minute
HI	:	High
HOR	:	Electric horizon
hPa	:	Hectopascal
hr	:	Hour
in	:	Inch
in.Hg	:	Inch of mercury
kg	:	Kilogram
kt	:	Knot (1 nautical mile/hr = 1852 m/hr)
l	:	Litre
lb	:	Pound
LDG	:	Landing gear
LO	:	Low
m	:	Metre
min	:	Minute
mm	:	Millimetre
P / N	:	Part Number
psi	:	Pounds per square inch
qt	:	Quart
QTY	:	Quantity
R.M. SWITCH	:	RADIO MASTER switch
SM	:	Statute Mile

GENERAL ABBREVIATIONS (Cont'd)

S / N	:	Serial Number
sq.ft	:	Square foot
Std	:	Standard
U.S Gal	:	U.S Gallon
V	:	Volt

RADIO ABBREVIATIONS

ADF	:	Automatic Direction Finder System
ADI	:	Attitude Director Indicator
ATC	:	ATC transponder
COM	:	Communications Transceivers
DME	:	Distance Measuring Equipment
ELT	:	Emergency Locator Transmitter
HF	:	High Frequency
HSI	:	Horizontal Situation Indicator
IFR	:	Instrument Flight Rules
ILS	:	Instrument Landing System
MKR	:	Marker Radio Beacon
NAV	:	Navigation Indicators and/or Receivers
RMI	:	Radio Magnetic Indicator
UHF	:	Ultra-High Frequency
VFR	:	Visual Flight Rules
VHF	:	Very High Frequency
VOR	:	VHF Omnidirectional Range
VOR / LOC	:	VHF Omnidirectional Range Localizer
VSI	:	Vertical Speed Indicator
XPDR	:	Transponder

CONVERSION FACTORS

IMPERIAL AND U.S UNITS TO METRIC UNITS			METRIC UNITS TO IMPERIAL AND U.S UNITS		
MULTIPLY	BY	TO OBTAIN	MULTIPLY	BY	TO OBTAIN
FEET	0.3048	METRE	METRE	3.2808	FEET
INCH	25.4	mm	mm	0.03937	INCH
Imp.Gal	4.546	Litre	Litre	0.220	Imp.Gal
US.Gal	3.785	Litre	Litre	0.264	US.Gal
lb	0.45359	kg	kg	2.2046	lb

STANDARD ATMOSPHERE

Pressure altitude (ft)	Pressure (hPa)	°C	°F
0	1013.2	+ 15.0	+ 59.0
2000	942.1	+ 11.0	+ 51.8
4000	875.0	+ 7.0	+ 44.6
6000	811.9	+ 3.1	+ 37.6
8000	752.6	- 0.8	+ 30.5
10000	696.8	- 4.8	+ 23.4
12000	644.3	8.7	+ 16.2
14000	595.2	- 12.7	+ 9.2
16000	549.1	- 16.6	+ 2.2
18000	505.9	- 20.6	- 5.0
20000	465.6	- 24.6	- 12.4

CONVERSION TABLE

NOTE :
The standard pressure of 1013.2 hPa is equal to 29.92 inches of mercury.

950 28.05	951 28.08	952 28.11	953 28.14	954 28.17	955 28.20	956 28.23	957 28.26	958 28.29	959 28.32
960 28.35	961 28.38	962 28.41	963 28.44	964 28.47	965 28.50	966 28.53	967 28.56	968 28.58	969 28.61
970 28.64	971 28.67	972 28.70	973 28.73	974 28.76	975 28.79	976 28.82	977 28.85	978 28.88	979 28.91
980 28.94	981 28.97	982 29.00	983 29.03	984 29.06	985 29.09	986 29.12	987 29.15	988 29.18	989 29.20
990 29.23	991 29.26	992 29.29	993 29.32	994 29.35	995 29.38	996 29.41	997 29.44	998 29.47	999 29.50
1000 29.53	1001 29.56	1002 29.59	1003 29.62	1004 29.65	1005 29.68	1006 29.71	1007 29.74	1008 29.77	1009 29.80
1010 29.83	1011 29.85	1012 29.88	1013 29.91	1014 29.94	1015 29.97	1016 30.00	1017 30.03	1018 30.06	1019 30.09
1020 30.12	1021 30.15	1022 30.18	1023 30.21	1024 30.24	1025 30.27	1026 30.30	1027 30.33	1028 30.36	1029 30.39
1030 30.42	1031 30.45	1032 30.47	1033 30.50	1034 30.53	1035 30.56	1036 30.59	1037 30.62	1038 30.65	1039 30.68
1040 30.71	1041 30.74	1042 30.77	1043 30.80	1044 30.83	1045 30.86	1046 30.89	1047 30.92	1048 30.95	1049 30.98

SECTION 2

LIMITATIONS

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GENERAL

The SOCATA Model TB 20 airplane is certified in Norma Category in accordance with following basis.

- Basic general technical conditions .
  FAR 23 Regulations, amendments 1 to 16.
- Complementary general technical conditions .
  Paragraph 23-1581, amendment 21.
- Special technical condition :
  The landing gear being held in high position by hydraulic pressure alone, the requirements of paragraphs 23-143 and 23-729 are modified as follows :

  . 1,6 V_{S1} speed is replaced by V_{NO} in 23-729 (a).

  Condition 23-143, as for landing gear extension must be checked up to V_{NO}

This airplane must be flown in compliance with the limits specified by placards or markings and with those given in this section and throughout this Manual.

This section presents the various operating limitations, the significance of such limitations, instrument markings, color coding, and basic placards necessary for the safe operation of the airplane, its power plant and installed equipment.

The limitations for optional systems are given in Section 9 "Supplements" of this Manual and any airplane/country specifics are given in Section "Specifics" hereto.

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in Figure 2.1.

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	189	187	Do not exceed this speed in any operation
V_{NO}	Maximal Structural Cruising Speed	151	150	Do not exceed this speed except in smooth air, and then only with care
V_A	Maneuvering Speed	130	129	Do not make abrupt or full control movements above this speed
V_{FE}	Maximum Flap Extended Speed Take-off Landing	 130 102	 129 103	Do not exceed these speeds depending on flaps position
V_{LO}	Maximum Landing Gear Operating Speed	130	129	Do not extend or retract landing gear above this speed
V_{LE}	Maximum Landing Gear Extended Speed	140	139	Do not exceed this speed with landing gear extended

Figure 2.1 - AIRSPEED LIMITATIONS

AIRSPEED INDICATOR OR TRUE AIRSPEED INDICATOR MARKINGS

Airspeed indicator or true airspeed indicator markings and their color code significance are shown in Figure 2.2.

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Arc	59 - 103	Full Flap Operating Range. Lower limit is maximum weight V_{SO} in landing configuration. Upper limit is maximum speed permissible with flaps extended
Green Arc	70 - 150	Normal Operating Range. Lower limit is maximum weight V_{S1} with flaps retracted. Upper limit is maximum structural cruising speed
Yellow Arc	150 - 187	Operations must be conducted with caution and only in smooth air
Red line	187	Maximum speed for all operations

Figure 2.2 - AIRSPEED INDICATOR OR TRUE AIRSPEED INDICATOR MARKINGS

POWER PLANT LIMITATIONS

Number of engines : 1

Engine Manufacturer : AVCO LYCOMING

Engine Model Number : IO-540-C4 D5D or IO-540-C4 B5D

Engine Operating Limits for Take-off and Continuous Operations
- Maximum Power : 250 BHP
- Maximum Engine Speed : 2575 RPM
- Maximum Cylinder Head Temperature : 500°F (260°C)
- Maximum Oil Temperature : 244°F (118°C)

Oil Pressure :
- Minimum : 25 psi (1.7 bar)
- Maximum : 115 psi (7.9 bars)

Fuel Pressure
- Minimum : 0.1 psi (7 hPa)
- Maximum : 8 psi (552 hPa)

Fuel Grades : See Fuel Limitations

Oil Grades (Specification) :
- MIL-L-6082 Aviation Grade Mineral Oil or
- MIL-L-22851 Aviation Grade Dispersant Oil

Number of propellers : 1

Propeller Manufacturer : HARTZELL

Propeller Model Number : HC-C2YK-1BF/F8477-4

Propeller Diameter :
- Minimum : 78 inches (1.98 m)
- Maximum : 80 inches (2.03 m)

STARTER OPERATION LIMITS

Starter operation sequence is limited to 10 seconds.

Should several sequences be necessary, respect following spacing :

1st sequence

wait . . . . . 1 minute

2nd sequence

wait . . . . . 1 minute

3rd sequence

wait . . . . . 15 minutes

4th sequence

POWER PLANT INSTRUMENT MARKINGS

Power plant instrument markings and their color code significance are shown in Figure 2.3.

INSTRUMENT	Red Line or arc Minimum Limit	Yellow Arc Caution Range	Green Arc Normal Operating	Red Line Maximum Limit
Tachometer	---	---	750 to 2575 RPM	2575 RPM
Oil Temperature	---	below 104°F (40°C)	104 to 244°F (40 to 118°C)	244°F (118°C)
Fuel Pressure Fuel flow	0.1 psi 2 Gal./hr	---	0.1 to 8 psi 2 to 25 Gal./hr	8 psi 25 Gal./hr
Oil Prossure (1)	25 psi	25 to 60 psi and 90 to 100 psi	60 to 90 psi	100 psi
Oil Pressure (2)	25 psi	25 to 55 psi and 95 to 115 psi	55 to 95 psi	115 psi
Cylinder Head Temperature (3)	---	435 to 500°F (224 to 260°C) (4)	200 to 435°F (93 to 224°C) (4)	500°F (260°C)

(1) Alternative No. 1 Pre-MOD.87

(2) Alternative No. 2 Post-MOD.87 (Engine monito. cluster "PEINTATEC")

(3) If installed on airplane

(4) Optional marking (according to instrument model)

Figure 2.3 - POWER PLANT INSTRUMENT MARKINGS

WEIGHT LIMITS

Maximum Take-off Weight : 3086 lbs (1400 kg)
Maximum Landing Weight : 3086 lbs (1400 kg)
Maximum Weight in Baggage Compartment : 143 lbs (65 kg) ; refer to Section 6 for cargo loading.

CENTER OF GRAVITY LIMITS

Center of gravity range with landing gear extended :

Forward :
42.2 inches (1.071 m) aft of datum at 3086 lbs (1400 kg)
37.4 inches (0.949 m) aft of datum at 2756 lbs (1250 kg)
35.9 inches (0.913 m) aft of datum at 2205 lbs (1000 kg) or less.

Aft :
47.4 inches (1.205 m) aft of datum at all weights.

Reference datum : Front face of firewall.
Straight line variation between points.
Leveling point : Upper fuselage spar

NOTE:
It is the responsibility of the pilot to insure that the airplane is properly loaded. See Section 6 "Weight and Balance" for proper loading instructions.

MANEUVER LIMITS

This airplane is certificated in the normal category.
The normal category is applicable to airplane intended for non-aerobatic operations.
These include any maneuvers incidental to normal flying, stalls (except whip stalls), lazy eights, chandelles, and steep turns in which the angle of bank is no more than 60°.

Aerobatic maneuvers, including spins, are not approved.

DESIGN LIMIT LOAD FACTORS

Flaps up : + 3.8 g and - 1.5 g
Flaps down . + 2.0 g and 0

CAUTION

INTENTIONAL NEGATIVE LOAD FACTORS ARE PROHIBITED

KINDS OF OPERATION LIMITS

The airplane is equipped for day VFR operations and may be equipped for night VFR and day & night IFR operations. See Supplements Section of this Manual.

Flight into known icing conditions is prohibited.

FUEL LIMITATIONS

2 Tanks .	44.4 U.S Gallons	(168 Litres) each
Total Fuel .	88.8 U.S Gallons	(336 Litres)
Usable Fuel '	86.2 U.S Gallons	(326 Litres)
Unusable Fuel	2.6 U.S Gallons	(10 Litres)

NOTE:
Usable fuel (up to unusable fuel) can be safely used during all normal airplane maneuvers.
FOR STEEP NOSE DOWN ATTITUDE (rapid descent) select a fuel tank with at least 10 U.S Gallons (a quarter of tank capacity).
FOR PRONOUNCED OR LONG SIDE SLIPPING select the fuel tank (with usable fuel) at the opposite side of the low wing.

CREW LIMITATIONS

Minimum crew : 1 Pilot
(1 pilot required at L.H. station)

SEATING LIMITS

Front seats . 2

Rear seats ' 2 when accommodated with 2 seat belts or
3 when accommodated with 3 seat belts
(maximum total weight on rear seats '
509 lbs (231 kg))

USE OF DOORS

Flight with doors open or ajar is prohibited.

VACUUM GAGE MARKINGS (If Installed)

MARKING	CORRESPONDING VALUE
Green	Normal operating from 4.4 to 5.2 in.Hg
Red lines	at 4.4 and 5.2 in.Hg

PLACARDS

NOTE.
The placards described in the Section 9 "Supplements" replace or supplement those described in this paragraph.

(1) In full view of the pilot, forward of overhead lights

Placard in lbs :

THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN FORM OF PLACARDS, MARKINGS AND FLIGHT MANUAL.

INVERTED FLIGHT	PROHIBITED
AEROBATIC MANEUVERS	PROHIBITED
INTENTIONAL SPINS	PROHIBITED
ICING CONDITIONS	PROHIBITED
MAXIMUM TAKE-OFF AND LANDING WEIGHT	3086 lbs
DESIGN MANEUVERING SPEED V_A	128 KIAS
LIMIT SPEED V_{NE}	187 KIAS
FLAPS EXTENDED MAXIMUM SPEED V_{FE}	
FLAPS "TAKE OFF"	120 KIAS
FLAPS "LANDING"	102 KIAS
LANDING GEAR EXTENDED MAXIMUM SPEED V_{LE}	139 KIAS
LANDING GEAR OPERATING MAXIMUM SPEED V_{LO}	129 KIAS
POSITIVE FLIGHT LOAD FACTOR (MAXIMUM)	
FLAPS UP	+ 3.8
FLAPS DOWN	+ 2

Placard in kg :

THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN FORM OF PLACARDS, MARKINGS AND FLIGHT MANUAL.

INVERTED FLIGHT	PROHIBITED
AEROBATIC MANOUVERS	PROHIBITED
INTENTIONAL SPINS	PROHIBITED
ICING CONDITIONS	PROHIBITED
MAXIMUM TAKE-OFF AND LANDING WEIGHT	1400 kg
DESIGN MANEUVERING SPEED V_A	129 KIAS
LIMIT SPEED V_{NE}	167 KIAS
FLAPS EXTENDED MAXIMUM SPEED V_{FE}	
FLAPS "TAKE-OFF"	129 KIAS
FLAPS "LANDING"	103 KIAS
LANDING GEAR EXTENDED MAXIMUM SPEED V_{LE}	139 KIAS
LANDING GEAR OPERATING MAXIMUM SPEED V_{LO}	129 KIAS
POSITIVE FLIGHT LOAD FACTOR (MAXIMUM)	
FLAPS UP	+ 3.8
FLAPS DOWN	+ 2

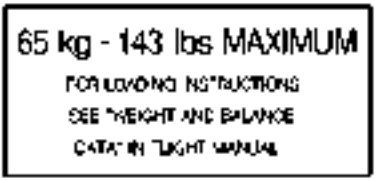
FLIGHT CONDITIONS : DAY VFR
ICING CONDITIONS NOT ALLOWED

(2) Calibration chart on compass

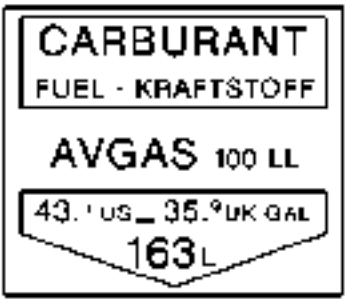
For Steer	N	30	60	E	120 150
For Steer	S	210	240	W	300 330

DATE: RADIO ON

(3) On Baggage door

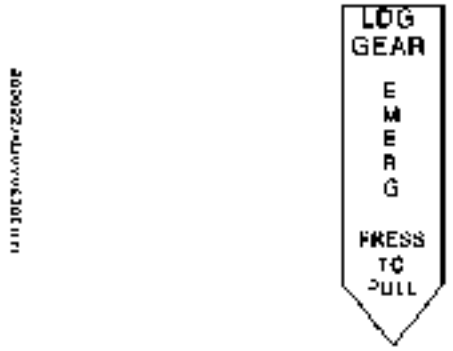


(4) Near fuel tank caps



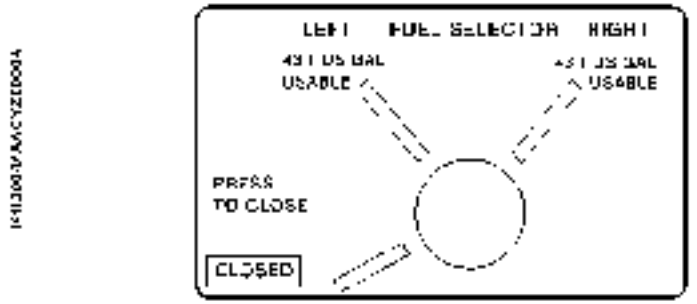
(5) On the back side of access door to oil filler cap

i6) Near the pilot's air outlet

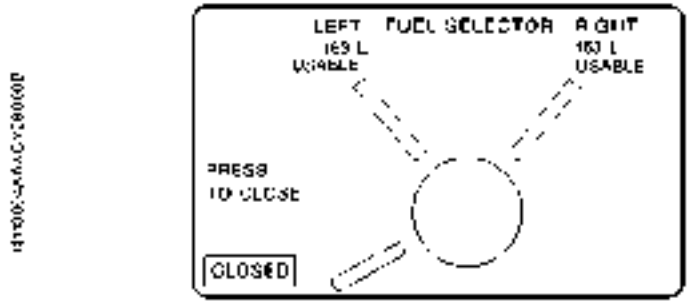


(7) On the fuel selector

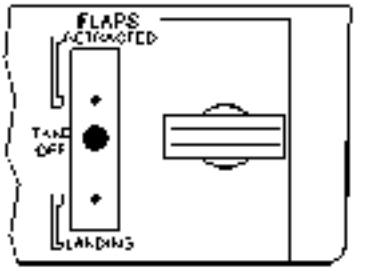
Markings in U.S. Gallons :



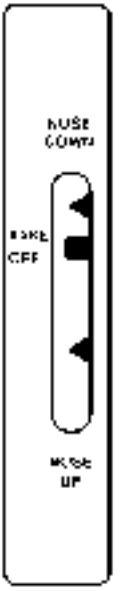
Markings in Litres :



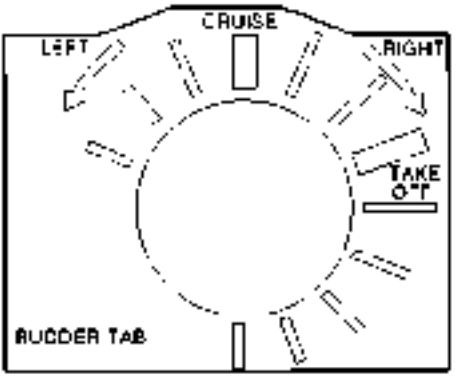
(8) Near the wing flap control



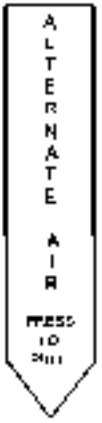
(9) Near the stabilator tab position indicator



(10) Near the rudder trim



(11) Near landing gear configuration and control



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SECTION 3

EMERGENCY PROCEDURES

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GENERAL

This section provides the pilot with procedures that enable him to cope with emergencies that may be encountered in operating the SOCATA Model TB 20 airplane. If proper preflight inspections, operating procedures, and maintenance practices are used, emergencies due to airplane or engine malfunction should be rare. Likewise, careful flight planning and good pilot judgment can minimize enroute weather emergencies. However, should any emergency develop, the guidelines in this section should be considered and applied as necessary to correct the problem.

The emergency procedures for optional systems are given in Section 9 "Supplements" of this Manual and any airplane/country specifics are given in Section "Specifics" hereto.

AIRSPEEDS FOR SAFE OPERATIONS (IAS)

Engine failure after take-off	70/76 KIAS
Maneuvering speed	129 KIAS
Best glide speed	92 KIAS
Precautionary landing with engine power	70/76 KIAS

ENGINE FAILURES

ENGINE FAILURE DURING TAKE-OFF RUN

Throttle	IDLE
Brakes	APPLY
Mixture	IDLE CUT-OFF
Magneto selector	OFF
Main switch	OFF
Fuel selector	OFF

ENGINE FAILURE IMMEDIATELY AFTER TAKE-OFF

Airspeed	70/76 KIAS
Mixture	FULL RICH
Fuel selector	SWITCH TANKS
Fuel pump	ON

If engine does not start :

Mixture	IDLE CUT-OFF
Fuel selector	OFF
Fuel pump	OFF
Landing gear lever	AS REQUIRED
Land	STRAIGHT AHEAD
Magneto selector	OFF
Main switch	OFF

WARNING

LANDING STRAIGHT AHEAD IS USUALLY ADVISABLE

ENGINE FAILURE IN FLIGHT

Glide speed	92 KIAS
Mixture	FULL RICH
Fuel gages	CHECK
Fuel selector	SWITCH TANKS
Magneto selector	BOTH
Fuel pump	ON

If icing conditions are unintentionally encountered :

"Alternate Air"	FULLY PULLED

If the engine does not start :

Mixture	IDLE CUT-OFF
Throttle	1/2 OPEN
Starter	ENGAGE (if propeller stopped)
When the engine runs	SLOWLY ENRICH
(windmilling)	UNTIL RE-START

NOTE.
Engine re-starting can be performed without particular limitations in all airplane flight envelope.

If the engine does not start, get ready for an emergency landing without engine power.

NOTE.
Gliding distance - see Figure 3.4.

LOW OIL PRESSURE

Oil warning light	ILLUMINATED
Pressure indicator	IN RED LOW SECTOR
Throttle	REDUCE AS FAR AS POSSIBLE
Oil temperature	CHECKED
If oil temperature in red sector	REDUCE THROTTLE

Prepare for a forced landing and land as soon as possible.

LOW FUEL FLOW

Fuel pump	OPERATING
Fuel gages	CHECKED
Fuel selector	SWITCH TANKS

ENGINE VIBRATION

Engine vibration is generally due to defective spark plugs or too rich a mixture

Mixture RESET

If vibration persists :

RPM SET FOR MINIMUM VIBRATION RANGE

Land as soon as possible.

PROPELLER GOVERNOR FAILURE

In case of oil pressure drop in the governor system or pitch control failure, the propeller moves to low pitch.

Oil pressure	CHECKED
Oil temperature	CHECKED
Throttle	AS REQUIRED
Airspeed	REDUCED

Avoid rapid application of power.

CAUTION : MAXIMUM RPM : 2575

FORCED LANDINGS

NOTE.
It is recommended that the wheels be up if landing on an unprepared surface.

EMERGENCY LANDING WITHOUT ENGINE POWER

Glide speed	92 KIAS
Radio	TRANSMIT MAYDAY on 121.5 MHz or on the appropriate frequency giving location and intentions
Seats, seat belts, shoulder harnesses	ADJUSTED and SECURE
Landing gear lever	AS REQUIRED
Mixture	IDLE CUT-OFF
Fuel selector	OFF
Magneto selector	OFF
Flaps	AS REQUIRED

When the landing is secured :

Flaps	LANDING
Approach speed	70 / 76 KIAS
Main switch	OFF

PRECAUTIONARY LANDING WITH ENGINE POWER

Flaps	LANDING
Approach speed	70/76 KIAS
Radio	ADVISE ATC OF INTENTIONS
Seats, seat belts, shoulder harnesses	ADJUSTED and SECURE
Field	FLY OVER selected field
Landing gear lever	AS REQUIRED
Main switch	OFF
Touch-down	FLARE OUT and keep nose high
Mixture	IDLE CUT-OFF
Fuel selector	OFF
Magneto selector	OFF
Brakes	AS REQUIRED

DITCHING

Radio	TRANSMIT MAYDAY on 121.5 MHz or on the appropriate frequency giving location and intentions
Landing gear lever	UP
Flaps	LANDING
Seats, seat belts, shoulder harnesses	ADJUSTED and SECURE
Airspeed	70/76 KIAS
Flight path	Parallel to swells

Before touch-down :

Main switch	OFF
Mixture	IDLE CUT-OFF
Fuel selector	OFF
Magneto selector	OFF
Touch-down	FLARE OUT and keep nose high

EMERGENCY DESCENT

Throttle	IDLE AS REQUIRED
Airspeed	129 KIAS
Landing gear lever	DOWN
Descent at V_{LE}	139 KIAS

After a prolonged descent with reduced power, apply power with caution due to low cylinder head temperature.

FIRES

ENGINE FIRE DURING START

Mixture	IDLE CUT-OFF
Starter (10 sec. maxi)	GO ON STARTING
Throttle	FULL THROTTLE
Fuel selector	OFF

If fire goes on :

Main switch	OFF
Magneto selector	OFF

Evacuate passengers and extinguish fire using all available means (fire extinguisher if installed)

ENGINE FIRE IN FLIGHT

Visual detection	SMOKE - FLAMES
Fuel selector	OFF
Mixture	IDLE CUT-OFF
Fuel pump	OFF
Throttle	FULL THROTTLE
Cabin air cooling & demisting	FIRE CUT-OFF (-)

After engine has stopped :

Magneto selector	OFF
"ALTr FLD" switch-breaker	OFF
Forced landing	EXECUTE (as described in "Emergency Landing Without Engine Power")

WARNING

NO ATTEMPT SHOULD BE MADE TO RESTART THE ENGINE AFTER A FIRE

ELECTRICAL FIRE IN FLIGHT

* *If FIRE is in ENGINE COMPARTMENT :*

Main switch	OFF
Cabin air cooling & demisting	FIRE CUT-OFF

Land as soon as possible

* *If FIRE is in CABIN .*

Main switch	OFF
"ALTr FLD" switch-breaker	OFF
All electrical switches (except magnetos)	OFF
Cabin air cooling & demisting	FIRE CUT-OFF
Fire extinguisher (if installed)	ACTIVATE

* *If FIRE APPEARS TO BE OUT and electrical power is necessary to continue flight .*

Main switch	ON
Circuit breakers	CHECK for faulty circuit, do not close
Radioelectrical switches	ON, one at a time
Cabin air cooling	OPEN when fire is out

CABIN FIRE

Main switch	OFF
Cabin air cooling & demisting	FIRE CUT-OFF
Fire extinguisher (if installed)	ACTIVATE

WARNING

AFTER DISCHARGING A FIRE EXTINGUISHER WITHIN A CLOSED CABIN, WHEN FIRE IS EXTINGUISHED, PARTIALLY OPEN CABIN AIR COOLING TO VENTILATE THE CABIN AND PREVENT SUFFOCATION

Land as soon as possible.

WING FIRE

Navigation and landing lights	OFF
Anticollision lights (if installed)	OFF
Pitot heating (if installed)	OFF

Land as soon as possible.

ICING

FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED

Cabin temperature	FULL HOT
Pitot heating (if installed)	ON
Demisting	OPEN
"Alternate Air"	FULLY PULLED
Engine	INCREASE POWER without exceeding red line and periodically change RPM to minimize ice buildup on propeller

Turn back or change altitude to obtain best outside air conditions.
If icing continues plan a landing at the nearest airport. With an extremely rapid ice build-up, select a suitable "off airport" landing site.

NOTE.
With an ice accumulation on or near the wing leading edges, a higher stalling speed may be expected. Plan all maneuvers accordingly.

LANDING GEAR MALFUNCTIONS

LANDING GEAR FAILS TO RETRACT

THE THREE GREEN LIGHTS REMAIN ON

Landing gear lever	CHECK UP
"LDG GEAR" circuit breaker	CHECK CLOSED
Emergency landing gear control	CHECK PUSHED

If landing gear fails to retract :

Landing gear lever	DOWN
Landing gear lights	CHECK GREEN ON

Continue flight with landing gear down, up to destination or toward an appropriate alternate airfield.

Maximum airspeed	139 KIAS

THE RED LIGHT REMAINS ON (WITH OR WITHOUT GREEN LIGHT ON)

"LDG GEAR" circuit breaker	OPEN
Landing gear lever	DOWN
"LDG GEAR" circuit breaker	CLOSE
Landing gear lights	CHECK GREEN ON RED OFF

Continue flight with landing gear down, up to destination or toward an appropriate alternate airfield.

Maximum airspeed	139 KIAS

A GREEN LIGHT REMAINS ON, RED LIGHT OFF

Flaps	TAKEOFF
Best airspeed	85 KIAS
Maximum airspeed	97 KIAS
"LDG GEAR" circuit breaker	OPEN
Landing gear lever	DOWN
Emergency landing gear control	PULL
Landing gear lights	CHECK GREEN ON

Continue flight with landing gear down, up to destination or toward an appropriate alternate airfield.

Maximum airspeed	139 KIAS

As a precaution, proceed as described in procedure LANDING WITH A LANDING GEAR NOT LOCKED.

LANDING GEAR FAILS TO EXTEND (ONE OR SEVERAL GREEN GEAR DOWN LIGHTS FAIL TO ILLUMINATE)

Main switch	ON
Landing gear lever	DOWN
"LDG GEAR" circuit breaker	CHECK CLOSED
Landing gear lights	ILLUMINATE DURING TEST
Flaps	TAKE-OFF
Maximum airspeed	97 KIAS

The landing gear should extend and lock normally.

If this does not happen :

Landing gear lever	UP
"LDG GEAR" circuit breaker	OPEN
Landing gear lever	DOWN
Emergency landing gear control	PULLED
Gear down (green) lights	ON
Gear in transit (red) light	OFF

If all electrical power has been lost, the landing gear must be extended using the above procedures. The gear position indicator lights will not illuminate.

Normal landing

ONE OR SEVERAL LANDING GEAR (GREEN) LIGHTS FAIL TO ILLUMINATE DURING TEST CARRIED OUT IN THE PREVIOUS PROCEDURE

Yaw/slip airplane to help lock gear down

Gear in transit (red) light	OFF
Gear in transit (red) light	ILLUMINATES DURING TEST

The affected indicator green light bulb should be burnt out :

Landing gear position	CHECK DOWN POSITION WITH THE TOWER

Precautionary landing

LANDING WITH A LANDING GEAR NOT LOCKED

Landing gear position	CHECK POSITION WITH THE TOWER

LANDING GEAR APPEARS DOWN AND LOCKED

"LDG GEAR" circuit breaker	CLOSED
Landing gear lever	DOWN
Emergency landing gear control	PUSHED

Precautionary landing

LANDING GEAR UP OR PARTIALLY EXTENDED

Nose gear not locked

- *Landing :*

Flaps	LANDING
Airspeed	65/70 KIAS
Seats, seat belts, shoulder harnesses	ADJUSTED and SECURE

- *In final, cut-off the engine*

Main switch	OFF
Mixture	IDLE CUT-OFF
Fuel selector	OFF
Magneto selector	OFF

- *After touch-down of main landing gears :*

  Keep nose high without braking.
  Brake smoothly as soon as nose wheel contacts ground.

Main gear not locked

NOTE:
In case only one main gear extends, minimum airplane damage will result if a gear-up landing is made.

- *Retract the landing gear :*

Emergency landing gear control	PUSHED
"LDG GEAR" circuit breaker	CLOSED
Landing gear lever	UP

- *Landing on grass if possible :*

Flaps	LANDING
Airspeed	65/70 KIAS
Seats, seat belts, shoulder harnesses	ADJUSTED and SECURE

- *Before touch-down :*

Main switch	OFF
Mixture	IDLE CUT-OFF
Fuel selector	OFF
Magneto selector	OFF

LANDING WITHOUT STABILATOR CONTROL

Fly the airplane using pitch trim and throttle.

– *Long final :*

Airspead	80 KIAS
Flaps	LANDING
Landing gear lever	DOWN
Fuel pump	ON
Mixture	FULL RICH
Propeller	HIGH RPM
Throttle and pitch trim	ADJUST SO AS TO MAINTAIN A RATE OF DESCENT LOWER THAN 500 ft/min

- *Final*

FLARE OUT near the ground with the pitch trim.

CAUTION

REDUCE THROTTLE ONLY AFTER TOUCH-DOWN

RADIO MASTER SWITCH FAILURE (if installed)

When radio navigation equipment cannot be set under voltage due to RADIO MASTER switch malfunction.

"R.M. SWITCH" circuit breaker — OPEN

Radio navigation are supplied again and flight can go on normally.

ELECTRICAL FAILURE : IMMEDIATE ACTION

ELECTRICAL EQUIPMENT FAILURE

Check the circuit breakers panel.
If the circuit breaker is open, close it once only.
If it trips again, do not try to close the circuit breaker, the equipment has failed.

ALTERNATOR FAILURE (Simplified procedure)

'ALTr' warning light — ON

Pre-MOD.182

Voltmeter :
- Green sector — CONTINUE FLYING
- Red / yellow sector :
  'ALTr FLD' switch-breaker — OFF then ON

Post-MOD.182

Voltmeter :
- 26 < V < 29 — CONTINUE FLYING
- < 26 .
  'ALTr FLD' switch-breaker — OFF then ON

All

'ALTr' warning light — REMAINS ON
'ALTr FLD' switch-breaker — OFF
Air conditioning switch (if installed) — OFF
Non essential electrical load items — OFF

CAUTION

SEE HEREAFTER CHECK-OUT PROCEDURE TO BE USED FOR NIGHT VFR OR IFR (See Figure 3.1)

CAUTION

**CHECK BATTERY DISCHARGE.
IN THIS CASE, ENDURANCE IS
REDUCED AS ELECTRICAL POWER
IS ONLY SUPPLIED BY BATTERY**

Battery approximate duration . 40 min (Night IFR emergency conditions).

NOTE:
The use of the normal landing gear extension may induce a total electrical failure. For landing gear extension, first use the emergency system.

ELECTRICAL FAILURE : CHECK-OUT PROCEDURE FOR NIGHT VFR AND IFR

ALTERNATOR FAILURE (See Figure 3.1)

NOTE:
The use of the normal landing gear extension may induce a total electrical failure. For landing gear extension, first use the emergency system.

BATTERY FAILURE (See Figure 3.2)

NOTE.
The use of the normal landing gear extension may induce a total electrical failure. For landing gear extension, first use the emergency system.

TOTAL ELECTRICAL FAILURE (See Figure 3.3)

NOTE: WHEN BUS 3 "PULL-OFF" TYPE CIRCUIT BREAKER IS OPEN, LANDING GEAR ELECTRICAL CONTROL BECOMES INOPERATIVE AND THE LANDING GEAR MUST BE EXTENDED USING EMERGENCY SYSTEM

KEY: CB : Circuit breaker
PCB : Pull-off type circuit breaker
SB : Switch-breaker

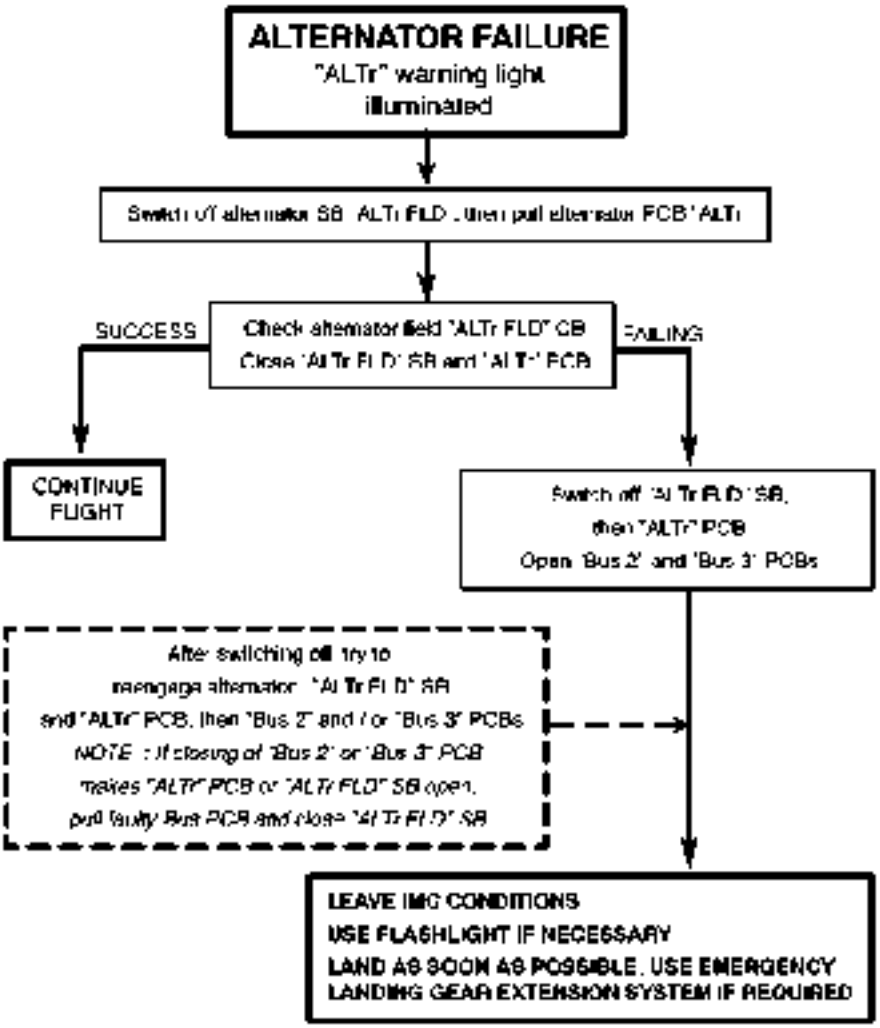

Figure 3.1 – ALTERNATOR FAILURE DIAGRAM

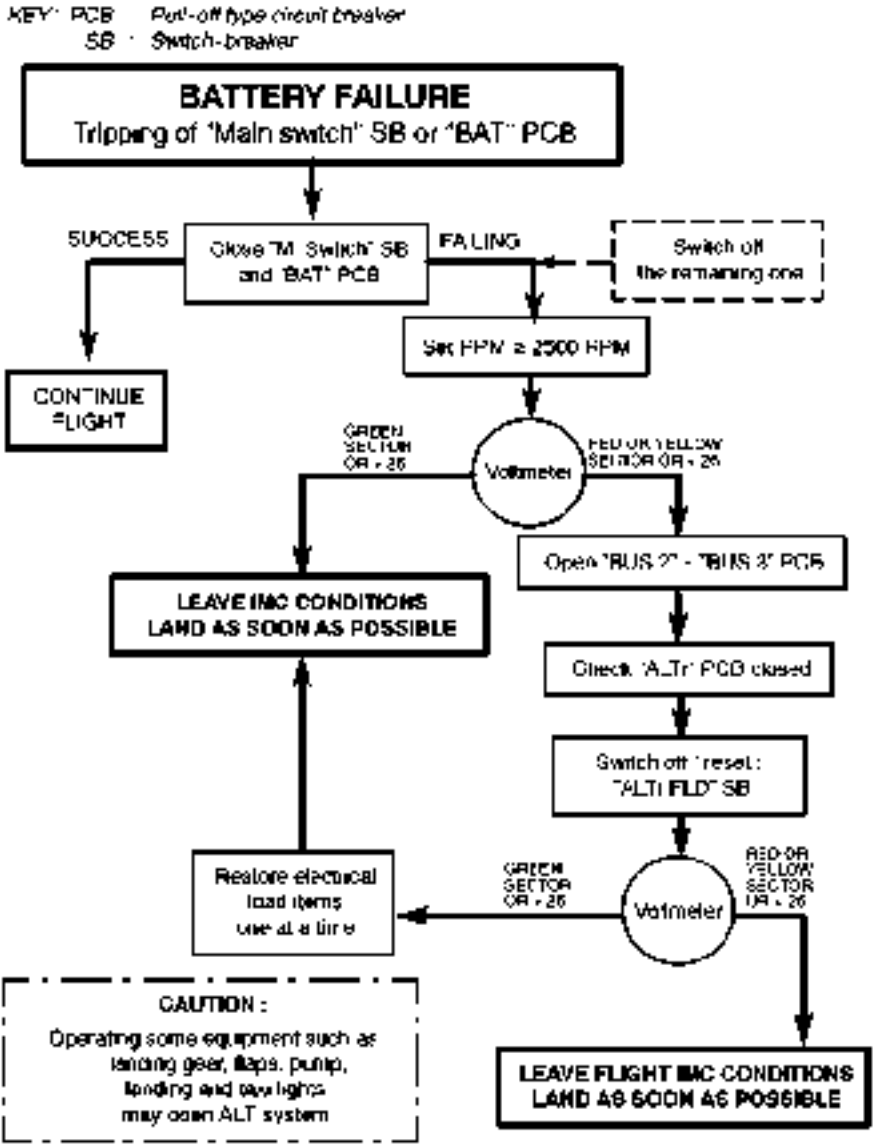

Figure 3.2 - BATTERY FAILURE DIAGRAM

INVOLUNTARY SPIN

INTENTIONAL SPINS ARE PROHIBITED

However, should inadvertent spin occur, the following recovery procedure is recommended .

Rapid and simultaneous action :

Throttle	IDLE
Rudder control	HOLD OPPOSITE DIRECTION OF ROTATION
Stabilator control	FULL FORWARD
Ailerons	NEUTRAL

Spin with flaps :

Same procedure, except retract flaps as soon as possible

When spinning stops, centralize rudders, level the wings and ease out of the ensuing dive.

JAMMED DOORS

Pre-MOD.151

In case of jammed doors and in case of emergency : JETTISON REAR WINDOWS, kicking with foot on the upper part.

OPTIMUM GLIDE WITHOUT ENGINE RUNNING

- MAXIMUM AERODYNAMIC EFFICIENCY "8"

  Landing gear up - Flaps up
  Speed 92 KIAS at maximum weight
  Propeller wind milling
  Zero wind

- MAXIMUM AERODYNAMIC EFFICIENCY "5"

  Landing gear up - Flaps in landing position
  Speed 70 KIAS at maximum weight
  Propeller wind milling
  Zero wind

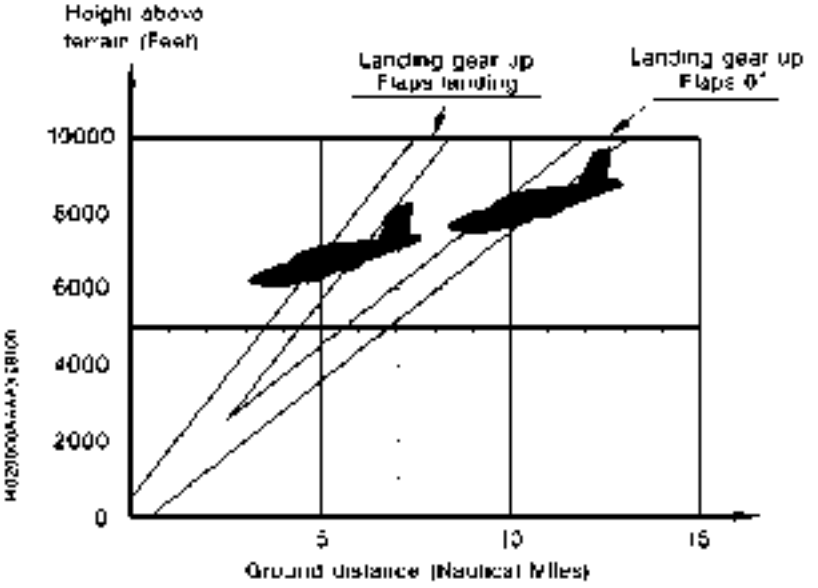

Figure 3.4 - OPTIMUM GLIDE WITHOUT ENGINE RUNNING

SECTION 4

NORMAL PROCEDURES

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GENERAL

This section provides procedures for the conduct of normal operation of the SOCATA Model TB 20 airplane.

The normal procedures for optional systems are given in Section 9 "Supplements" of this Manual and any airplane/country specifics are given in Section "Specifics" hereto.

AIRSPEEDS FOR SAFE OPERATIONS (IAS)

Following speeds are those important for safe operation of airplane.

These data are valid for standard airplane used at maximum weight in normal conditions.

- Best rate of climb	
. Landing gear up, flaps retracted	95 KIAS
Landing gear down, flaps in landing position	79 KIAS
- Best angle of climb	
. Landing gear up, flaps retracted	81 KIAS
Landing gear down, flaps in landing position	67 KIAS
- Operating speed in turbulent air	127 KIAS
- Maximum speed with flaps in take-off position	129 KIAS
- Maximum speed with flaps in landing position	103 KIAS
- Final approach speed (flaps in landing position)	79 KIAS
Maximum demonstrated crosswind	25 KNOTS

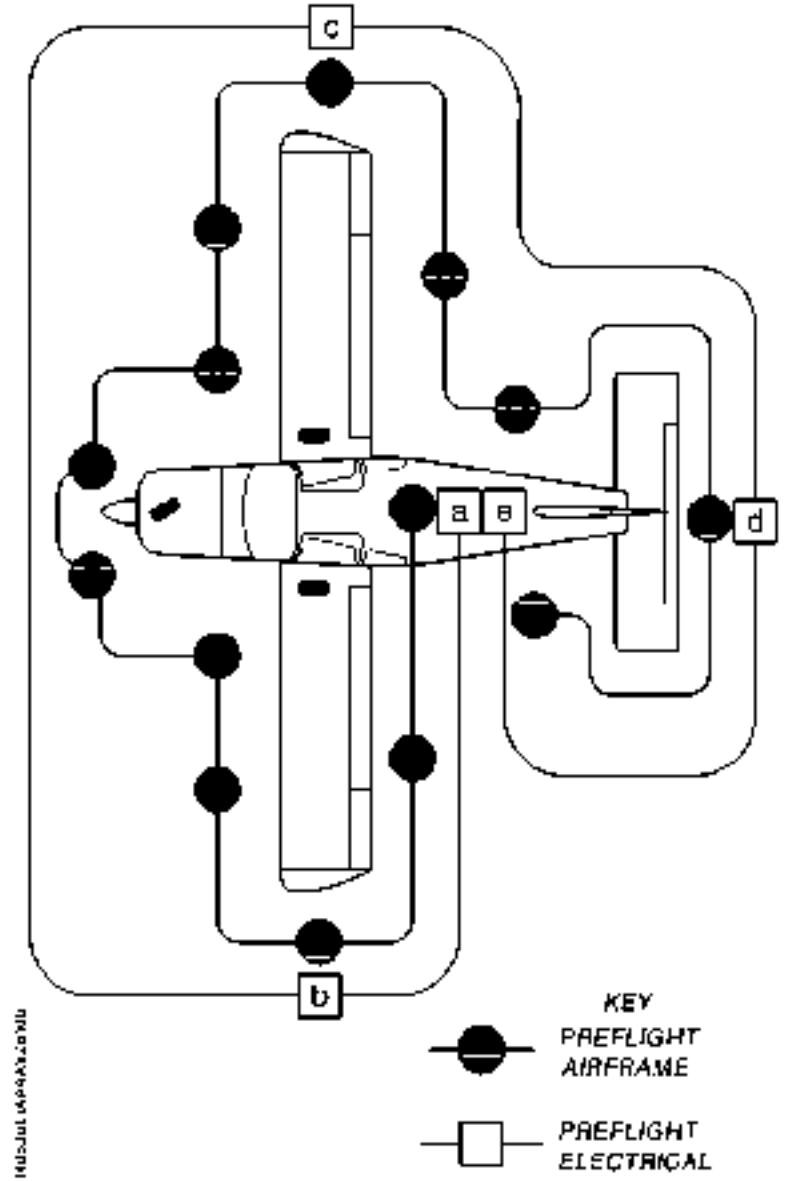

Figure 4.1 - PREFLIGHT INSPECTIONS

PREFLIGHT INSPECTIONS (See Figure 4 1)

AIRFRAME

1 - Cabin

Pilot door	OPEN
Control lock	REMOVED
Magneto selector	OFF
Landing gear lever	DOWN
Mixture	IDLE CUT-OFF
Main switch	ON
Flaps	LANDING
Pitch trim	TAKE-OFF
Rudder trim	TAKE-OFF
Oxygen (if installed)	Check pressure
Fire extinguisher (if installed)	Check pressure
Main switch	OFF
Fuel selector	OPEN on "Left"

Proceed with the external preflight inspection moving clockwise around the airplane.

2 - L.H. wing trailing edge

Flap and aileron	Check controls, hinges, plays, deflections

3 - L.H. wing

Wing tip, lights and landing lights	Undamaged

4 - L.H. wing leading edge

Wing	Free from frost, snow, ice
Pitot	Cover removed, clean, unobstructed
Tie-down	REMOVED
Stall warning device	Clean, check deflection
Fuel tank	Check level
Fuel tank cap	SECURED
Fuel tank draining	Fuel free from water and sediment

Fuel tank drain	Check CLOSED

5 - L.H. main landing gear

Chocks	REMOVE
Tire	Check condition
Shock absorber	Normal position
Door	Check play and cleanliness
Microswitches	Clean
Landing gear well	No foreign body

6 - Forward fuselage

Windshield and window panels	Clean
Engine cowling attachment	Check
Oil	Check level and absence of leak
Propeller	Clean, good condition
Propeller cone	Check (no slack)
Air intakes	Clean
Oil pump breather	Unobstructed
Exhaust pipe	Check
Fuel filter draining	Fuel free from water and sediment
Fuel filter drain	Check CLOSED

7 - Nose landing gear

Towing fork	REMOVE
Tire	Check
Shock absorber	Normal position
Door	Check attachments and cleanliness
Microswitches	Clean
Landing gear well	No foreign body

8 - R.H. main landing gear

Chocks	REMOVE
Tire	Check condition
Shock absorber	Normal position
Door	Check play and cleanliness
Microswitches	Clean
Landing gear well	No foreign body

9 - R.H. wing leading edge

Fuel tank draining	Fuel free from water and sediment
Fuel tank drain	Check CLOSED
Fuel tank	Check level
Fuel tank cap	SECURED
Tie-down	REMOVED
Wing	Free from frost, snow and ice

10 - R.H. wing

Wing tip and lights	Undamaged

11 - R.H. wing trailing edge

Flap and aileron hinges, plays, deflections	Check controls,

12 - R.H. rear fuselage

R.H. door lock	UNLOCKED
Static port	Cover removed, clean
Window panels	Clean

13 - Stabilizers

Fin	Check
Rudder and rudder tab	Check controls, hinges, plays, frictions
Stabilator and stabilator tab	Check controls, hinges, deflections, plays, frictions
Tail cone and navigation light (Pre-MOD.151)	Good condition

14 - L.H. rear fuselage

Static port	Cover removed, clean
Baggage compartment door	SECURED
Window panels	Clean

ELECTRICAL SYSTEMS

a - Cabin

"ALTr FLD" switch-breaker	OFF
Fuel pump	OFF
Main switch	ON
Engine monitoring cluster (Post-MOD.182)	Tested

NOTE :
Should the AMP lamp flash during test, contact your maintenance department as soon as possible (loss of one of the power supplies).

- V/A switch	V
Advisory panel	Tested
Landing gear indicator lights	Tested
Fuel gages	Check
Flaps	RETRACT
Instrument lights	ON
Navigation lights	ON
Anticollision lights (if installed)	ON
Strobe lights (if installed)	ON
Recognition lights (if installed) (Post-MOD.151)	ON
Pitot heating (if installed)	ON
Landing and taxi lights	ON

b - L.H. wing

Navigation light	Illuminated
Anticollision light (if installed)	Flashing
Recognition light (if installed) (Post-MOD.151)	Illuminated
Landing and taxi lights	Illuminated

WARNING

**DO NOT TOUCH PITOT DIRECTLY.
IT CAN BE HOT ENOUGH TO BURN SKIN**

Heated pitot (if installed)	Check heat
Stall warning device	Aural warning

NOTE:
Landing and taxi lights and Pitot heating OFF before carrying on inspection will prevent battery from being run down.

c - R.H. wing

Navigation light	Illuminated
Anticollision light (if installed)	Flashing
Recognition light (if installed) (Post-MOD.151)	Illuminated

d - Airplane rear part

Navigation light (Pre MOD 151)	Illuminated
Strobe light (if installed)	Flashing
Anticollision light (if installed)	Flashing

e - Cabin

Navigation lights	OFF
Strobe lights (if installed)	OFF
Anticollision lights (if installed)	OFF
Recognition lights (if installed) (Post-MOD.151)	OFF
Pitot heating (if installed)	OFF
Landing and taxi lights	OFF
Instrument lights	OFF
Main switch	OFF

BEFORE STARTING ENGINE

Preflight inspection	Carried out
Doors	CLOSED, check catches in place
Main switch	OFF
Parking brake	Set
Seats, seat belts, shoulder harnesses	ADJUSTED and SECURE
Flight controls	Check for proper operation
Pitch trim	Check deflection
Rudder trim	Check deflection
Fuel selector	OPEN (L.H. or R.H.)
Circuit breakers (side panel)	Closed
Magneto selector	OFF
Emergency landing gear control	PUSHED
"Radio master" (if installed)	OFF
Landing gear lever	DOWN
"Alternate Air"	PUSHED
Alternate static source (if installed)	PUSHED
Air conditioning (if installed)	OFF

ENGINE STARTING

Main switch	ON
Parking brake light "PARK"	Illuminated
Anticollision lights (if installed)	ON

NORMAL PROCEDURE

Propeller	FULL FORWARD
Throttle	1/4 OPEN
Mixture	IDLE CUT-OFF
Fuel pump	ON
Mixture	FULL RICH until fuel flow is displayed (3 to 5 sec.) then IDLE CUT-OFF
Fuel pump	OFF
Area	Clear
Magneto/start selector	START (10 sec maxi)

When the engine starts :

Magneto selector	BOTH
Mixture	FULL RICH
Oil pressure	Check If no pressure within 30 sec., shut down engine
Engine	1000 to 1200 RPM during heating

HOT ENGINE PROCEDURE

Propeller	FULL FORWARD
Throttle	1/4 OPEN
Mixture	IDLE CUT-OFF
Fuel pump	ON
Mixture	FULL RICH for 1 sec, then IDLE CUT-OFF
Fuel pump	OFF
Area	Clear
Magneto/start selector	START (10 sec. max)

When the engine starts :

Magneto selector	BOTH
Mixture	FULL RICH
Throttle	Reduce rapidly
Engine	1000 to 1200 RPM during heating

NOTE :
Refer to Section 2 "Limitations" for starter operation limits.

FLOODED ENGINE PROCEDURE

Same procedure as "Hot engine procedure", but without 1/4 open throttle.

NOTE :
Refer to Section 2 "Limitations" for starter operation limits.

AFTER STARTING ENGINE

ELECTRICAL POWER CHECK :

"ALTr FLD" switch-breaker OFF

- "ALTr" warning light — ON
- Voltmeter — Yellow sector
  or (Post MOD.182) — > 24

"ALTr FLD" switch-breaker ON

- "ALTr" warning light — OFF
- Voltmeter — Green sector
  or (Post-MOD.182) — 26 < V < 29

Turn and bank indicator (if installed)	ON
Vacuum gage (if installed)	Checked
Advisory panel test	Positive
Landing gear indicator lights test	Positive
"Radio master" switch (if installed)	ON
All radios and navaids	ON
Fuel selector	Check engine operation (minimum 1 minute) on each tank
Fuel selector	Set to fullest tank
Flaps	Checked and RETRACTED

DAY OPERATION :

Air conditioning switch (if installed) — AIR COND if air conditioning required

NIGHT OPERATION

Air conditioning switch (if installed) — OFF

TAXIING

Parking brake	Release
Brakes	Checked
Flight instruments	Checked
Taxi light	As required

Avoid exceeding 1200 RPM as long as the oil temperature indicator pointer is within yellow sector.

Steering the airplane with the rudder pedals only is generally sufficient. The combined use of the rudder pedals and the brakes permits the necessary tight turns.

Check operation of gyroscopic instruments (horizontal attitude, heading and turn and bank indicators) by means of alternate turns.

ENGINE RUN-UP

Parking brake	Set
Engine control friction	Adjusted
Oil temperature	Green sector
Oil pressure	Green sector
Mixture	FULL RICH
Fuel selector	Set to fullest tank

PROPELLER CHECK :

Propeller	FULL FORWARD
Throttle	2000 RPM
Propeller	Cycle twice (maxi. 500 RPM drop) Return to high RPM (FULL FORWARD)

MAGNETO CHECK :

Throttle	2000 RPM
Magneto selector	L. then BOTH R. then BOTH
Maximum RPM drop on each magneto	175 RPM
Maximum difference between magnetos	50 RPM

"ALTERNATE AIR" CHECK :

"Alternate Air"	Pulled
Manifold pressure	Maintained
"Alternate Air"	Pushed

MAXIMUM POWER CHECK (or when releasing brakes before take-off) :

Full throttle	2575 RPM

BEFORE TAKE-OFF

Seats, seat belts, shoulder harnesses	Check
Doors	LOCKED
Controls	Free
Pitch trim	TAKE-OFF
Rudder trim	TAKE-OFF
Flaps	TAKE-OFF
Magneto selector	BOTH
"Alternate Air"	As required
Propeller	FULL FORWARD
Mixture	FULL RICH
Fuel selector	Check set to fullest tank
Fuel pump	ON
Oil temperature	Green sector
Oil pressure	Green sector
Voltmeter	Green sector
or (Post-MOD.182)	26 < V < 29
Altimeter	Set
Heading Indicator (if installed)	Set
Horizontal attitude gyro (if installed)	Set
Parking brake	RELEASE - Light OFF
Cabin blower (if installed)	OFF
Landing lights	As required
Navigation lights	As required
Pitot heating (if installed)	As required
Transponder (if installed)	As required
Air conditioning switch (if installed)	"OFF"

TAKE-OFF

Lined up on runway	Check heading indicator Check emergency compass
Smoothly apply full power	
Engine parameters	Check
Airspeeds	See Section 5 "Take-off performance"

STANDARD AIRSPEEDS :

Rotation	68 KIAS
Initial climb	75 KIAS

WHEN SAFELY AIRBORNE :

Brakes	Apply
Landing gear	RETRACT

AT 300 ft .

Flaps	RETRACT

AT 1000 ft .

Fuel pump	OFF
External lights	As required
Air conditioning switch (if installed)	"AIR COND" if air conditioning required

CLIMB

Mixture	FULL RICH
Throttle	FULL POWER
Propeller	FULL FORWARD (2575 RPM)
Optimum climb speed	95 KIAS

NOTE.
Climb can also be carried out at higher speeds and lower power ratings (better visibility towards front, better engine cooling, lower noise level)

CRUISE

Cruise 75 % and holding. see engine data in "Performance" section.

In practice, it is recommended to change tank every half-hour and not to exceed a fuel imbalance of 20 U.S Gallons (75 Litres)

Flight into known icing conditions is PROHIBITED

Unintentional icing conditions : see Section 3 "Emergency procedures", Paragraph "Icing".

Leave icing condrions as soon as poss ble.

Remember to push in the "Alternate Air" control after leaving the icing area and when you are sure there is no ice on the airframe.

DESCENT

Power setting as required for descent.

Every 1500 ft, apply engine power to prevent excess engine cooling and spark plugs fouling. Avoid too long descents with manifold pressure lower than 14 in.Hg.

Seats, seat belts,
shoulder harnesses ADJUSTED and SECURE

APPROACH - LANDING

FINAL :

Airspeed	86/92 KIAS
Flaps	TAKE-OFF below 129 KIAS
Landing gear lever	DOWN
Fuel pump	ON
Mixture	FULL RICH
Propeller	FULL FORWARD
Brakes	Checked
Seats, seat belts, shoulder harnesses	Checked
Landing lights	ON

SHORT FINAL :

Flaps	LANDING below 103 KIAS
Airspeed	See Section 5 "Landing Performance"
Standard airspeed	73 KIAS
Air conditioning switch (if installed)	"OFF"

GO-AROUND

Smoothly apply full power

Airspeed	76/81 KIAS

When climb rate is positive

Landing gear lever	UP
Flaps	TAKE-OFF
Airspeed	90 KIAS
Flaps	RETRACTED
Climb at	95 KIAS

AFTER LANDING

Fuel pump	OFF
Flaps	RETRACTED
Landing light	OFF
Taxi light	As required
Trims	TAKE-OFF
Radio equipment	As required
Pitot heating (if installed)	OFF
Air conditioning (if installed)	As required

SHUT-DOWN / SECURING AIRPLANE

Parking brake	Set
Turn and bank indicator (if installed)	OFF
Anticollision lights (if installed)	OFF
Taxi light	OFF
Lights	OFF
"Radio master" switch (if installed)	OFF
Air conditioning switch (if installed)	"OFF"
Throttle	Reduce

WARNING

THE TEST HEREAFTER MUST BE IMPERATIVELY CARRIED OUT WITH ENGINE POWER LOWER THAN 1000 RPM ; THE FAILURE TO OBSERVE THIS RULE MAY LEAD TO EXHAUST SYSTEM DAMAGE

Magnetos cut-off test (*)	OFF, then BOTH
Throttle	1200 RPM
Mixture	IDLE CUT-OFF

(*) Depending on the kind of operation, it is not necessary to perform this test more than once a day, but just before securing the airplane.

AFTER ENGINE STOPS :

Magneto selector	OFF
"ALTr FLD" switch-breaker	OFF
Main switch	OFF
Fuel selector	OFF
Protection for pitots and static ports	Installed
Control lock	Installed
Chocks/Tie-downs	If necessary

PARTICULAR USES

STALLS

CAUTION

ATTEMPT PRACTICE STALLS ONLY WITH SUFFICIENT ALTITUDE FOR RECOVERY

Power-on stalls require an extremely steep pitch attitude. If the center of gravity is at or near its aft limit, a slight tendency toward wing rocking or a wing drop may occur when the stabilator is deflected near its stop.

Aerodynamic warning (pre-stall buffet) is low with power idle and more pronounced at higher power settings. Stall recovery can be effected immediately by easing the stick forward. Altitude loss is minor in all cases and is minimized by prompt application of power at the onset of the stall.

The stall warning horn will sound from 5 to 10 knots before stall speed.

FLIGHT WITH CROSSWIND

TAKE-OFF :

Apply full power before brake release

Aileron control moved into wind.

Keep the airplane on runway centerline using the rudder.

Maintain nose-wheel on ground up to 65 KIAS.

Lift-off cleanly in order to avoid subsequent touch-down.

LANDING :

When landing in a strong crosswind, use the landing flap setting

Although the crab or combination method of drift correction may be used, the wing low method gives the best control. Maximum bank angle close to the ground is 15°.

After touch-down, keep the nose-wheel on the ground, hold a straight course using rudder pedals

FLIGHT IN TURBULENT AIR

Maximum airspeed	140 KIAS
Recommended airspeed	129 KIAS
Seats, seat belts, shoulder harnesses	ADJUSTED and SECURE

USE OF DOORS

In windy or gusty conditions, the doors should be firmly held during opening and closing and should be closed and locked immediately after entering or leaving the airplane.

The doors must be closed and locked for all taxiing and flight operations.

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SECTION 5

PERFORMANCE

TABLE OF CONTENTS

ACOUSTIC LIMITATION

In compliance with decree dated 3rd April 1980, the maximum noise level permissible for SOCATA Model TB 20 airplane corresponding to total maximum certification weight of 3086 lbs is 78.7 d B (A).

The noise level which was determined in conditions stated by above-mentioned decree at maximum continuous power is 74 d B (A)

ICAO regulations

With a noise level lower than the limit noise level of 4.4 d B (A) the TB 20 airplane complies with Chapter 10, appendix 6, annex 16 of the agreement relative to International Civil Aviation Organization (ICAO).

The noise limit authorized in above-mentioned ICAO conditions is of 88 d B (A) at a maximum takeoff weight of 3086 lbs (1400 kg).

The noise level which was determined in above mentioned ICAO conditions at maximum continuous power and at 2575 RPM is 83.6 d B (A).

In compliance with decree dated 12th November 1980 SOCATA Model TB 20 airplane has received the noise limitation type certificate Nr N165 dated 18th December 1981.

AIRSPEED CALIBRATION

NOTE.
The indicated airspeeds (IAS) suppose instrument error to be null.

NORMAL STATIC SOURCE

FLAPS RETRACTED L'Gear UP		FLAPS TAKE-OFF L/Gear UP OR DOWN		FLAPS LANDING L'Gear DOWN	
KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
65	62	60	56	55	52
75	74	70	59.5	60	56
86	85	76	76	65	64.5
120	120.5	86	86.5	80	79.5
150	151	100	101	100	99.5
MPH IAS	MPH CAS	MPH IAS	MPH CAS	MPH IAS	MPH CAS
76	71	70	58	65	61
86	84	80	79	70	68
100	100	90	90	80	79
135	135	100	101	95	96
175	176	115	116	115	114

Figure 5.1

ALTERNATE STATIC SOURCE

CONDITIONS :
Air outlets and/or cabin air selector flow lever to open position

FLAPS RETRACTED L'Gear UP		FLAPS LANDING L'Gear DOWN	
KIAS	KCAS	KIAS	KCAS
66	63	56	51
76	72	60	56
100	95	65	61
120	114	80	74
150	142	100	93
MPH IAS	MPH CAS	MPH IAS	MPH CAS
75	73	65	60
85	82	70	65
100	95	80	74
135	129	95	88
175	165	115	105

Figure 5.2

ALTITUDE COMPENSATION

ALTERNATE STATIC SOURCE

NOTE 1 :
Subtract corrections from the read altitude.

NOTE 2 :
In case of alternate static source utilization, open air outlets and/or actuate cabin air selector flow lever to open position).

AIRSPEED / ALTITUDE	80 KIAS 92 MPH IAS	110 KIAS 127 MPH IAS	140 KIAS 160 MPH IAS	170 KIAS 195 MPH IAS
0 ft	25	50	80	125
5000 ft	25	55	95	145
9000 ft	30	60	105	160
13000 ft	35	70	120	190
17000 ft	40	80	135	220

Figure 5.3 – ALTITUDE COMPENSATION

STALLING SPEEDS

CONDITIONS : Weight 3086 lbs (1400 kg)
Power OFF

CONFIGURATION	BANK					
	0°		30°		45°	
	KIAS	MPH IAS	KIAS	MPH IAS	KIAS	MPH IAS
FLAPS RETRACTED L. GEAR RETRACTED	70	80	75	86	83	95
FLAPS TAKE-OFF L. GEAR UP OR DOWN	65	75	70	80	77	89
FLAPS LANDING L. GEAR DOWN	59	68	63	73	70	81

NOTE.
The indicated airspeeds (IAS) suppose instrument error to be null.

Figure 5.4 – STALLING SPEEDS

WIND COMPONENTS

EXAMPLE : Wind speed . 20 kt
Angle between wind direction and flight path . 50°
Headwind : 13 kt
Crosswind : 15 kt

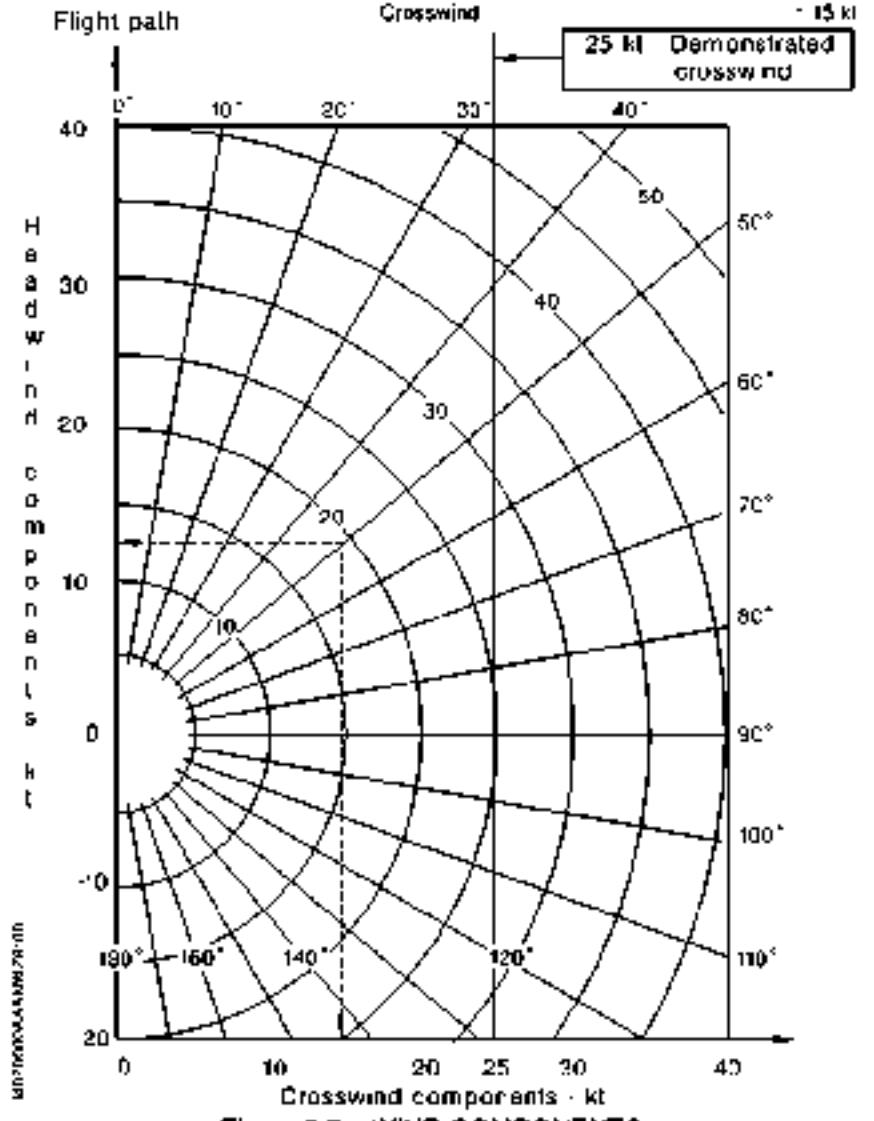

Figure 5 5 - WIND COMPONENTS

NOTICE

Performance given in this section are based on tests and interpolated to standard conditions (ICAO) and extrapolated from parameters : weight, altitude, temperature...

Performance values given do not take into account factors such as pilot technique or degraded airplane condition.

Take-off and landing performance figures are based on a dry hard surface runway.

The total take-off and landing distances (taxiing and clear 50 ft) will be corrected as follows :

- Influence of runway condition :

  Increase by : 7 % on hard sod

  10 % on short grass

  25 % on high grass

- Influence of wind :

  Increase by 30 % for each 10 kt rear wind

  Reduce by 10 % for each 10 kt headwind.

ALTERNATE AIR INFLUENCE

If flight conditions may cause icing, it is recommended to operate the cwer pull control actuating Alternate Air flap. This operation has an influence on the engine developped power due to the appreciable elevation of air intake temperature and alters the take-off distance by approximately 10 %. During climb at maximum power, climb speed drop is 150 ft / min. During climb at lower power and during cruise flight, rated performance could be established by increasing manifold pressure of 1 in Hg at the same power.

TAKE-OFF PERFORMANCE

CONDITIONS : IAS : Lift off : 63 KIAS - 73 MPH IAS
Clear 50 ft : 69 KIAS - 79 MPH IAS
Weight : 2370 lbs (1075 kg)
Flaps : Take-off position (10°)
Power : Full low pitch - Full throttle
Runway : Tar, dry
N : 2575 RPM

NOTE:
See Paragraph "NOTICE" for corrections due to wind and runway condition.

Temperature	Distance	Pressure altitude (ft)					
		0	2000	4000	6000	8000	10000
ISA - 20°C (- 36°F)	Roll (ft)	647	757	886	1042	1230	1448
	Clear 50 ft (ft)	1008	1170	1365	1605	1906	2282
ISA	Roll (ft)	771	905	1063	1254	1487	1758
	Clear 50 ft (ft)	1197	1399	1642	1948	2341	2851
ISA + 20°C (+ 36°F)	Roll (ft)	909	1070	1261	1492	1775	2106
	Clear 50 ft (ft)	1409	1655	1959	2346	2859	3564

Figure 5.6 - TAKE-OFF PERFORMANCE

TAKE-OFF PERFORMANCE

CONDITIONS : IAS . Lift off . 71 KIAS - 82 MPH IAS
Clear 50 ft . 78 KIAS - 90 MPH IAS
Weight : 3086 lbs (1400 kg)
Flaps . Take-off position (10°)
Power : Full low pitch - Full throttle
Runway : Tar, dry
N 2575 RPM

NOTE:
See Paragraph "NOTICE" for corrections due to wind and runway condition.

Temperature	Distance	Pressure altitude (ft)					
		0	2000	4000	6000	8000	10000
ISA - 20°C (- 36°F)	Roll (ft)	1115	1305	1527	1795	2119	2496
	Clear 50 ft (ft)	1735	2036	2409	2889	3537	4457
ISA	Roll (ft)	1329	1560	1833	2162	2562	3029
	Clear 50 ft (ft)	2083	2469	2959	3618	4578	6190
ISA + 20°C (+ 36°F)	Roll (ft)	1566	1845	2173	2572	3059	3630
	Clear 50 ft (ft)	2483	2976	3626	4562	6116	9854

Figure 5.7 - TAKE-OFF PERFORMANCE

CLIMB PERFORMANCE

CONDITIONS : Landing gear UP
Weight : 2370 lbs (1075 kg)
Indicated speed : 86 KIAS - 99 MPH IAS
Mixture : FULL RICH
Flaps retracted
Power 2575 RPM - full throttle

PRESSURE ALTITUDE	CLIMB SPEED					
	ISA -20°C (36°F)		ISA		ISA +20°C (68°F)	
	m/s	ft/min	m/s	ft/min	m/s	ft/min
500	8.94	1760	8.01	1576	7.22	1422
2500	8.13	1601	7.24	1425	6.48	1276
4500	7.33	1443	6.47	1273	5.74	1130
6500	6.54	1287	5.70	1122	4.99	982
8500	5.74	1129	4.93	970	4.25	836
10500	4.95	973	4.16	818	3.49	688
12500	4.15	817	3.39	667	2.74	540

Figure 5.8 - CLIMB PERFORMANCE

CLIMB PERFORMANCE

CONDITIONS : Landing gear UP
Weight : 3086 lbs (1400 kg)
Indicated speed : 95 KIAS - 109 MPH IAS
Mixture : FULL RICH
Flaps retracted
Power 2575 RPM - full throttle

PRESSURE ALTITUDE	CLIMB SPEED					
	ISA -20°C (- 36°F)		ISA		ISA +20°C (+ 36°F)	
	m/s	ft/min	m/s	ft/min	m/s	ft/min
500	6.32	1244	5.69	1100	4.96	977
2500	5.65	1112	4.94	972	4.34	853
4500	4.98	979	4.29	844	3.70	729
6500	4.31	848	3.64	716	3.07	604
8500	3.64	716	2.99	588	2.43	479
10500	2.97	585	2.34	460	1.80	353
12500	2.31	455	1.69	332	1.16	228

Figure 5.9 - CLIMB PERFORMANCE

CLIMB PERFORMANCE

CONDITIONS : Landing gear UP
Weight : 2370 lbs (1075 kg)
Indicated speed : 86 KIAS - 99 MPH IAS
Mixture : FULL RICH
Flaps 0°
Power 2575 RPM - full throttle

PRESSURE ALTITUDE Feet	CLIMB FROM SEA LEVEL								
	ISA -20°C (-36°F)			ISA			ISA +20°C (+36°F)		
	TIME mn's"	FUEL US Gal	DIST. NM	TIME mn's"	FUEL US Gal	DIST. NM	TIME mn's"	FUEL US Gal	DIST NM
500	0'17"	0.1	0.4	0'19"	0.1	0.5	0'21"	0.1	0.5
2500	1'29"	0.6	2.1	1'39"	0.6	2.4	1'49"	0.6	2.8
4500	2'48"	1.0	4.0	3'0"	1.1	4.7	3'28"	1.1	5.3
6500	4'17"	1 5	6 3	4'48"	1.6	7.3	5'20"	1 6	8 4
8500	5'58"	2 0	8 9	6'43"	2.1	10.4	7'31"	2 2	12 0
10500	7'53"	2 6	11 9	8'67"	2.7	14.1	10'6"	2 8	16 4
12500	10'9"	3.1	15.7	11'39"	3.3	18.7	13'18"	3.5	22.1

Figure 5.10 - CLIMB PERFORMANCE

CLIMB PERFORMANCE

CONDITIONS : Landing gear UP
Weight : 3086 lbs (1400 kg)
Indicated speed : 95 KIAS - 109 MPH IAS
Mixture : FULL RICH
Flaps 0°
Power 2575 RPM - full throttle

PRESSURE ALTITUDE Feet	CLIMB FROM SEA LEVEL								
	ISA -20°C (36°F)			ISA			ISA +20°C (+ 36°F)		
	TIME min's"	FUEL US Gal	DIST. NM	TIME min's"	FUEL US Gal	DIST. NM	TIME min's"	FUEL US Gal	DIST. NM
500	0'24"	0.2	0.6	0'27"	0.2	0.7	0'30"	0.2	0.8
2500	2'6"	0.8	3.3	2'23"	0.9	3.8	2'41"	0.9	4.5
4500	4'2"	1.5	6.4	4'35"	1.6	7.5	5'10"	1.7	8.8
6500	6'15"	2 2	10.0	7'9"	2.3	11 9	8'8"	2 5	14 0
8500	8'51"	3 0	14.5	10'13"	3.2	17 3	11'46"	3 4	20 7
10500	11'58"	3 8	20.0	14 2"	4.2	24 3	16'28"	4 5	29 6
12500	15'53"	4.8	27.1	19'5"	5.3	33.8	23'9"	6.0	42.7

Figure 5.11 - CLIMB PERFORMANCE

MAXIMUM PERFORMANCE ALTITUDE

Maximum performance altitude in standard temperature condition (ISA), corresponding to a vertical speed of 100 ft/min, is 18000 ft at take-off maximum weight.

ANTENNAS INFLUENCE ON PERFORMANCE

Installation of radio antennas reduces cruise performance as follows :

AERIAL	CRUISE SPEED		RANGE
	KIAS	MPH IAS	
VHF	0.48	0.56	0.30 %
VOR	- 0.59	- 0.68	- 0.37 %
Glide	- 0.32	- 0.37	- 0.20 %
ADF Loop antenna	- 0.75	- 0.87	- 0.47 %
ELT	- 0.16	- 0.19	- 0.10 %
Anticollision lights	- 0.16	- 0.19	- 0.10 %
Strobe lights	- 0.43	- 0.50	- 0.27 %
Example : IFR	- 3.23	- 3.73	- 2 %

Figure 5.12 - ANTENNAS INFLUENCE ON PERFORMANCE

FOOTSTEPS INFLUENCE ON PERFORMANCE

Installation of the retractable footsteps increases cruise performance as follows :

CRUISE SPEED		RANGE
KIAS	MPH IAS	
+ 2.5	+ 2.9	+ 0.8 %

Figure 5.12A - FOOTSTEPS INFLUENCE ON PERFORMANCE

NOTE:
The retractable footsteps are only installed when modification No. MOD.151 is applied. Thereby, the 2.5 KIAS speed gain counterbalances the standard installation of the VHF, VOR, Glide, ADF, ELT antennas and of the anticollision lights.

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LEVEL FLIGHT PERFORMANCE

Level flight performance are given for a weight of 2943 lbs (1335 kg) and for setting "Best Power" or "Best Economy" obtained with an EGT indicator.

Fuel : 66.2 U.S Gal (326 litres) usable

Various parameters such as the mixture setting, engine and propeller condition and the atmospheric conditions (wind, moisture, temperature and so on...) may noticeably vary the endurance and range.

Settings with EGT indicator :

- Best economy mixture : from full rich, weaken slowly mixture until peak EGT.
- Best power mixture : From peak EGT, re-enrich until EGT temperature decreases by 75°F (3 divisions).

Settings without EGT indicator :

- Best economy mixture : from full rich, weaken slowly until first engine malfunctioning signs (vibration) appear and then re-enrich slowly.

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 500 FT

ISA : 57.2°F (14°C)

CONDITIONS : - Mixture adjusted to the BEST POWER
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

% BHP	N RPM	PA in.Hg	CAS MPH	CAS kt	TAS MPH	TAS kt	MIXTURE ADJUSTING l / h	MIXTURE ADJUSTING U.S. Gal / h	SPECIFIC CONSUMTION l / 100 NM	SPECIFIC CONSUMTION U.S. Gal / 100NM
75 %	2500	23.6	175	150	174	151	61.3	16.2	40.6	10.7
	2400	**24.3**					**60.4**	**15.9**	**40.0**	**10.6**
	2300	25.1					59.4	15.7	39.3	10.4
	2200	26.0					58.5	15.4	38.7	10.2
70 %	2500	22.4	166	146	169	147	58.4	15.4	39.7	10.5
	2400	**23.1**					**57.4**	**15.2**	**39.1**	**10.3**
	2300	23.8					56.5	14.9	38.4	10.1
	2200	24.7					55.5	14.7	37.8	10.0
65 %	2500	21.2	162	142	165	143	55.5	14.7	34.8	10.2
	2400	**21.9**					**56.5**	**14.4**	**34.1**	**10.1**
	2300	22.6					53.6	14.2	37.5	9.9
	2200	23.4					52.6	13.9	36.8	9.7
60 %	2500	20.1	158	137	159	138	52.5	13.9	38.0	10.0
	2400	**20.7**					**51.6**	**13.6**	**37.3**	**9.9**
	2300	21.3					50.8	13.4	35.6	9.7
	2200	22.1					49.7	13.1	35.9	9.5
55 %	2500	19.5	152	132	153	133	49.6	13.1	37.2	9.8
	2400	**19.5**					**48.6**	**12.8**	**35.5**	**9.6**
	2300	20.1					47.7	12.6	35.8	9.5
	2200	20.8					46.7	12.3	35.0	9.2
50 %	2500	7.7	146	127	147	128	46.7	12.3	35.6	9.6
	2400	**8.2**					**45.7**	**12.1**	**35.8**	**9.5**
	2300	18.8					44.8	11.8	35.0	9.2
	2200	18.5					43.8	11.6	34.3	9.1

Figure 5-13 - LEVEL FLIGHT PERFORMANCE (500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 2500 FT

ISA : 50°F (10°C)

CONDITIONS : - Mixture adjusted to the BEST POWER
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

% BHP	N RPM	Pa in.Hg	CAS MPH	CAS kt	TAS MPH	TAS kt	MIXTURE ADJUSTING l/h	MIXTURE ADJUSTING U.S. Gal./ hr	SPECIFIC CONSUMPTION l/100 NM	SPECIFIC CONSUMPTION U.S. Gal./100NM
75 %	2500	23.0	171	148	177	154	61.3	16.2	39.9	10.5
	2400	23.8					60.4	15.9	39.2	10.4
	2300	24.5					59.4	15.7	38.6	10.2
	2200	25.4					58.5	15.4	38.0	10.0
70 %	2500	21.9	166	144	172	150	58.4	15.4	39.0	10.3
	2400	22.6					57.4	15.2	38.4	10.1
	2300	23.3					56.5	14.9	37.7	10.0
	2200	24.2					55.5	14.7	37.1	9.8
65 %	2500	20.7	161	140	167	145	55.4	14.6	38.1	10.1
	2400	21.4					54.5	14.4	37.6	9.9
	2300	22.1					53.6	14.2	36.8	9.7
	2200	22.9					52.6	13.9	36.2	9.6
60 %	2500	19.6	156	136	162	141	52.5	13.9	37.3	9.9
	2400	20.2					51.6	13.6	36.6	9.7
	2300	20.9					50.6	13.4	36.0	9.5
	2200	21.6					49.7	13.1	35.3	9.3
55 %	2500	18.5	150	131	156	136	49.6	13.1	36.6	9.7
	2400	19.0					48.6	12.8	35.9	9.5
	2300	19.6					47.7	12.6	35.2	9.3
	2200	20.3					46.7	12.4	34.5	9.1
50 %	2500	17.3	144	125	150	130	46.7	12.3	35.9	9.5
	2400	17.8					45.7	12.1	35.2	9.3
	2300	18.4					44.8	11.8	34.4	9.1
	2200	19.0					43.8	11.6	33.7	8.9

Figure 5.14 - LEVEL FLIGHT PERFORMANCE (2500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 4500 FT

ISA : 42.8°F (6°C)

CONDITIONS : - Mixture adjusted to the BEST POWER
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

%	N	PA	CAS		TAS		MIXTURE ADJUSTING		SPECIFIC CONSUMTION	
BHP	RPM	in.Hg	MPH	kt	MPH	kt	l / h	U.S Gal / h	l / 100 NM	U.S Gal / 100NM
75 %	2500	22.5	168	147	180	157	64.3	16.2	39.1	10.3
	2400	**23.2**					**60.4**	**16.0**	**38.5**	**10.2**
	2300	24.0					59.4	15.7	37.9	10.0
70 %	2500	21.4	164	143	176	153	58.4	15.4	38.3	10.1
	2400	**22.1**					**57.4**	**15.2**	**37.7**	**10.0**
	2300	**22.8**					**56.5**	**14.9**	**37.0**	**9.8**
	2200	**23.6**					**55.5**	**14.7**	**36.4**	**9.6**
65 %	2500	20.2	160	139	170	148	55.5	14.7	37.4	9.9
	2400	20.9					54.5	14.4	35.8	9.7
	2300	**21.6**					**53.6**	**14.1**	**36.2**	**9.6**
	2200	**22.4**					**52.6**	**13.9**	**35.5**	**9.4**
60 %	2500	19.2	154	134	165	143	52.5	13.9	35.6	9.7
	2400	**19.7**					**51.6**	**13.6**	**35.0**	**9.5**
	2300	20.4					50.6	13.4	34.3	9.3
	2200	21.1					49.7	13.1	34.7	9.2
55 %	2500	18.0	146	126	158	139	49.6	13.1	36.6	9.5
	2400	**18.6**					**48.6**	**12.8**	**35.9**	**9.3**
	2300	19.2					47.7	12.6	34.6	9.1
	2200	19.8					46.7	12.4	33.9	9.0
50 %	2500	16.5	141	123	151	131	46.7	12.3	35.5	9.4
	2400	17.4					45.7	12.1	34.8	9.2
	2300	18.0					44.8	11.8	34.1	9.0
	2200	18.6					43.8	11.6	33.4	8.8

Figure 5.15 – LEVEL FLIGHT PERFORMANCE (4500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 6500 FT

ISA : 35.6°F (2°C)

CONDITIONS : - Mixture adjusted to the BEST POWER
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

%	N	Pa	CAS		TAS		MIXTURE ADJUSTING		SPECIFIC CONSUMPTION	
BHP	RPM	in.Hg	MPH	kt	MPH	kt	l/h	U.S. Gal./hr	l/100NM	U.S. Gal./100NM
75 %	2500	22.1	167	145	184	160	61.3	16.2	38.4	10.1
70 %	2500	20.9	162	141	178	155	58.4	15.4	37.6	9.9
	2400	21.6					57.4	15.2	37.0	9.8
	2300	22.3					56.5	14.9	36.3	9.6
65 %	2500	19.8	157	137	173	151	55.4	14.6	36.8	9.7
	2400	20.5					54.5	14.4	36.1	9.5
	2300	21.1					53.6	14.1	35.5	9.4
	2200	21.9					52.6	13.9	34.9	9.2
60 %	2500	18.7	152	132	168	146	52.5	13.9	36.0	9.5
	2400	19.3					51.5	13.6	35.4	9.4
	2300	19.9					50.6	13.4	34.7	9.2
	2200	20.6					49.7	13.1	34.1	9.0
55 %	2500	17.6	146	127	161	140	49.6	13.1	35.4	9.4
	2400	18.2					48.6	12.9	34.7	9.2
	2300	18.8					47.7	12.6	34.0	9.0
	2200	19.4					46.7	12.3	33.3	8.8
50 %	2500	16.5	138	120	152	132	46.7	12.3	35.2	9.3
	2400	17.0					45.7	12.1	34.5	9.1
	2300	17.6					44.8	11.8	33.8	8.9
	2200	18.2					43.8	11.5	33.1	8.7

Figure 5.16 – LEVEL FLIGHT PERFORMANCE (6500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 8500 FT

ISA - 26.4°F (- 2°C)

CONDITIONS : - Mixture adjusted to the BEST POWER
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

%	N	PA	CAS		TAS		MIXTURE ADJUSTING		SPECIFIC CONSUMTION	
BHP	RPM	in.Hg	MPH	kt	MPH	kt	l / h	U.S. Gal / h	l / 100 NM	U.S. Gal / 100NM
70 %	**2500**	**20.5**	**162**	**139**	**182**	**158**	**58.4**	**15.4**	**35.9**	**9.7**
65 %	2500	19.1	156	135	176	154	55.5	14.7	35.1	9.5
	2400	20.0					54.5	14.4	35.5	9.4
	2300	**20.7**					**53.6**	**14.2**	**34.9**	**9.2**
60 %	2500	16.2	150	130	170	148	52.5	13.8	35.4	9.4
	2400	18.5					51.8	13.6	34.8	9.2
	2300	**19.5**					**50.6**	**13.4**	**34.1**	**9.0**
	2200	**20.2**					**49.7**	**13.1**	**33.5**	**8.8**
55 %	2500	17.2	144	125	164	143	49.5	13.1	34.8	9.2
	2400	17.8					48.8	12.8	34.1	9.0
	2300	18.3					47.7	12.6	33.4	8.8
	2200	**19.0**					**46.7**	**12.4**	**32.8**	**8.7**

Figure 5-17 - LEVEL FLIGHT PERFORMANCE (8500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 10500 FT

ISA - 21.2°F (- 6°C)

CONDITIONS : - Mixture adjusted to the BEST POWER
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

%	N	Pa	CAS		TAS		MIXTURE ADJUSTING		SPECIFIC CONSUMPTION	
BHP	RPM	in.Hg	MPH	kt	MPH	kt	l / h	U.S. Gal / hr	l / 100 NM	U.S. Gal / 100NM
65 %	**2500**	**19.0**	**153**	**133**	**180**	**156**	**55.5**	**14.7**	**35.5**	**9.4**
60 %	2500	17.9	148	129	173	151	52.6	13.9	34.8	9.2
	2400	16.5					51.6	13.6	34.2	9.0
	2300	**19.1**					**50.6**	**13.4**	**33.6**	**8.9**
55 %	2500	16.8	142	123	166	144	48.6	13.1	34.4	9.1
	2400	17.4					48.6	12.8	33.7	8.8
	2300	17.9					47.7	12.6	33.1	8.7
	2200	**18.6**					**46.7**	**12.3**	**32.4**	**8.6**

Figure 5.18 - LEVEL FLIGHT PERFORMANCE (10500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 12500 FT

ISA - 14°F (- 10°C)

CONDITIONS : - Mixture adjusted to the BEST POWER
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

%	N	PA	CAS		TAS		MIXTURE ADJUSTING		SPECIFIC CONSUMTION	
BHP	RPM	in.Hg	MPH	kt	MPH	kt	l / h	U.S Gal / h	l / 100 NM	U.S Gal / 100NM
60 %	2500	27.5	146	127	176	154	52.5	13.9	34.2	9.0
	2400	28.1					51.6	13.6	33.6	8.9
55 %	2500	26.5	139	120	168	146	49.6	13.1	34.0	9.0
	2400	27.0					48.8	12.9	33.4	8.8
	2300	27.5					47.7	12.6	32.7	8.6

Figure 5.19 - LEVEL FLIGHT PERFORMANCE (12500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 500 FT

ISA : 57.2°F (14°C)

CONDITIONS : - Mixture adjusted to the BEST ECONOMY
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

% BHP	N RPM	Pa in.Hg	CAS MPH	CAS kt	TAS MPH	TAS kt	MIXTURE ADJUSTING l/h	MIXTURE ADJUSTING U.S. Gal./ hr	SPECIFIC CONSUMPTION l/100NM	SPECIFIC CONSUMPTION U.S. Gal./100NM
75 %	**2500**	**23.6**	169	147	170	148	**52.8**	**14.0**	**35.5**	**9.4**
	2400	**24.3**					**51.8**	**13.7**	**35.0**	**9.2**
	2300	**25.1**					**50.9**	**13.5**	**34.4**	**9.1**
	2200	**26.0**					**50.0**	**13.2**	**33.7**	**8.9**
70 %	2500	22.4	165	143	166	144	50.3	13.3	34.9	9.2
	2400	**23.1**					49.4	13.1	34.2	9.0
	2300	**23.9**					48.5	12.8	33.6	8.9
	2200	**24.7**					47.5	12.6	32.9	8.7
65 %	2500	21.2	160	139	161	140	47.9	12.7	33.2	9.0
	2400	21.9					46.9	12.4	33.6	8.8
	2300	**22.6**					46.0	12.1	32.8	8.7
	2200	**23.4**					45.0	11.9	32.2	8.5
60 %	2500	20.1	155	135	156	136	45.4	12.0	33.5	8.8
	2400	20.7					44.5	11.8	32.8	8.7
	2300	**21.3**					43.5	11.5	32.1	8.5
	2200	**22.1**					42.6	11.3	31.4	8.3
55 %	2500	18.9	149	129	150	130	43.0	11.4	33.0	8.7
	2400	19.5					42.0	11.1	32.2	8.5
	2300	**20.1**					41.1	10.8	31.5	8.3
	2200	**20.8**					40.1	10.6	30.8	8.1
50 %	2500	17.7	142	123	143	124	40.5	10.7	32.6	8.6
	2400	18.3					39.6	10.4	31.8	8.4
	2300	**18.8**					38.6	10.2	31.1	8.2
	2200	**19.5**					37.7	9.9	30.3	8.0

Figure 5.20 - LEVEL FLIGHT PERFORMANCE (500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 2500 FT

ISA : 50°F (10°C)

CONDITIONS : - Mixture adjusted to the BEST ECONOMY
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

%	N	PA	CAS		TAS		MIXTURE ADJUSTING		SPECIFIC CONSUMTION	
BHP	RPM	in.Hg	MPH	kt	MPH	kt	l / h	U.S Gal / h	l / 100 NM	U.S Gal / 100NM
75 %	**2500**	**23.0**	167	145	174	151	**52.8**	**13.9**	**35.0**	**9.2**
	2400	**23.6**					**51.9**	**13.7**	**34.4**	**9.1**
	2300	**24.6**					50.9	13.5	33.7	8.9
	2200	**25.4**					50.0	13.2	33.1	8.7
70 %	**2500**	**21.5**	162	142	169	147	50.4	13.3	34.3	9.1
	2400	**22.6**					49.4	13.1	33.6	8.9
	2300	**23.3**					48.5	12.8	33.0	8.7
	2200	**24.2**					47.5	12.6	32.3	8.5
65 %	**2500**	**20.8**	156	137	164	143	47.9	12.7	34.6	9.9
	2400	**21.4**					46.9	12.4	32.9	8.7
	2300	**22.1**					46.0	12.2	32.3	8.5
	2200	**22.5**					45.1	11.9	31.6	8.3
60 %	**2500**	**19.6**	153	133	158	138	45.4	12.0	33.0	8.7
	2400	**20.2**					44.5	11.8	32.3	8.5
	2300	**20.5**					43.5	11.5	31.6	8.3
	2200	**21.6**					42.8	11.2	30.9	8.2
55 %	**2500**	**18.5**	147	128	152	133	43.0	11.4	32.4	8.6
	2400	**19.0**					42.0	11.1	31.7	8.4
	2300	**19.6**					41.1	10.9	31.0	8.2
	2200	**20.2**					40.1	10.6	30.3	8.0
50 %	**2500**	**17.2**	139	121	145	126	40.5	10.7	32.1	8.5
	2400	**17.8**					39.5	10.4	31.4	8.3
	2300	**18.4**					38.6	10.2	30.6	8.1
	2200	**18.8**					37.7	10.0	29.8	7.9

Figure 5.21 - LEVEL FLIGHT PERFORMANCE (2500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 4500 FT

ISA : 42.6°F (6°C)

CONDITIONS : - Mixture adjusted to the BEST ECONOMY
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

%	N	Pa	CAS		TAS		MIXTURE ADJUSTING		SPECIFIC CONSUMTION	
BHP	RPM	in.Hg	MPH	kt	MPH	kt	l/h	U.S. Gal./hr	l/100NM	U.S. Gal./100NM
75 %	2500	22.5	165	144	177	154	52.8	13.9	34.4	9.1
	2400	23.2					51.9	13.7	33.7	8.9
	2300	24.0					50.9	13.4	33.1	8.7
70 %	2500	21.4	161	140	172	150	50.3	13.3	33.7	8.9
	2400	22.1					49.4	13.0	33.0	8.7
	2300	22.8					48.5	12.8	32.4	8.6
	2200	23.6					47.5	12.6	31.8	8.4
65 %	2500	20.3	156	136	167	145	47.5	12.7	33.0	8.7
	2400	20.9					46.5	12.4	32.3	8.5
	2300	21.6					46.0	12.2	31.7	8.4
	2200	22.4					45.0	11.9	31.0	8.2
60 %	2500	19.2	151	131	161	140	45.2	12.0	32.4	8.6
	2400	19.8					44.5	11.8	31.7	8.4
	2300	20.4					43.6	11.5	31.1	8.2
	2200	21.1					42.8	11.3	30.4	8.0
55 %	2500	18.0	145	126	155	135	43.0	11.4	31.9	8.4
	2400	18.6					42.0	11.1	31.2	8.2
	2300	19.2					41.1	10.8	30.6	8.1
	2200	19.9					40.1	10.6	29.8	7.9
50 %	2500	16.9	137	119	146	127	40.5	10.7	31.9	8.4
	2400	17.4					39.6	10.5	31.1	8.2
	2300	18.0					38.6	10.2	30.4	8.0
	2200	18.6					37.7	10.0	29.6	7.8

Figure 5.22 – LEVEL FLIGHT PERFORMANCE (4500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 6500 FT

ISA : 35.6°F (2°C)

CONDITIONS : - Mixture adjusted to the BEST ECONOMY
- Speed without antennas nor external lights
- Weight : 2940 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

%	N	PA	CAS		TAS		MIXTURE ADJUSTING		SPECIFIC CONSUMTION	
BHP	RPM	in.Hg	MPH	kt	MPH	kt	l / h	U.S. Gal / h	l / 100 NM	U.S. Gal / 100NM
75 %	2530	22.1	162	142	180	157	52.8	14.0	33.7	8.9
70 %	2500	21.0	158	138	175	152	50.3	13.3	33.1	8.7
	2400	21.6					49.4	13.1	32.4	8.6
	2300	22.3					48.4	12.8	31.8	8.4
65 %	2500	9.8	154	134	170	148	47.9	12.7	32.4	8.6
	2400	20.5					46.9	12.4	31.8	8.4
	2300	21.1					46.0	12.2	31.2	8.2
	2200	21.8					45.0	11.9	30.5	8.1
60 %	2500	18.7	149	129	164	142	45.4	12.0	31.8	8.4
	2400	19.2					44.5	11.8	31.2	8.2
	2300	19.9					43.5	11.5	30.6	8.1
	2200	20.6					42.6	11.2	29.9	7.9
55 %	2500	17.6	142	124	157	136	43.0	11.4	31.5	8.3
	2400	18.2					42.0	11.1	30.8	8.1
	2300	18.8					41.1	10.8	30.1	7.9
	2200	19.4					40.1	10.6	29.4	7.8
50 %	2500	16.5	134	116	147	128	40.5	10.7	31.7	8.4
	2400	17.0					39.6	10.5	30.9	8.2
	2300	17.6					38.8	10.2	30.2	8.0
	2200	18.2					37.7	10.0	29.4	7.8

Figure 5.23 - LEVEL FLIGHT PERFORMANCE (6500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 8500 FT

ISA - 28.4°F (- 2°C)

CONDITIONS : - Mixture adjusted to the BEST ECONOMY
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

%	N	Pa	CAS		TAS		MIXTURE ADJUSTING		SPECIFIC CONSUMPTION	
BHP	RPM	in.Hg	MPH	kt	MPH	kt	l/h	U.S. Gal./hr	l/100 NM	U.S. Gal./100NM
70 %	2500	20.5	157	136	179	155	50.3	13.3	32.5	8.6
65 %	2500	19.4	152	132	170	150	47.0	12.6	31.9	8.4
	2400	20.0					46.0	12.1	31.2	8.2
	2300	**20.7**					**46.0**	**12.1**	**30.6**	**8.1**
60 %	2500	18.3	146	127	167	145	45.4	12.0	31.3	8.3
	2400	18.8					44.5	11.7	30.7	8.1
	2300	**19.5**					**43.8**	**11.5**	**30.0**	**7.9**
	2200	**20.2**					**42.6**	**11.3**	**29.4**	**7.8**
55 %	2500	17.2	140	122	159	138	43.0	11.4	31.0	8.2
	2400	17.8					42.0	11.1	30.4	8.0
	2300	18.3					41.1	10.9	29.7	7.8
	2200	**19.0**					**40.1**	**10.6**	**29.0**	**7.7**

Figure 5-24 - LEVEL FLIGHT PERFORMANCE (8500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 10500 FT

ISA - 21.2°F (- 6°C)

CONDITIONS : - Mixture adjusted to the BEST ECONOMY
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

%	N	PA	CAS		TAS		MIXTURE ADJUSTING		SPECIFIC CONSUMTION	
BHP	RPM	in.Hg	MPH	kt	MPH	kt	l / h	U.S Gal / h	l / 100 NM	U.S Gal / 100NM
65 %	**2500**	**- 9 C**	**150**	**130**	**- 76**	**153**	**47.9**	**12 6**	**31 9**	**8 9**
60 %	2500	- 7 C	144	125	- 69	147	45,4	12 0	30 9	8 2
	2400	- 8 5					44,5	11,7	30 2	8 0
	2300	**- 9 1**					43,5	11,5	29 6	7 8
55 %	2500	0.2	137	119	- 61	140	43.0	11.3	33.8	8.1
	2400	- 7.4					42.0	11.1	33.1	7.8
	2300	- 7.5					41.1	10.9	23.4	7.6
	2200	**- 9.6**					**40.1**	**10.6**	**20.7**	**7.6**

Figure 5.25 - LEVEL FLIGHT PERFORMANCE (10500 ft)

LEVEL FLIGHT PERFORMANCE

PRESSURE ALTITUDE : 12500 FT

ISA - 19°F (- 10°C)

CONDITIONS : - Mixture adjusted to the BEST ECONOMY
- Speed without antennas nor external lights
- Weight : 2943 lbs (1335 kg)

NOTE:
Bold-faced types represent recommended power.

% BHP	N RPM	PA in.Hg	CAS MPH	CAS kt	TAS MPH	TAS kt	MIXTURE ADJUSTING /	FUEL FLOW U.S. Gal / hr	SPECIFIC CONSUMPTION Nm / 100NM	SPECIFIC CONSUMPTION U.S. Gal / 100NM
60 %	2500	17.5	142	123	171	149	45.4	12.0	30.4	8.0
	2400	**18.1**					**44.5**	**11.7**	**29.8**	**7.9**
55 %	2500	16.5	134	116	162	141	43.0	11.4	30.6	8.1
	2400	17.0					42.0	11.1	29.9	7.9
	2300	17.6					41.1	10.9	29.2	7.7

Figure 5.26 - LEVEL FLIGHT PERFORMANCE (12500 ft)

HOLDING CONDITIONS IN FLIGHT

45 % BHP
1800 RPM
MP = 21.5 in.Hg
Substract 0.3 per 1000 ft
Consumption : 8.5 U.S.Gal/h

LANDING PERFORMANCE

WEIGHT : 2370 lbs (1075kg)

CONDITIONS : Clear 50 ft - 67.5 KIAS - 78 MPH IAS
Flaps : Landing position
Runway : Tar, dry

NOTE:
See Paragraph "NOTICE" for corrections due to wind and runway condition.

Temperature	Distance	Pressure altitude (ft)					
		0	2000	4000	6000	8000	10000
ISA - 20°C (- 36°F)	Roll (ft)	675	710	755	800	855	905
	Clear 50 ft (ft)	1420	1495	1570	1650	1740	1905
ISA	Roll (ft)	720	765	810	865	920	980
	Clear 50 ft (ft)	1515	1590	1675	1760	1855	1975
ISA + 20°C (+ 36°F)	Roll (ft)	770	820	870	930	985	1055
	Clear 50 ft (ft)	1610	1690	1780	1875	1980	2095

Figure 5.27 – LANDING PERFORMANCE (2370 lbs)

LANDING PERFORMANCE

WEIGHT : 3086 lbs (1400kg)

CONDITIONS : Clear 50 ft . 76 KIAS - 88 MPH IAS
Flaps . Landing position
Runway : Tar, dry

NOTE:
See Paragraph "NOTICE" for corrections due to wind and runway condition.

Tempe-rature	Distance	Pressure altitude (ft)					
		0	2000	4000	6000	8000	10000
ISA - 20°C (- 36°F)	Roll (ft)	770	815	865	915	980	1040
	Clear 50 ft (ft)	1713	1800	1895	1995	2110	2235
ISA	Roll (ft)	825	875	930	985	1050	1115
	Clear 50 ft (ft)	1820	1920	2015	2120	2245	2380
ISA + 20°C (+ 36°F)	Roll (ft)	885	940	995	1055	1130	1200
	Clear 50 ft (ft)	1945	2045	2145	2255	2390	2535

Figure 5.28 - LANDING PERFORMANCE (3086 lbs)

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SECTION 6

WEIGHT AND BALANCE

TABLE OF CONTENTS

GENERAL

This section contains the procedure for determining the basic empty weight and moment of SOCATA Model TB 20 airplane. Procedures for calculating the weight and moment for various operations are also provided. A list of equipment available for this airplane is included at the back of this section.

It should be noted that the list of specific optional equipment installed on your airplane as delivered from the factory can be found in the records carried in the airplane.

IT IS THE RESPONSIBILITY OF THE PILOT TO ENSURE THAT THE AIRPLANE IS LOADED PROPERLY

AIRPLANE WEIGHING PROCEDURES

Refer to Maintenance Manual for the procedures to use.

NOTE:
Weighing carried out at the factory takes into account all equipment installed on the airplane. The list of these equipment and the weighing result are noted in the Individual Inspection Record.

BAGGAGE / CARGO LOADING

BAGGAGE

The baggage compartment is located at the back of rear passengers bench or, Post-MOD.151, seats. Loading can either be carried out through baggage compartment access door provided with a locking device, located on L.H. side of the airplane, or from the inside of the cabin, on upper part of the back of the bench or, Post-MOD 151, of the rear seats. In this case, a zip fastener allows folding the sound-proofing cloth.

Tie-down straps are provided for securing baggage on compartment floor.

CARGO

To facilitate the carrying of equipment, large or bulky items, the rear bench or, Post-MOD.151, the rear seats may be removed from the airplane.

To remove rear bench or seats : See Figure 6.1 (A, B, C)

- Lift up seating (Item 6) (kept in position with "Velcro" straps) of rear bench or, Post-MOD.151, of rear seats and, in this last case, remove arm rest.

  If you want to free the back from its support plate, lift it up about 1.5 inch (3 cm) at both ends and pull it forward so that both attaching pins free from apertures

- To remove the support plate (Item 5) and back (Item 1) :

  - Unfasten attachments of sound-proofing cloth on cross-beam (Item 2)

    Pushing, unscrew ¼ turn both attaching pins of air regulation duct on rear floor (Item 4)

  - Pull both latches inwards (Item 3)

  - Lift up support plate (Item 5) to disengage it forward.

NOTE:
To reinstall rear bench or, Post-MOD.151, rear seats - see Figure 6.1 (a, b, c) reverse removal instructions.

IMPERATIVELY RESPECT WEIGHT AND BALANCE LIMITS

THE PILOT IS RESPONSIBLE FOR CORRECT BAGGAGE AND / OR CARGO LOADING. PRIOR TO ANY FLIGHT HE MUST MAKE SURE THAT WEIGHT, BALANCE AND TIE-DOWN ARE CORRECT.

- **Baggage weight :**

  Maximum 143 lbs (65 kg) at 102.36 in. (2.600 m)

- **Cargo weight (without baggage) :**

  Maximum 573 lbs (260 kg) at 74.80 in. (1.900 m)

CAUTION

WHEN IN CARGO CONFIGURATION, NO PASSENGERS ARE ALLOWED IN THE CARGO AREA

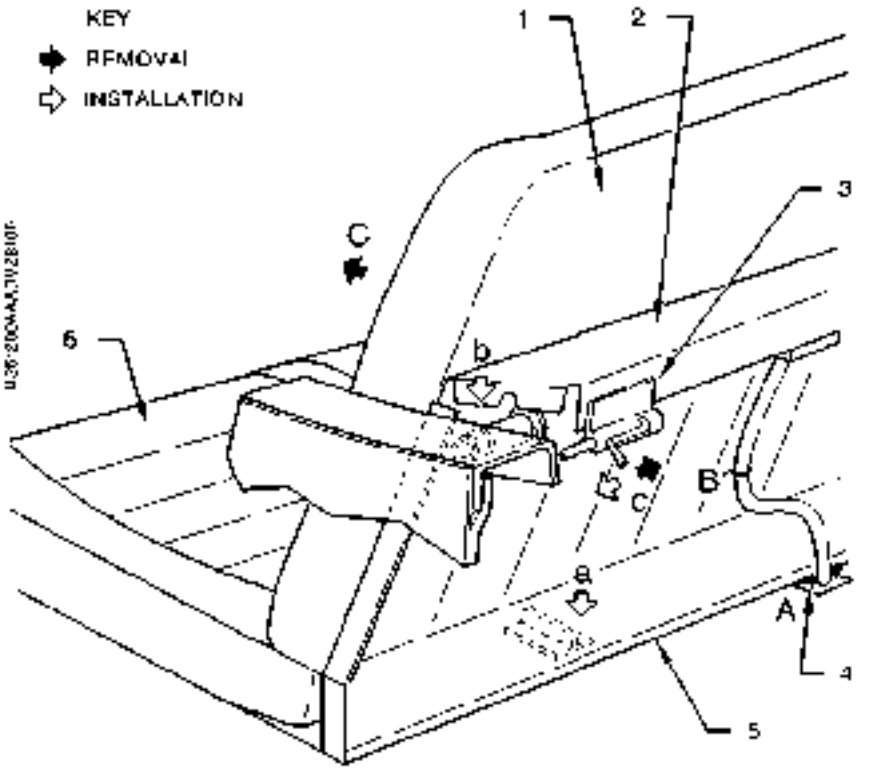

Figure 6 1 - REMOVAL AND INSTALLATION OF REAR BENCH OR, Post-MOD 151, REAR SEATS

DETERMINING WEIGHT AND BALANCE

GENERAL

This paragraph is intended to provide the pilot with a simple means of determining weight and balance of his airplane with regard to its empty characteristics and loading. The empty weight to be considered is the one noted on the last weighing form.

The data concerning loading are given on following graphs :

- Loading graph : see Figure 6.4
- Weight / Moment envelope : see Figure 6.5

To determine airplane loading within a given flight configuration, you only have to add up weights and moments of the various loads recorded and to add them to empty airplane data.

These values carried forward on weight / moment envelope must give a point within the limits drawn with continuous line.

If that is the case, loading is acceptable.

NOTE :
If moment is not directly known (optional equipment for example), determine it multiplying weight [lbs (kg)] by arm [in (m)].

UTILIZATION OF WEIGHT / MOMENT GRAPH

Extract translucent Figure 6.5 from the manual and take a pencil.

- On Figure 6.5, place point A (1) corresponding to your empty airplane [Our sample loading : 1866 lbs (846.5 kg) ; 70.64 lb in / 1000 (813.7 m kg)]
- Superpose point A (1) and point A of graph ① Figure 6.4.
- Draw on weight / moment envelope the straight line pilot + front passenger to get point A (2) corresponding to front seats loading. [Our sample loading : 2 persons 340 lbs (154 kg)].

- Superpose point A (2) and point A of graph ①, draw the rear passengers straight line to get point B (1) related to rear seat loading
  (Our sample loading : 2 persons 340 lb (154 kg))
- Superpose point B (1) and point B of graph ②, draw the fuel straight line to get point B (2).
  [Our sample loading : 397 lbs (180 kg) - 66 U.S Gal (250 l) fuel]
- Superpose point B (2) and point B of graph ②, draw the baggage straight line to get point M.
  [Our sample loading : 110 lbs (50 kg) baggage]

Since point M falls within weight / moment envelope, the loading is acceptable

NOTE :

Option No. 0800.00M "L.H. or R.H. front seat back off installation", option No. 0800.10M "L.H. front seat back-off installation" and/or option No. 0800.20M "R.H. front seat back-off installation" are marked on your airplane by a color ring (yellow / green) located on the 2 front supports (tubes) of each seat.

For C.G. location calculation, take 2-inch (50 mm) L.H. front seat or L.H. and R.H. front seats back-off installation into account.

CAUTION

**OPTION(S) No. 0800.00M (Qty 1 or 2)
OR 0800.10M AND 0800.20M (See NOTE on page 6.6) :
2-in. (50 mm) back-off installation for L.H. and/or R.H. front seat(s)**

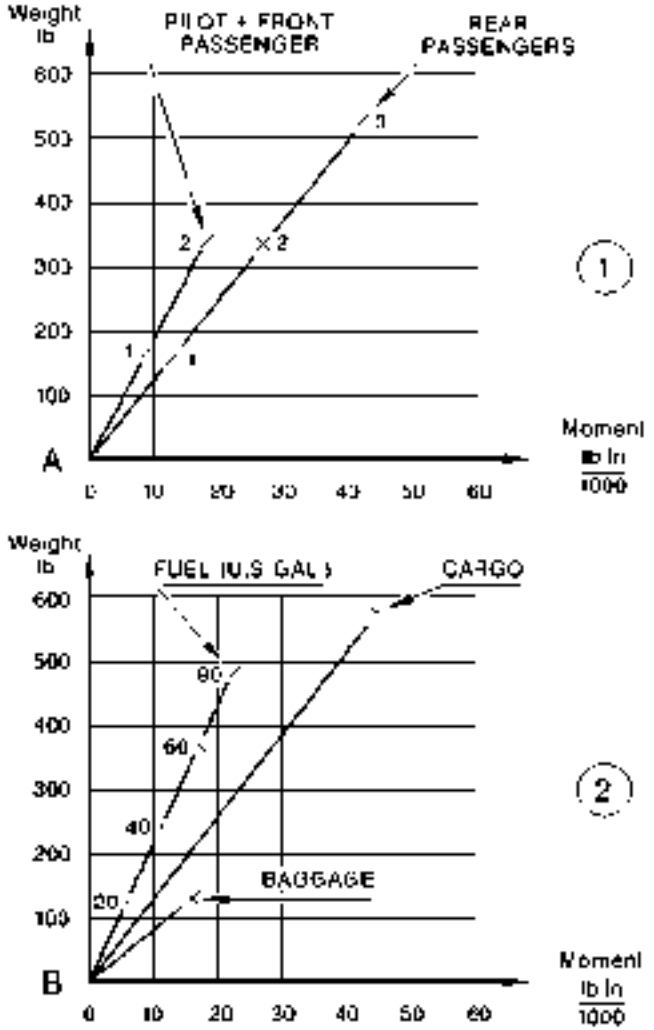

Figure 6.4 - LOADING GRAPHS

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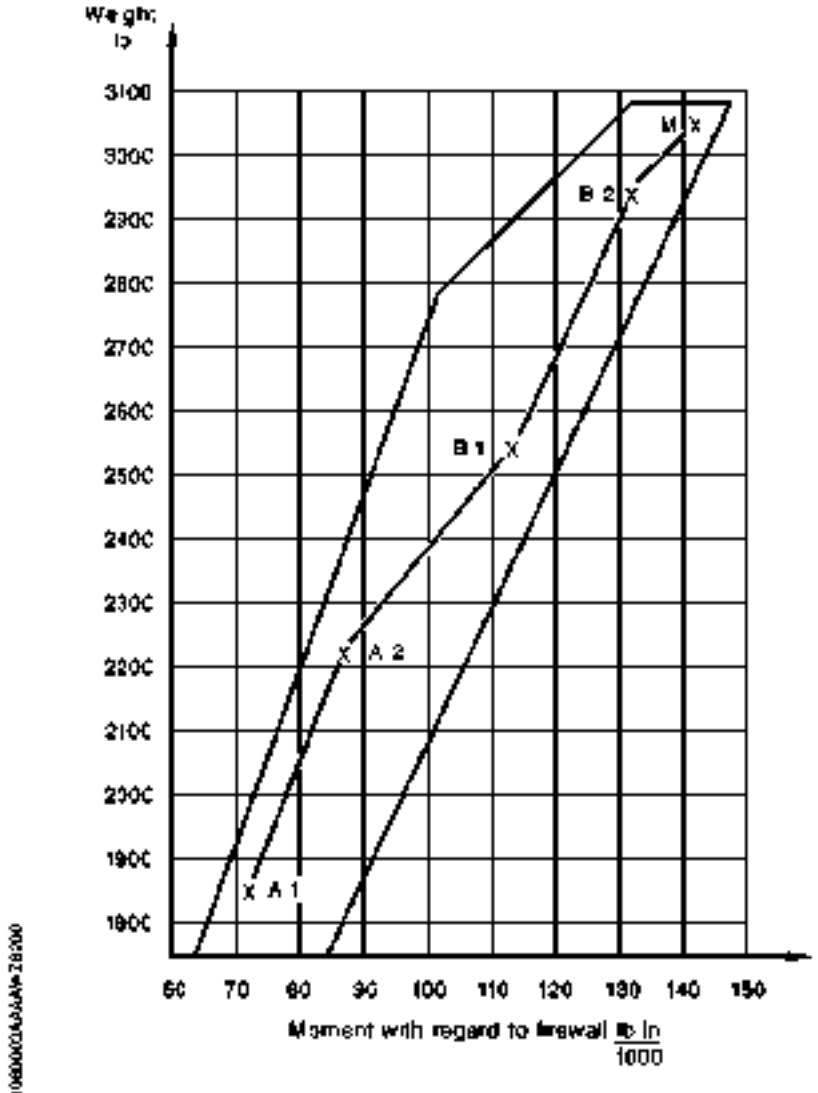

Figure 6.6 - LOADING SAMPLE

EQUIPMENT LIST

The following equipment list contains standard equipment installed on each airplane and available optional equipment.

A separate equipment list of items installed at the factory in your specific airplane is provided in your airplane file.

Columns showing weight (in pounds) and arm (in inches) provide the weight and center of gravity location for the equipment.

The equipment list provides the following information :

- Required or Standard items
  - A letter "R" or "S" allows classifying of the equipment :
    "R" : equipment items required for certification
    "S" : standard equipment items
- Optional equipment (not restrictive list)
  - A letter "O" or "A" allows classifying of the equipment :
    "O" : optional equipment items replacing required or standard items
    "A" : optional equipment items which are in addition to required or standard items

    In the following column, an item number allows identification of the optional equipment.
  - The column marked "*" will be used to tick off the optional equipment installed on your airplane.

NOTE 1 :
Unless otherwise indicated (-), arms are positive values
Positive arms are distances aft of the airplane datum ; negative arms are distances forward of the datum.

NOTE 2 :
*Equipment list with the validity "**Pre-MOD. 151**" :*
S/N 948 to 1999, except S/N 1900
*Equipment list with the validity "**Post-MOD. 151**" :*
S/N 2000 to 9999, plus S/N 1900

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		01 - SPECIFIC OPTIONAL EQUIPMENT			
A	46*5 20M	Additional equipment for IFR France "Grey" - Up to S/N 1269 - From S/N 1270		0.44* /	25.59 /
A	46*6 20M	Additional equipment for right VFR France "Grey"		0.44*	25.59

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT		WEIGHT per unit lb (kg)	ARM in. (m)
		21 – ENVIRONMENTAL SYSTEM			
		21-30 – Heating			
A	C596 00M	Radio console ventilation		1.543	6.30
A	C869 00M	Radio console forced ventilation (blower KING KA 33)		1.543	4.33
A	C869 10M	Radio console forced ventilation (blower KING KA 33) (With option C672 00M "Battery (at the front)" installed - refer to ATA 24)		1.543	7.87
A	C869 20M	Radio console forced ventilation (blower KING KA 33)		1.543	12.99
A	F822 00M	Forced ventilation, rear passengers VETUS		2.756	136.61
A	F822 10M	Forced ventilation, rear passengers VETUS		2.756	136.61
A	F822 20M	Forced ventilation, rear passengers VETUS		2.756	136.61
		21-50 – Air conditioning			
A O	F874 00M	Air conditioning system KEITH with alternator 70A LW 14363 LYCOMING		67.000 13.000	72.83 – 37.80
A O	F874 10M	Reinforced air conditioning system KEITH with alternator 70A LW 14363 LYCOMING		68.210 13.000	72.83 – 37.80

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	▲	WEIGHT per unit lb (kg)	ARM in. (m)
		22 - AUTO FLIGHT			
		22-12 - Autopilot			
A	22-001A	A/P KFC 225 HONEYWELL		26.109	85.76
A	0675 00M	Altitude and vertical speed preselector KAS 297B KING		1 764	21.65
A	0675 10M	Altitude and vertical speed preselector KAS 297B KING (on P.F.H. instrument panel)		1 764	21.65
A	0675 20M	Altitude and vertical speed preselector KAS 297B KING (on radio console)		1 764	21 65
A	0675 30M	Altitude and vertical speed preselector KAS 297B KING (EHSI version) (on radio console)		1 764	21 65
A	G668 00M	A/P KAP 100 KING		11 442	35 43
A	G668 10M	A/P KAP 100 KING with electrical pitch trim		17 659	67 72
A	G669 00M	A/P KAP 150 KING		21 363	78 38
A	G670 00M	A/P KFC 150 KING		21 561	75 59
A	G810 00M	Remote A/P modes annunciator KA 185-03 for KAP 150		0 66'	23.62
A	G810 10M	Remote A/P modes annunciator KA 185-01 for KFC 150		0 66'	23 62
A	G892 00M	A/P KAP 150 KING with EFIS included in K891 00M option (refer to A"A 34)		21 959	77 95
A	G892 10M	A/P KFC 150 KING with EFIS included in K923 00M option (refer to A"A 34)		21 959	77 95
A	G892 20M	A/P KAP 150 KING with EFIS included in K923 00M option (refer to A"A 34)		21.959	77.95

S/ R/ A/ O	ITEM OPTIO	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		23 - COMMUNICATIONS			
		23-10 - Speech communications			
		23-11 - VHF capability			
A	23-001A	Audio selector/intercom system PMA 7000MS PS ENGINEERING (stereo wiring)		3.814	26.77
A	23-001B	Audio selector/intercom system PMA 7000MS PS ENGINEERING (mono wiring)		3.814	26.77
A	23-002A	Audio selector/intercom system GMA 340 GARMIN		4.189	27.56
A	34-503A	Boom microphone headset AHX-05 Serie X BOSE - Pilot Front passenger		 1.235 0.683	 56.12 56.12
A	J524 30M	Interphone		0.441	11.81
A	J539 00M	VHF/COM capability (Loud-speaker "SONAVOX")		3.395	47.24
A	J539 20M	VHF/COM capability (Loud-speaker "ALDAX")		2.888	45.28
A	J686 00M	Boom microphone headset PELTOR		0.882	56.12
A	J827 00M	Intercommunication system SPA 400 ICS SIGTRONICS (Front and rear seats)		0.750	32.28
A	J827 10M	Intercommunication system SPA 400 AV SIGTRONICS (Front seats)		0.750	32.28
A	J896 00M	Headset (noise reducer) HDCII BOSE (pilot and front passenger)		4.189	55.12
A	J896 10M	Headset (noise reducer) HDCII BOSE (pilot)		2.094	55.12
A	J994 00M	VHF/COM capability		3.219	45.27
A	J994 20M	VHF/COM capability		3.219	45.27

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	J912 00M	Boom microphone headset H10-13-4 DAVID CLARK		0.936	55.12
A	J928 00M	Boom microphone headset HMEC 25-KA SENNHEISER : Pilot and front passenger Rear passengers		 0.66* 0.66*	 55.12 94.49
A	J928 10M	Boom microphone headset HMEC 25-KAS SENNHEISER : Pilot and front passenger Rear passengers		 0.66* 0.66*	 55.12 94.49
A	K807 00M	Audio control box KMA 24H52 KING with interphone		2.205	27.56
A	K809 00M	Audio control box KMA 24H70 KING with audio selector threshold (4 transmitters/receivers)		2.38*	31.50
A	K809 10M	Audio control box KMA 24H71 KING with audio selector threshold (5 transmitters/receivers)		2.38*	31.50
A	K815 00M	Audio selection box KMA 24-02 KING		2.910	22.44
A	K815 10M	Audio selection box KMA 24-02 KING		2.910	22.44
A	D523 00M	Boom microphone headset H10-30 DAVID CLARK		1.190	55.12
		23-12 - COM 1 installation			
A	K805 20M	VHF COM 1 KY 196 A 3C KING + KMA 24-02 (with VHF capability)		7.23*	32.28
A	K805 30M	VHF COM 1 KY 196 A 3C KING (without VHF capability)		3.858	18.11
A	05-1910 M	VHF trailed antenna CMC 72 1 AX or CMC 70 1/A DORNE & MARGOLIN		0.66*	127.32

SW R AV O	ITEM OPTIO	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		23-13 - COM 2 installation			
A	K805 00M	VHF/COM 2 KY 196 A 30 KING		3.825	22.83
A	054920 M	VHF 2 faired antenna DMC 70 1/A DORNE & MARGOLIN		0.661	57.96
		23-14 - UHF installation			
A	K86C 10M	UHF KTR908 KING		9.590	83.46
		23-60 - Static dischargers			
A	J884 00M	ESD protection		)	.

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		24 - ELECTRICAL POWER			
A	C675 00M	Firewall disconnects		1.367	0.00
		24-30 - DC generation			
R		Alternator 70A ALU 8421 or ALU 8521 PRESTOLITE/ELECTROSYSTEMS or LW 14324 LYCOMING (when air conditioning system installed, refer to ATA 21)		12.985	- 37.80
R		Battery G242-10AH GILL		26.962	93.70
R		Battery relay 70 117 221.5 ESSEX		0.772	87.40
R		Voltage regulator TB20 61215 P/N DOD 368 S LAMAR		0.375	3.94
R		Pedestal electrical equipment: TB20 61216		0.726	29.53
A	C669 00M	Converter 28 V - 14 V LT - 71A KGS		1.653	39.37
O	C661 00M	Battery G246-19AH GILL		41.446	94.09
O	C672 00M	Battery (at the front)		35.47	5.79
A	D689 10M	Ammeter 28 V (with 60A shunt)		0.551	29.74
A	D907 00M	Voltmeter-ammeter indicator ELECTRONICS INTERNATIONAL		0.605	26.77
		24-40 - External power supply			
A	C679 30M	Ground power receptacle		2.27	90.55
A	C836 00M	Ground power receptacle		2.579	91.74
A	C836 10M	Ground power receptacle (With option C672 00M "Battery (at the front)")		3.682	49.6
A	C841 00M	Ground power extension (With options C835 00M or C836 00M)		4.740	91.73

SW R AV O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		24-50 - Distribution			
R		Standard circuit breakers panel TB20 61212		1.962	29.92
R		Printed circuits assembly on firewall TB20 6' 210 including fuses printed circuit, lights warning printed circuit patch and alternator output printed circuit		0.948	0.39

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	▲	WEIGHT per unit lb (kg)	ARM in. (m)
		25 - EQUIPMENT AND FURNISHINGS			
		25-10 - Cockpit			
O	F778 00M	Leather seats assembly "Grey 95" PMV with head-rests (F778 15M) :			
		- Front seats (Qty 2) PMV		56.599	49.2"
		- Rear seat PMV		17.061	84.65
O	F778 10M	Leather seats assembly "Chanel 95" PMV with head-rests (F778 25M)			
		- Front seats (Qty 2) PMV		56.599	49.2"
		- Rear seat PMV		17.061	84.65
A	F779 15M	Front head-rests "Blue 95" (Qty 2)		3.417	55.12
A	F879 15M	Front head-rests "Blue 95" (Qty 2) PMV		3.46"	55.12
A	F879 25M	Front head-rests "Fiorite 95" (Qty 2) PMV		3.46"	55.12
A	F879 35M	Rear head-rests "Blue 95" (Qty 2) PMV		3.46"	90.55
A	F879 45M	Rear head-rests "Fiorite 95" (Qty 2) PMV		3.46"	90.55
O	067800 M	Leather seats assembly "Grey" PMV with head-rests (067815 M) :			
		- Front seats (Qty 2) PMV		40.060	49.2"
		- Rear seat PMV		19.556	84.65
O	067810 M	Leather seats assembly "Chanel" PMV with head-rests (067825 M)			
		- Front seats (Qty 2) PMV		40.060	49.2"
		- Rear seat PMV		19.556	84.65
A	067815 M	Leather head-rests "Grey" (Qty 2)		3.086	55.12 or 90.55
O	067820 M	Leather seats assembly "Grey" PMV with head-rests (067815 M) (Extended version) :			
		- Front seats (Qty 2) PMV		46.060	49.2"
		- Rear seat PMV		19.555	84.65

S/ R/ A/ O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	057825 M	Leather head-rests "Chanel" (Qty 2)		3.086	55.12 or 90.56
O	057830 M	Leather seats assembly "Chanel" PMV with head-rests (057825M) (Extended version) - Front seats (Qty 2) PMV - Rear seat PMV		46.060 18.555	49.21 84.65
A	057915 M	Head-rests "Cendre" (Qty 2)		2.161	55.12 or 90.55
A	057925 M	Head-rests "Sable" (Qty 2)		2.161	55.12 or 90.55
A	057935 M	Head-rests "Blue 95" (Qty 2) PMV		2.161	55.12 or 90.55
A	057945 M	Head-rests "Ficelle 95" (Qty 2) PMV		2.161	55.12 or 90.55
A	057955 M	Rear head-rests "Blue 95" (Qty 2) PMV		3.461	90.55
A	057965 M	Rear head-rests "Ficelle 95" (Qty 2) PMV		3.461	90.55
		25-11 - Front seats			
R		Front seats TB10 74030		18.298	51.18
R		Front seats TB10 74096		20.022	51.18
R		Front seats TB10 74106x01/01		24.625	49.21
R		Front seats TB10 74106x02/03		26.065	49.21
O	F779-00M	Front seats "Blue 95" (Qty 2)		52.117	49.21
O	F979-00M	Front seats "Blue 95" (Qty 2) PMV		52.976	49.21
O	F979-10M	Front seats "Ficelle 95" (Qty 2) PMV		52.976	49.21

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	▲	WEIGHT per unit lb (kg)	ARM in. (m)
O	067900 M	Front seats "Garaldi" (Qty 2) with head-rests (067915 M)		45.194	49.2"
O	067910 M	Front seats "Sable" (Qty 2) with head-rests (067925M)		45.194	49.2"
O	067940 M	Front seats "Blue 95" (Qty 2) PMV with head-rests (067935 M)		45.194	49.2"
O	067950 M	Front seats "Fidelle 95" (Qty 2) PMV with head-rests (067945 M)		45.194	49.2"
O	067980 M	Front seats "Blue 95" (Qty 2) PMV with head-rests (067935 M)		52.274	49.2"
O	067990 M	Front seats "Fidelle 95" (Qty 2) PMV with head-rests (067946 M)		52.274	49.2"
O	D60000 M	L.H. or R.H. front seat back - off installation (Pre-MOD.89)		0.99"	37.80
O	D60010 M	L.H. front seat back - off installation (Post-MOD.89)		0.882	37.80
O	D60020 M	R.H. front seat back - off installation (Post-MOD.89)		0.882	37.80
O	100140 M	Tilting front seat "Blue 95"		16.300	49.2"
O	100140 M	Tilting front seat "Fidelio 95"		16.300	49.2"
		25-12 - Rear bench			
R		Rear seat - Back + seating TB10 74027		12.449	84.65
R		Rear seat - Back + seating TB10 74107		14.615	84.65
O	F879 20M	Rear seat "Blue 95" PMV		16.144	84.65
O	F879 30M	Rear seat "Fidelle 95" PMV		16.144	84.65
O	F899 60M	Rear bench "Blue 95" with arm rest "LUXE" (Post-MOD.90)		16.939	84.65
O	F899 10M	Rear bench "Fidelle 95" with arm-rest "LUXE" (Post-MOD.90)		16.939	84.65

S/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
O	067920 M	Rear seat "Cendre" with head-rests (067915 M)		17.064	84.65
O	067930 M	Rear seat "Sable" with head-rests (067925 M)		17.064	84.65
O	067960 M	Rear seat "Blue 95" PMV with head-rests (067955 M)		17.064	84.65
O	067970 M	Rear seat "Fibelle 95" PMV with head-rests (067945 M)		17.064	84.65
O	079900 M	Rear seat "Cendre" with central arm-rest		13.338	84.65
O	079910 M	Rear seat "Sable" with central arm-rest		13.338	84.65
O	079920 M	Rear seat "Blue 95" PMV with central arm-rest		13.338	84.65
O	079930 M	Rear seat "Fibelle 95" PMV with central arm-rest		13.338	84.65
		25-13 - Safety and harnesses belts			
R		Front seat belt TB10 79013 SECURAGLON		2.646	47.24
R		Front seat belt TB10 79013 TRW REPA		2.646	47.24
R		Front seat belt TB10 79013 P/N 10.4622.300.002 ANJOU AERO		2.646	47.24
R		Rear seat belt TB10 79014 P/N 344.22.070.04.300 AUGLON		4.124	94.49
A	050210 M	3rd rear safety belt "Black"		0.882	84.65
O	056320 M	Rear reel safety belt		2.646	106.30
A	063700 M	Rear seat shoulder harness (Qty 2)		2.249	94.49
A	064000 M	3rd rear reel safety belt		4.916	106.30
A	064100 M	3rd rear seat shoulder harness		4.124	94.49

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		25-14 - Central pedestal			
S		Lighter R.V.I : - Plug 5000 361 007 R.V.I - Fixed part 5000 361 635 R.V.I - Light 5000 462 170 R.V.I		0.154	37.80
S		Front ash-tray		0.882	43.31
S		Rear ash-tray		0.353	65.26
		25-15 - Upper duct			
S		Sun visor PLEXIGLAS		0.683	41.34
		25-60 - Emergency equipment			
A	F902 00M	Axe		2.535	37.40
A	F909 00M	Life jackets (Qty 4)		8.818	124.60
A	H881 00M	First aid case		4.409	90.86
		25-61 - Emergency locator transmitter			
A	26-001A	Emergency locator transmitter ELT 91 SOCATA P/N ELT 91A 2360 000 000 (TSO)		3.35	103.15
A	J871 00M	Emergency locator transmitter POINTER		2.756	103.54
A	J908 00M	Three-frequency emergency locator transmitter ELT 96 SOCATA (EUROCAE)		3.638	106.30
A	J908 10M	Three-frequency emergency locator transmitter ELT 90 SOCATA (EUROCAE)		4.079	106.89
A	J924 00M	Emergency locator transmitter ELT 90 SOCATA (EUROCAE)		3.35	103.15
A	J931 00M	Emergency locator transmitter ELT 200 ARTEX (For export only)		2.866	103.45
A	J931 50M	Provisions assy for ELT 200 ARTEX (For export only)		0.220	103.45

SAO	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	J933 00M	Three-frequency emergency locator transmitter ELT 97 SOCATA (TSO)		3.638	106.30
A	051700 M	Emergency locator transmitter ELT 10 NARCO		3.307	■■9.29
A	051710 M	Emergency locator transmitter JO_LIET (aft baggage compartment)		3.086	■■9.29
A	051730 M	Emergency locator transmitter JE2 NO JOLLIET (forward baggage compartment)		3.086	108.45

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		25 - FIRE PROTECTION			
A	F823 00M	Cabin halon extinguisher FH 16N AREOFEU		4 409	37.80
A	F823 10M	Cabin halon extinguisher H1-10 AIR MAIP		4 850	37.80
A	F823 20M	Cabin halon extinguisher H1-10 AIR MAIP (and special support)		5 313	37.80
A	F823 30M	Cabin halon extinguisher L'HOTELLIER		3 638	37.68
A	F963 00M	Cabin powder extinguisher AFT 1SN AREOFEU		4 806	37.80
A	D52800 M	Cabin fire extinguisher		2 622	36.22

S/A/O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	.	WEIGHT per unit lb (kg)	ARM in. (m)
		27 - FLIGHT CONTROLS			
		27-60 - Wing flaps (control)			
R		Flaps actuator TB20-61225 P/N 8308 AVIAC		5.534	80.71
R		Flaps actuator TB20-61201 P/N 709-22b LPMI		5.203	85.04
R		Flaps control selector TB20-61234		0.220	31.50
R		Flaps position indicator TB20-61232		0.132	31.50
R		Flaps relay + support TB20-6126C : - 3 relays HG2 24 VDC MATSUSHITA - 2 supports HG2 SS MATSUSHITA		0.551 0.110	78.35 78.35

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		28 - FUEL SYSTEM			
		28-10 - Fuel tanks			
A	058030 M	Ferry fuel tank (TB20 52926)		62.900	79.26
A	058040 M	Ferry fuel tank (TB20 52926)		62.900	79.26
		28-20 - Fuel supply			
R		Fuel electric pump TB20 61216 P/N 8120-H WELDON		2.425	24.80
R		Fuel electric pump TB20 61216 P/N 8120-H WELDON		2.425	24.80
R		Fuel selector/filter TB20 52026		1.30	44.49
		28-40 - Fuel indication			
O	C668 00M	Fuel low level warning		0.728	33.46

SYM OPT	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		30 - ICE AND RAIN PROTECTION			
		30-05 - T.K.S. airframe deicing			
A	C687 00M	TKS ice protection systems (empty tank) (icing conditions authorized - with two-blade propeller)		40.565	74.80
A	C687 10M	TKS system (empty tank) (icing conditions not authorized - with two-blade propeller)		40.565	74.80
		30-60 - Propeller deicing			
A	C522 20M	Propeller deicing (two-blade propeller) TKS		9.545	-11.42
A	C522 30M	Propeller deicing (two-blade propeller) TKS		9.545	-11.42
A	C522 40M	Propeller deicing (three-blade propeller) TKS		9.545	-11.42

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	▲	WEIGHT per unit lb (kg)	ARM in. (m)
		31 - INDICATING/RECORDING SYSTEMS			
		31-10 - Control and indicating panels			
R		Engine and fuel controls TB20 76201		1.102	24.80
O	F634 COM	Raised radio console		3.131	23.62
		31-20 - Independent instruments			
A	D516 COM	Stop watch DODANE		0.441	35.43
A	D571 COM	Hourmeter DAICOIN		0.551	23.62
A	D638 COM	Digital chronometer (L.H. station) ASTROTECH		0.507	35.43
A	D639 10M	Digital chronometer (R.H. station) ASTROTECH		0.507	35.43
A	D638 20M	Digital chronometer (R.H. station) ASTROTECH		0.507	35.43
A	D680 COM	Quartz chronometer THOMMEN (60 minutes elapsed time ind.calor) P/N Q18.945.22.28.1KB or Q18.945.22.28.1ME		0.486	35.43
A	D680 10M	Quartz chronometer THOMMEN (60 minutes elapsed time ind.calor) P/N Q18.945.22.28.1KB or Q18.945.22.28.1MF (R.H. station)		0.486	35.43
A	D680 20M	Quartz chronometer THOMMEN (60 minutes elapsed time ind.calor) P/N Q18.945.22.28.1KB or Q18.945.22.28.1ME		0.485	35.43
A	D680 30M	Quartz chronometer THOMMEN (12 minutes elapsed time ind.calor) P/N Q18.948.22.28.1ME		0.485	35.43
A	D806 COM	Three-axis accelerometer		0.992	23.62
A	D829 COM	Mechanical chronometer THOMMEN P/N 316.945.22.28.1K		0.485	35.43

S/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	C829 10M	Mechanical chronometer THOMMEN P/N 8186 15 22 28 1K (R.H. version)		0.485	35.43
A	C830 00M	Digital clock/chronometer LC2 ASTROTECH		0.331	23.62
A	C844 00M	Mechanical chronometer Type 11.1 BREGUET		0.441	35.43
O	C811 00M	Hourmeter "Flight duration" DATCON NOTE * Tachometer - Hourmeter, refer to ATA 77		0.661	31.50
		31-60 - Central warning systems			
R		Advisory panel TB20 61222 (if GPS installed refer to ATA 34)		0.397	22.83
R		LDG / stall warning unit TB30 69030		0.529	86.61
A	C067 00M	Starter warning light		0.132	39.37
A	C850 00M	LDG GR hydraulic generator operation light		0.176	47.24
O	C900 00M	Advisory panel (extended) (Not valid for U.K. aircraft)		0.529	23.62
O	C900 10M	Advisory panel (extended) (Specific for U.K. aircraft)		0.529	23.62

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		32 - LANDING GEARS			
		32-30 - Extension and retraction			
R		LDG relay TB20 6°261 P/N 03395-24 V-50 A CARTIER		0.673	70.87
R		LDG relay TB20 6°279 P/N MS 24°97-01		1.498	70.87
		32-35 - Hydraulic generation			
R		LDG hydraulic generator TB20 61213 P/N HYH 5001 PRESTOLITE		9.918	73.20
R		LDG hydraulic generator TB20 61213 P/N HYH 5003 PRESTOLITE		9.918	73.20
R		LDG hydraulic generator TB20 61263 P/N 1117-04 LHC		10.582	73.20
R		LDG hydraulic generator TB20 61263 P/N 1117-05 LHC		10.582	73.20
R		LDG hydraulic generator TB20 61267 P/N 3939637177 COMMERCIAL HYDRAULICS		11.640	73.23
R		LDG hydraulic generator TB20 61267 P/N MC106 BI 19 AL4VT (637177) OILDYNE		11.640	73.23
R		LDG hydraulic generator TB20 61267 P/N 106 BI 19 GP AL4VT (641634) OILDYNE		11.640	73.23
		32-40 - Wheels and brakes			
R		Main LDG wheel assy (2) 40-84 CLEVELAND		5.686	57.48
R		Main LDG wheel assy (2) 40-84B CLEVELAND		5.820	64.42
R		Main LDG brake assy (2) 30-41B CLEVELAND		2.535	57.48
R		Main LDG tire (2) 15.6.00-6 6 PATT DUNLOP		5.107 or 7.500	57.48

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
R		Main LDG tire (2) 15.6.00-5 6 PR GOODYEAR		8.330	57.48
R		Main LDG tire (2) 15.6.00-5 6 160TT MICHELIN		7.200	57.48
R		Main LDG tube (2) 15.6.00-6 DUNLOP		2.426	57.48
R		Main LDG tube (2) 6.00-6 DUNLOP		1.053	57.48
R		Main LDG tube (2) 15.6.00-6-5.00.6 GOODYEAR		1.653	57.48
R		Main LDG tube (2) TR20 P/N 092-500-0 MICHELIN		1.653	57.48
R		Main LDG tube (2) 15.6.00-6 TR GOODYEAR		1.653	57.48
R		Nose LDG wheel assy 40-77 B CLEVELAND		2.822	- 17.72
R		Nose LDG tire 5.00-5 6 PRTT DUNLOP		5.798 or 6.400	- 17.72
R		Nose LDG tire 5.00-5 6 120TT MICHELIN		6.400	- 17.72
R		Nose LDG tire 5.00-5 6 120TT AVIATOR		5.500	17.72
R		Nose LDG tire 5.00-5 6 PR P/N 505C61 8 GOODYEAR		5.200	- 17.72
R		Nose LDG tube 5.00-5 DUNLOP		1.456	- 17.72
R		Nose LDG tube TR67A P/N 092-308-0 MICHELIN		1.455	- 17.72
R		Nose LDG tube 5.00-5 TR67 GOODYEAR		1.455	- 17.72
A	052100 M	Braking control (R.H. post)		3.307	11.81
		32-60 - Position indicating system and alarms			
R		LDG configuration and control panel TB20 61202		0.309	20.62

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		33 - LIGHTS			
		33-10 - Cockpit			
S		Rear cabin lighting TB20 64200		0.607	65.26
S		Instrument panel lighting TB20 64201		0.486	29.62
S		Front cabin lighting (emerg.) TB20 64200		0.220	41.00
A	E588 COM	Maps reading light		0.176	25.59
A	EB73 COM	Emergency lighting system		4.079	104.72
		33-40 - External lighting			
S		Landing light G.E. 4591		0.353	35.40
S		Taxi light G.E. 4625		0.353	35.40
S		L.H. navigation light 3131 LABINAL		0.196	31.66
S		R.H. navigation light 3133 LABINAL		0.196	31.66
S		L.H. navigation light W1250 PH WHELEN		0.196	34.65
S		R.H. navigation light W1250 PG WHELEN		0.196	34.65
S		Rear navigation light 3175 LABINAL		0.154	239.76
S		Rear navigation light A555A-V-28V WHELEN		0.132	239.76
A	E537 20M	Strobe light JPC on vertical stabilizer		1.874	145.67
A	E537 10M	Strobe lights JPC on vertical stabilizer and under fuselage		3.197	140.55
A	E537 20M	Strobe light JPC on vertical stabilizer (red glass)		1.874	145.67
A	EB24 COM	Anticollision lights WHELEN (wing tips) A490A TS DT 14-28 - Light A625		5.423	107.48

S/R/A/O	ITEM OPTIO	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	E824 10M	Anticollision lights WHELEN (wing tips) A490A TS CF 14-28 - Light A625		5.423	107.48
A	E824 20M	Anticollision lights WHELEN (wing tips) A490A TS CF 14-28 - Light A625D		5.423	107.48
A	E824 30M	Anticollision lights WHELEN (wing tips) A490A TS CF 14-28 - Light A625D		5.423	107.48
A	E824 40M	Anticollision lights WHELEN (wing tips) A490A TS CF 14-28 - Light A625 P/N 01 077050 15		5.423	107.48
O	E826 00M	Strobe light WHELEN (tail) A490A TS CF 14-28 - Light A500 ASP		2.094	145.67
O	E826 10M	Strobe light WHELEN (tail) A490A TS CF 14-28 - Light A500 SP		2.094	145.67
O	E826 20M	Strobe light WHELEN (tail) A490A TS CF 14-28 - Light A500A		2.094	145.67
O	E848 00M	Light control box JX 128 FLASHELEK		0.551	55.31

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		34 - NAVIGATION			
		34-10 - Flight environment data			
		34-11 - Air data systems			
R		Altimeter TB20 76222 P/N 5634 PD1 or PD3 Code A253 UNITED INSTRUMENTS		0.816	25.59
R		Altimeter TB20 76222 P/N 5634 PD1 or PD3 Code A187 (with light tray 28 VDC) UNITED INSTRUMENTS		0.816	25.59
R		True airspeed indicator with integrated lighting TB20 76223 P/N 8125 Code 3588 (with light tray 28 VDC) UNITED INSTRUMENTS		0.726	24.80
R		True airspeed indicator with integrated lighting TB20 76223 P/N 8125 Code 3605 UNITED INSTRUMENTS		0.726	24.80
R		Vertical speed indicator TB20 76224 P/N 7000 Code C65 (with light tray 28 VDC) UNITED INSTRUMENTS		1.014	23.62
R		Vertical speed indicator TB20 76224 P/N 7000 Code C63 UNITED INSTRUMENTS		1.014	23.62
O	C635-10M	Heated pitot (Not valid for Russian & Ukrainian aircraft)		1.190	53.15
A	C635-03M	2nd heated pitot (R.H. wing)		1.190	47.24
A	D681-03M	2nd altimeter 20000 ft		1.433	19.69
A	D803-03M	Installation of 2nd airspeed indicator		1.213	23.62
A	D811-03M	Alti-coder KE 127 KING		1.433	17.72
A	D830-03M	Alti-coder 20000 ft TRANSCALL		1.433	17.72
A	D831-03M	Alti-coder 30000 ft TRANSCALL		1.433	17.72
A	D832-03M	2nd altimeter 35000 ft		1.433	19.69

S/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	C697 0CM	2nd vertical speed indicator (F.H. station) P/N 7000 C83 UNITED INSTRUMENTS		1.521	23.62
A	C915 0CM	Metric altimeter # 3 P/N 5940 UNITED INSTRUMENTS		0.926	23.62
O	K608 20M	Alti-coder KEA 130A (35000 ft) Kollsman		1.764	21.65
O	K608 30M	Alti-coder 20000 ft UNITED INSTRUMENTS		1.764	21.65
A	N846 0CM	Altitude encoder AR850 NARCO		1.323	19.69
A	051100 M	Alternate static source (in cabin)		0.331	23.62
		34-13 - Outside temperature			
A	C604 0CM	Outside air temperature indicator (standard connector on sensor)		0.551	23.62
A	C604 1CM	Outside air temperature indicator (water-tight connector on sensor)		0.551	23.62
A	C604 2CM	Outside air temperature indicator (water-tight connector on sensor) (OPT10 0604 10M retrofit)		0.551	20.62
A	C915 0CM	Outside air temperature indicator (standard connector on sensor) DAVTRON		0.551	23.62
A	C915 1CM	Outside air temperature indicator (water-tight connector on sensor) DAVTRON		0.551	23.62
A	C915 2CM	Outside air temperature indicator (water-tight connector on sensor) DAVTRON		0.551	23.62
		34-20 - Attitude and direction			
		34-21 - Heading reference system			
A	34-302A	HSI easy KCS 55A HONEYWELL		12.721	67.32
A	C683 4CM	Air-driven heading indicator AID		2.888	21.65
A	C914 0CM	Heading gyro indicator SIGMATEK (on L.H. instrument panel)		2.668	23.62

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	D914 10M	Heading gyro indicator SIGMATEK (on R.H. instrument panel)		2 976	49 69
A	D922 00M	Electric heading gyro indicator 2J5-1BL BFG		3 219	23 62
A	K660 00M	HSI assy K.N.G without heading recopy		12 720	67 32
A	K660 10M	HSI assy K.N.G with heading recopy capability		12.720	67.32
A	K660 20M	HSI assy K.N.G with heading recopy capability (90/400 Hz) with vertical KA 51B		12.720	67.32
A	K660 30M	HSI assy K.N.G with heading recopy capability (90/400 Hz) with horizontal KA 51B		12 720	67 32
A	K660 40M	HSI assy K.N.G with heading recopy capability (90/400 Hz) (lighting control at R.H. station)		12 720	67 32
A	K660 50M	HSI assy K.N.G with horizontal KA 51B (+ GPS KLN 90B installed)		12 720	67 32
A	K660 60M	HSI assy K.N.G with vertical KA 51B (+ GPS KLN 90B installed)		12 720	67 32
A	D57140 M	Heading indicator KG 107		2 690	20.47
		34-22 - Turn and bank indication			
R		Slip indicator Type 57 AIR PRECISION		0 110	23 62
R		Slip indicator P/N 35216 WINTER		0 110	23 62
O	34-002A	Electrical turn coordinator UNITED INSTRUMENTS		1 320	23 62
O	D691 00M	Turn-and-bank indicator UNITED INSTRUMENTS		1 675	23 62
O	D697 00M	Electrical turn coordinator CASTLEBERRY		1 698	23 62
A	D818 10M	Slip indicator (R.H. station) UNITED INSTRUMENTS		1 675	23 62

S/ R/ A/ O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		34-23 - Magnetic compass			
R		Compass TB20 76229 P/N C2400 L 4P (28 V) AIRPATH		0.596	20.47
		34-24 - ADI and standby horizon			
A	34-001A	Electrical attitude gyro indicator 1"00-28_(5F) BFG (Not valid for U.K. aircraft)		2.866	24.41
A	34-001B	Electrical attitude gyro indicator 1"00-28_K(5F) BFG (Specific for U.K. aircraft)		2.866	24.41
A	34-001C	Electrical attitude gyro indicator 1"00-28_S(5F) BFG (on L.H. instrument panel) (Not valid for U.K. aircraft)		2.866	24.41
A	34-001D	Electrical attitude gyro indicator 1"00-28_S(5F) BFG (on L.H. instrument panel) (Not valid for U.K. aircraft)		2.866	24.41
A	D695 00M	Attitude gyro and heading gyro indicators AID (Not valid for U.K. aircraft)		5.093	21.65
A	D695 10M	Attitude gyro and heading gyro indicators AID (Specific for U.K. aircraft)		5.093	21.65
A	D683 20M	Attitude gyro indicator AID (Not valid for U.K. aircraft)		2.205	21.65
A	D606 00M	Electrical attitude gyro indicator 305-2BL (on L.H. instrument panel) (Not valid for U.K. aircraft)		2.690	23.62
A	D602 10M	Electrical attitude gyro indicator 305-2BL-S (Not valid for U.K. aircraft)		2.690	20.62
A	D602 20M	Electrical attitude gyro indicator 305-2BL-S (Not valid for U.K. aircraft)		2.690	23.62
A	D602 30M	Electrical attitude gyro indicator 305-2BL-SK.A.D (Specific for U.K. aircraft)		2.690	23.62
A	D602 40M	Electrical attitude gyro indicator 305-2BL (on R.H. instrument panel) (Not valid for U.K. aircraft)		2.690	23.62

S/R/V/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	0602 90M	Electrical attitude gyro indicator 305-2BL-K BFG (Specific for U.K. aircraft)		2.690	23.62
A	0602 60M	Electrical attitude gyro indicator B305-2BL (on R.H. instrument panel) (Not valid for U.K. aircraft)		2.690	23.62
A	0667 00M	Electric attitude gyro indicator RCA26 BK-12 (R.H. seat) RC ALLEN (Not valid for U.K. aircraft)		2.315	21.65
A	0913 00M	Attitude gyro indicator SIGMATEK (Not valid for U.K. aircraft)		2.161	23.62
A	0913 10M	Attitude gyro indicator SIGMATEK (Specific for U.K. aircraft)		2.161	23.62
A	067130 M	Attitude gyro indicator KG 258 for KAP 100 (Not valid for U.K. aircraft)		3.086	23.47
A	067131 M	Attitude gyro indicator KG 258 for KAP 100 (Specific for U.K. aircraft)		3.086	23.47
A	067230 M	Attitude gyro indicator KG 258 for KAP 150 (Not valid for U.K. aircraft)		3.086	23.47
A	067231 M	Attitude gyro indicator KG 258 for KAP 150 (Specific for U.K. aircraft)		3.086	23.47
A	067330 M	Attitude gyro indicator with Flight Director KI 256 for KFC 150		3.285	23.47
		34-25 - Radio magnetic indication			
A	K584 00M	RMI KI 22930 (without switching) KING		3.086	21.65
A	K584 10M	RMI KI 22930 (with switching) KING		3.307	21.65
A	K619 00M	RMI KNI 582 KING		3.417	21.65

SYM AO	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		34-28 - Electronic flight instrumentation system			
A	K891 00M	Radionavigator assy KING with EHI 40 EFIS system K NG (EHSI only) : - KMA 24H70 audio control box - VHF1 VOR/ILS KX 165-25 - VHF2 VOR/ILS KX 165-25 with KI 206 indicator - DME KN 63 - ADF KR 87 - ATC KT 76A - MARKER KR 21 - RMI KI 229 - GPS KLN 90A - KCS 305 gyro unit The EHI 40 part components are as follows - SG 465 symbol generator - ED 461 EHSI indicator KN 40 adapter		96.325	65.75
A	K923 00M	Radionavigator assy KING with EHI 40 EFIS system K NG (EHSI only) : KMA 24H70 audio control box - VHF1 VOR/ILS KX 165-25 - VHF2 VOR/ILS KX 165-25 with KI 206 indicator DME KN 63 - ADF KR 87 - MARKER KR 21 - RMI KI 229 GPS KLN 90D - KCS 305 gyro unit The EHI 40 part components are as follows - SG 465 symbol generator - ED 461 EHSI indicator - KN 40 adapter		94.577	68.11
		34-30 - Landing and taxiing aids			
		34-31 - Marker			
A	K676 00M	Marker receiver indicator KR 21 KING		1.257	21.65

S/R/A/O	ITEM OPT'O	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		34-40 - Independent position determining			
		34-41 - Stormscope			
A	34-502A	Stormscope WX 500 BFG		4 960	117.22
A	J828 00M	Stormscope WX 1000 BFG (on panel strip)		15.432	80.07
A	J828 10M	Stormscope WX 1000 BFG (on R.H. instrument panel)		15.432	80.07
A	J828 00M	Stormscope WX 1000 + BFG		15.432	80.07
A	J828 10M	Stormscope WX 1000 + BFG (with converter assy)		15.432	80.07
A	J918 00M	Stormscope WX-900 BFG		4 806	65.43
		34-50 - Dependent position determining			
		34-51 - NAV 1 installation			
A	K654 00M	Receiver VOR KN 53 NAV 1 VOR/LS KING		5 026	68.11
A	K654 10M	Receiver VOR KN 53 NAV 1 VOR/LOC KING		6 790	56 12
A	K662 00M	NAV system KNS 81 10 KING		7 496	52 76
A	K662 20M	NAV system KNS 81-12 KING		7 496	52 76
A	K663 00M	VHF assy COM1/NAV1 (VOR/LOC) KX 155 with audio amplifier (with VHF capability) KING		11 486	35 40
A	K663 10M	VHF assy COM1/NAV1 (VOR/ILS) KX 155 (with VHF capability) KING		11 596	49 62
A	K663 40M	VHF assy COM1/NAV1 (VOR/LOC) KX 155 (with VHF capability) KING		11 486	35 43
A	K663 50M	VHF assy COM1/NAV1 (VOR/LOC) KX 155 (without VHF capability) KING		8 09[illegible]	30 7[illegible]
A	K663 60M	VHF assy COM1/NAV1 (VOR/ILS) KX 155 (without VHF capability) KING		8 20[illegible]	49 2[illegible]

SYM-BOL	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	K662 70M	VHF assy COM*/NAV1 (VOR/LOC) KX 155 with audio amplifier (without VHF capability) KING		8.091	30.71
A	K666 00M	VHF 1 VOR/LOC KX165-25 KING		12.566	39.37
A	K666 10M	VHF 1 VOR/ILS KX165-25 KING		14.097	35.43
A	K667 00M	NAV system KNS 80 KING		8.598	54.33
A	K812 00M	VHF assy COM*/NAV1 (VOR/ILS) KX 165 (with VHF capability) KING		11.118	49.61
A	K812 20M	VHF assy COM*/NAV1 (VOR/LOC) KX 165 (with VHF capability) KING		11.552	35.43
A	K812 50M	VHF assy COM*/NAV1 (VOR/LOC) KX 165 (without VHF capability: KING		8.157	30.71
A	K812 60M	VHF assy COM*/NAV1 (VOR/ILS) KX 165 (without VHF capability: KING		7.782	50.39
A	K813 00M	VOR/ILS indicator KI 206-04 KING		1.631	21.65
A	K813 10M	VOR/ILS indicator KI 206-05 KING		1.764	21.65
A	K814 00M	VOR/ILS indicator KI 204 KING		1.816	21.65
A	K847 00M	Converter VOR/LOC KN 72 KING		1.653	43.31
		34-52 - NAV 2 installation			
A	K664 20M	Receiver VOR KN 53 NAV 2 VOR/ILS KING		5.379	63.78
A	K664 30M	Receiver VOR KN 53 NAV 2 VOR/LOC KING		6.967	59.05
A	K663 20M	VHF assy COM2/NAV2 (VOR/LOC) KX 155 KING		7.760	24.80
A	K663 30M	VHF assy COM2/NAV2 (VOR/ILS) KX 165 KING		8.900	24.80
A	K666 20M	VHF 2 VOR/LOC KX165-25 KING		5.335	39.37
A	K666 30M	VHF 2 VOR/ILS KX165-25 KING		6.818	46.82

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	K812 10M	VHF assy COM2/NAV2 (VOR/ILS) KX 165 KING		6.482	24.80
A	K812 20M	VHF assy COM2/NAV2 (VOR/LOC) KX 165 KING		7.716	24.80
A	K813 00M	VOR/ILS indicator KI 206-04 KING		1.631	21.65
A	K813 10M	VOR/ILS indicator KI 206-05 KING		1.764	21.65
A	K814 00M	VOR/ILS indicator KI 204 KING		1.918	21.65
		34-50 - Transponder			
A	34-501A	Transponder GTX 320 GARMIN		3.005	23.53
A	34-504A	Transponder GTX 327 GARMIN		3.968	21.65
A	K656 00M	ATC KT 76 A KING or radio console		3.682	20.08
A	K656 10M	ATC KT 76 A KING or R.H. panel strip (with support) (when option C972 00M "Battery at the front" installed refer to ATA 24)		3.836	21.65
A	K656 20M	ATC KT 76 A KING or R.H. panel strip (with support)		3.836	21.65
A	K656 30M	ATC KT 76 A KING or R.H. panel strip (with support) (EHSI version)		3.830	21.65
A	K878 00M	Transponder ATC KT 71 KING		4.630	22.44
A	K878 10M	Transponder ATC KT 71 KING (on R.H. panel strip)		4.630	22.44
A	K929 00M	Transponder ATC KT 78C KING (on R.H. panel strip)		3.527	23.62
		34-54 - Automatic Direction Finder (ADF)			
A	34-300A	ADF assy KR 87 SCI (indicator KI 227 01) HONEYWELL		8.885	80.16
A	34-300B	ADF assy KR 87 SCI (indicator KI 227 00) HONEYWELL		8.885	80.16

SYM A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	34-300C	ADF assy KR 87 SC+ (Indicator KI 229) HONEYWELL		11.945	76.77
A	34-300D	ADF assy KR 87 SC+ (Indicator KNI 582) HONEYWELL		11.777	76.77
A	K655 00M	ADF KR 87 C1/04 (Indicator KI 227 00) KING (on radio console)		8.730	90.16
A	K655 10M	ADF KR 87 C1/04 (Indicator KI 227 01) KING (on radio console)		8.730	90.16
A	K655 20M	ADF KR 87 KING		8.625	96.06
A	K655 40M	ADF KR 87 (Indicator KI 227.01) KING (on R.H. panel strip)		8.730	90.16
A	K917 00M	ADF2 KR 87 KING		9.436	94.49
		34-65 - DME Installation			
A	34-305A	DME KN 62A SC+ HONEYWELL		3.527	30.71
A	K657 00M	DME KN 62A KING		3.682	21.26
A	K657 10M	DME KN 64 KING		3.682	21.26
A	K664 00M	DME KN 63 KING		5.488	40.94
		34-67 - Global Positioning System (GPS)			
A	34-300A	Cutout Skymap capability CM 2000 SKYFORCE		0.970	30.51
A	J870 00M	GPS 100 AVD-140 GARMIN Interfaced with HSI and A/P (VFR use only), including advisory panel TB20-61/eu (For export only)		4.145	22.44
A	J870 10M	GPS 100 AVD-140 GARMIN "Stand alone"		3.593	22.44
A	J870 20M	GPS 100 AVD-140 GARMIN "Stand alone", with audio attenuation, including extended advisory panel		3.593	22.44

S/R/A/O	ITEM OPT'O	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	J870 30M	GPS 100 AVD - 140 GARMIN Interfaced with HSI and A/P, with audio attenuation (VFR use only), including advisory panel (For export only)		4 145	22 44
A	J870 40M	GPS 100 AVD - 140 GARMIN Interfaced with HSI with audio attenuation (VFR use only), including advisory panel (For export only)		4 145	22.44
A	J925 00M	GPS 150 GARMIN "Stand alone"		4 696	25.60
A	K860 00M	GPS KLN 90A KING "Stand alone"		8 466	22.44
A	K860 10M	GPS KLN 90A KING Interfaced with HSI and A/P, with RMI		9 17"	21 65
A	K860 20M	GPS KLN 90A KING "Stand alone" with extended advisory panel		8 466	22 44
A	K860 30M	GPS KLN 90A KING Interfaced with HSI, with RMI		9 17"	21 65
A	K860 40M	GPS KLN 90A KING Interfaced with HSI and A/P, without RMI (For export only)		9 17"	21 65
A	K898 00M	GPS KLN 90B KING Interfaced with HSI and A/P, without RMI (KAS1 antenna) (For export only)		8 845	21.26
A	K898 10M	GPS KLN 90B KING Interfaced with HSI and A/P, without RMI (KAS2 antenna) (For export only)		9 943	21 26
A	K898 50M	GPS KLN 90B KING Interfaced with HSI and A/P, with RMI (KAS2 antenna) (English-speaking countries)		9 943	21 26
A	K920 00M	GPS KLN 89B KING "Stand alone"		4 510	25 20

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	K926 00M	GPS KLN 89B KING Interfaced with HSI KI 525A (KCS 55A compass system)		5.578	22.83
A	K927 00M	GPS KLN 90B KING Interfaced with HSI and A/P, without RMI (KA92 antenna)		9.943	21.26
		34-60 - Flight management computing			
		34-62 - Multifunction display			
A	34-304A	MFD KMD 550 HONEYWELL		6.614	21.65

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		35 - OXYGEN			
A	F921 00M	Oxygen constant-flow masks with radio (crew) (Qty 2) PURITAN BENNETT		0.705	55.12
A	061710 M	Oxygen system equipment EROS		31.085	115.35
A	061800 M	Oxygen mask with radio (pilot) EROS		2.205	55.12
A	061900 M	Oxygen mask without radio (passenger) EROS		1.323	90.56
A	062101 M	Oxygen front head-rests "Blue 90" (Qty 2) PMV		3.968	55.12
A	062102 M	Oxygen front head-rests "Blue 95" (Qty 2) PMV		3.968	55.12
A	062110 M	Oxygen system equipment (pressure-demand type) PURITAN BENNETT		32.187	115.35
A	062112 M	Oxygen front head-rests "Fidelle 95" (Qty 2) PMV		3.968	55.12
A	062115 M	Oxygen system equipment (constant-flow type) PURITAN BENNETT		32.187	115.35
A	062121 M	Oxygen rear head-rests "Blue 90" (Qty 2) PMV		3.968	90.56
A	062122 M	Oxygen rear head-rests "Blue 95" (Qty 2) PMV		3.968	90.55
A	062125 M	Oxygen front head-rest "Blue 95" PMV		2.469	55.12
A	062132 M	Oxygen rear head-rests "Fidelle 95" (Qty 2) PMV		3.968	90.55
A	062135 M	Oxygen front head-rest "Fidelle 95" PMV		2.469	55.12
A	062142 M	Oxygen leather head-rests "Grey 95" (Qty 2)		4.189	55.12 or 90.55
A	062145 M	Oxygen rear head-rest "Blue 95" PMV		2.469	90.56
A	062152 M	Oxygen leather head-rests "Chanel 95" (Qty 2)		4.189	55.12 or 90.55

SYMBOL	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	052150 M	Oxygen rear head-rest "Fidelle 85" PMV		2.469	90.55
A	052160 M	Oxygen head-rest "Cendre" PMV		2.469	55.12 or 90.55
A	052170 M	Oxygen head-rest "Sable" PMV		2.469	55.12 or 90.55
A	052180 M	Oxygen leather head-rest "Grey" PMV		3.527	55.12 or 90.55
A	052190 M	Oxygen leather head-rest "Chanel" PMV		3.527	55.12 or 90.55
A	052200 M	Oxygen pressure-demand type mask with radio (crew) PURITAN BENNETT		1.764	55.12
A	052300 M	Oxygen constant-flow mask without radio (rear passenger) PURITAN BENNETT		0.529	90.55

S/R/V/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM m. (m)
		37 - VACUUM			
		37-11 - Distribution (normal)			
A	AB16 00M	Vacuum system with : Pump AEROSPACE 210CC or Pump AEROSPACE 215CC or Pump CHAMPION CH215CC (with AIRBORNE filter) or Pump AERO ACCESSORIES AA215CC (with AIRBORNE filter)		4.784 2.205 3.285 3.285	0 0 - 15.75 - 15.75
A	AB04 00M	Vacuum pump SIGMA TEK (with filter)		5.225	- 3.79
A	AB04 10M	Vacuum pump SIGMA-TEK (with filter) (when stormscope installed, refer to ATA 34)		5.225	- 3.79
A	067150 M	Vacuum system (without standby gyro indicator, not heading, nor HSI)		2.579	13.24
		37-12 - Distribution (emergency)			
A	D632 00M	Auxiliary dry air pump		12.455	33.9"
		37-20 - Indicating			
A	063100 M	Vacuum system warning light		0.196	6.39

SW R AV O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		52 - DOORS			
		52-10 - Access doors			
A	HB89 00M	Door stop system (metallic doors)		1.653	49.21
		52-40 - Inspection doors			
A	HB82 00M	Doors (Qty 2) on lower engine cowl		0.441	26.38

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		53 - FUSELAGE			
A	B893 00M	Tail cone protection		0.661	216.67
A	H885 00M	Centering cup jack rest (convex contact area)		/	/

S/ R/ A/ O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		56 - WINDOWS			
S		Colourless windows assy : - Windshield TB21 24001 - Door windows TB10 25000 - Rear side windows TB10 22030		27.558 11.023 8.598 7.937	63.16 27.56 55.12 86.61
O	086520 M	Tinted windows assy : - Windshield TB21 24001 - Door windows TB10 25000 - Rear side windows TB10 22030		27.558 11.023 8.598 7.937	63.16 27.56 55.12 86.61
A	056200 M	L.H. little window		0.750	39.37
A	056210 M	R.H. little window		0.750	39.37
A	056220 M	L.H. tinted little window		0.750	39.37
A	056230 M	R.H. tinted little window		0.750	39.37
A	F989 00M	Ventilation scoops		0.220	79.53

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		61 - PROPELLER			
R		Propeller HC-C2YK-1BF/F 8477-1 HARTZELL		65.115	- 47.64
O	61-001A	Three-blade propeller HC-C3YR-1RF/F 7663F (Not deiced propeller) HARTZELL		Δ14.550	- 47.60
O	61-001B	Three-blade propeller HC-C3YR-1RF/F 7663FIB: (Deiced propeller) HARTZELL		Δ14.550	- 47.60
		61-20 - Controls			
R		Propeller governor M210 681 WOODWARD		2.645	- 39.37
R		Propeller governor C210 761 WOODWARD		2.645	- 39.37
R		Propeller governor F210 761 WOODWARD		2.645	- 39.37

S/ R/ A/ O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		72 - PISTON ENGINE			
R		Engine IO-540-C4D5D LYCOMING with starter and magneto		428.715	- 25.69
O	A805 00M	Engine IO-540-C4B5D LYCOMING with starter, magneto and vibrator :		439.377	- 25.59
		- Magneto selector P/N 10-357210-1 TCM		[illegible]	[illegible]
		- Starting vibrator P/N 10-382808-24 TCM		0.661	4.72
		- Dual magneto P/N 10-785146-108 TCM		11.508	- 9.08

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		73 - FUEL SYSTEM AND CONTROLS			
		73-30 - Indicating system			
A	73-001A	Digital fuel management system MICROFLO-I™ SHADIN		1.157	39.46
A	0821 00M	Flowmeter FT-10 or IFC 10 (litres) ARNAV		1.720	29.53
A	0821 10M	Flowmeter FT-10 or IFC 10 (gallons) ARNAV		1.720	29.53
A	0838 00M	Fuel flow totalizer (l/h) FT 101A HOSKINS		1.720	29.53
A	0838 10M	Fuel flow totalizer (Gal/h) FT 101A HOSKINS		1.720	29.53
A	0905 00M	Digital fuel management system SHADIN		1.157	39.46
A	0905 90M	Digital fuel management system SHADIN (EHSI compliant)		1.157	39.46

S/A/O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	.	WEIGHT per unit lb (kg)	ARM in. (m)
		74 - IGNITION			
		74-10 - Electric generation system			
R		DLail magneto DSLN 3000 BENDIX		11.508	– 9.06
R		DLail magneto DSLN 2031 BENDIX		11.508	– 9.06

S/R/V/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT		WEIGHT per unit lb (kg)	ARM in. (m)
		77 – ENGINE INDICATING			
		77-10 - Power			
R		Tachometer TB20 76820 LMI NORIS R60 VVS P/N LM 61		1 014	25 59
R		Manifold pressure - fuel flow/pressure TB20 76220 P/N 6331 Code H132 (with light tray 28 VDC) UNITED INSTRUMENTS		0 946	25 59
R		Manifold pressure - fuel flow/pressure TB20 76220 P/N 6331 Code H139 UNITED INSTRUMENTS		0.946	25.59
O	D962 00M	Tachometer - Hourmeter NRT 60 P/N LM 62 LMI		0.660	23.62
		77-20 - Temperature			
A	D536 00M	Exhaust gas temperature (EGT) ALCOR		0 882	21 65
A	D685	EGT/CHT - Probe on all cylinders		3 307	3.94
A	D685 00M	EGT/CHT - Probe on cylinder No 1		1 322	19 69
A	D906 00M	EGT/CHT multiple indicator EDM 700 8C JP INSTRUMENT		3.582	– 1.18

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		78 - EXHAUST			
A	A888 00M	Low noise exhaust		18.841	15.76

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		79 - LUBRICATION			
		79-10 - Storage			
A	065820 M	Oil drain door		0.220	- 25.59
		79-20 - Distribution			
R		Oil cooler 23005A NDM		3.086	14.17
A	AB86 00M	2nd oil cooler		4.079	- 13.39

SYM R/A/O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	.	WEIGHT per unit lb (kg)	ARM in. (m)
		80 - STARTING			
R		Starter : - PRESTOLITE/ELECTROSYSTEMS MHB 4016 or MHB 6016 or - LYCOMING LW 15572 or 31B22474		 17,990 8 091 17,990 8 091	 - 39,37 - 37,40 - 39,37 - 37,40
R		Starter 31B 21064 LYCOMING		11.376	- 39.37
R		Starter relay CE 1971 050 - PARIS RHONE		1 498	87 40

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		01 - SPECIFIC OPTIONAL EQUIPMENT			
A	46-5 20M	Additional equipment for IFR France "Grey"		/	/
A	46-6 20M	Additional equipment for right VFR France "Grey"		0.44	25.59

SW RAV O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	.	WEIGHT per unit lb (kg)	ARM in. (m)
		21 - ENVIRONMENTAL SYSTEM			
		21-40 - Heating			
S		Radio console forced ventilation TB20-72805		1.543	82.99
A	F822 20M	Forced ventilation, rear passengers VETUS		2.756	136.61
		21-50 - Air conditioning			
A O	F874 00M	Air conditioning system KEITH with alternator 70A LW 14363 LYCOMING		67.000 13.000	72.83 - 37.80
A O	F874 10M	Reinforced air conditioning system KEITH with alternator 70A LW 14363 LYCOMING		68.210 13.000	72.83 - 37.80

S/R/V/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT		WEIGHT per unit lb (kg)	ARM in. (m)
		22 – AUTO FLIGHT			
		22-12 - Autopilot			
A	22 001A	A/P KFC 225 HONEYWELL		28.109	65.76
A	D675 00M	Altitude and vertical speed preselector KAS 297B KING		1.764	21.65
A	D675 10M	Altitude and vertical speed preselector KAS 297B KING (on R.H. instrument panel)		1.764	21.65
A	D675 20M	Altitude and vertical speed preselector KAS 297B KING (on radio console)		1.764	21.65
A	D675 30M	Altitude and vertical speed preselector KAS 297B KING (EHSI version) (on radio console)		1.764	21.65
A	G668 00M	A/P KAP 100 KING		11.442	35.43
A	G668 10M	A/P KAP 100 KING with electrical pitch trim		17.653	67.72
A	G669 00M	A/P KAP 150 KING		21.363	76.38
A	G670 00M	A/P KFC 150 KING		21.561	75.59
A	G810 00M	Remote A/P modes annunciator KA 185-03 for KAP 150		0.661	23.62
A	G810 10M	Remote A/P modes annunciator KA 185-01 for KFC 150		0.661	23.62
A	G692 10M	A/P KFC 150 KING with EFIS included in K923 00M option (refer to ATA 34)		21.958	77.95
A	G692 20M	A/P KAP 150 KING with EFIS included in K923 00M option (refer to ATA 34)		21.958	77.95

S/R/A/O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		23 - COMMUNICATIONS			
		23-10 - Speech communications			
		23-11 - VHF capability			
S		VHF COM capability TB20 852/16 : - Loud-speaker - Hand microphone - Radio master switch		3.218	45.27
A	23-001A	Audio selector/intercom system PMA 7000M/S PS ENGINEERING (stereo wiring)		3.814	26.77
A	23-001B	Audio selector/intercom system PMA 7000M/S PS ENGINEERING (mono wiring)		3.014	26.77
A	23-002A	Audio selector/intercom system GMA 340 GARMIN		4.189	27.56
A	34-503A	Boom microphone headset A-H-X-05 Serie X BOSE - Pilot - Front passenger		1.235 0.683	55.12 55.12
A	J912 00M	Boom microphone headset H10 13 4 DAVID CLARK		0.838	55.12
A	J926 00M	Boom microphone headset HMEC 25-KA SENNHEISER : Pilot and front passenger Rear passengers		0.661 0.661	55.12 94.49
A	J926 10M	Boom microphone headset HMEC 25-KAS SENNHEISER : Pilot and front passenger Rear passengers		0.661 0.661	55.12 94.49
A	K807 00M	Audio control box KMA 24H52 KING with intercom		2.205	27.56
A	K805 00M	Audio control box KMA 24H70 KING with audio selector threshold (4 transmitters/voochers)		2.381	31.50

S/P/A/O	ITEM OPT'O	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	KB09 10M	Audio control box KMA 24H71 KING with audio selector threshold (5 transmitters/receivers)		2 38'	31 50
A	KB15 10M	Audio selection box KMA 24 03 KING		2 B10	32.44
A	052300 M	Boom microphone headset H10-30 DAVID CLARK		1 190	56 12
		23-12 - COM 1 installation			
S		Paired antenna VHF 1 DMC 70 1/A DORNE & MARGOLIN		0 66'	127,47
A	23-003A	VHF COM/NAV GPS#1 GNS 430 GARMIN		9 700	24.80
A	23-005A	COM1/NAV1 KX 155A VOR/ LS HONEYWELL (KN 72 and HSI Indicator)		6 945	26.38
A	23-005D	COM1/NAV1 KX 155A VOR/ LS HONEYWELL (KI 204 indicator)		7 516	22.44
A	23-006A	COM1/NAV1/GPS1 GNS 430 #1 GARMIN Interfaced with HSI		8 157	25.59
A	23-007A	COM1/NAV1/GPS1 GNS 530 GARMIN interfaced with HSI		10.141	23.23
A	KB05	VHF COM 1 KY 196 A 3C KING		3 856	18.11
		23-13 - COM 2 installation			
S		Paired rigid antenna VHF 2 DMC 70 1/A DORNE & MARGOLIN		0 66'	57.87
A	23-004	COM2/NAV2/GPS2 GNS 430 #2 GARMIN Interfaced with CI 106A		9 700	29 20
A	23-005B	COM2/NAV2 KX 155A VOR/LOC HONEYWELL (KI 203 indicator)		6 945	22 44
A	23-005C	COM2/NAV2 KX 155A VOR/ LS HONEYWELL (KI 204 indicator)		7 474	22 44
A	KB05 11M	VHF COM 2 KY 196 A 3C KING		5 07'	29 74

S/ R/ A/ O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		23-14 - UHF installation			
A	K89C 10M	UHF KTR909 KING		9.590	83.46
		23-60 - Static dischargers			
A	J884 00M	ESD protection		)	.

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	▲	WEIGHT per unit lb (kg)	ARM in. (m)
		24 - ELECTRICAL POWER			
A	C675 00M	Firewall disconnects		1 367	0 00
		24-30 - DC generation			
R		Alternator 70A ALU 8421 or ALU 8621 PRESTOLITE/ELECTROSYSTEMS or LW 14324 LYCOMING (when air conditioning system installed, refer to ATA 21)		12.985	- 37.80
R		Battery G242-10AH GILL		26.962	93.70
R		Battery relay 70 117 221.5 ESSEX		0 772	87 40
R		Voltage regulator TB20 61213 P/N DOO 369 S LAMAR		0 375	3 94
R		Pedestal electrical equipment: TB20 61215		0 726	29 53
A	C669 00M	Converter 28 V - 14 V LT - 71A KGS		1 653	39 37
O	C661 00M	Battery G246-19AH GILL		41.446	94.09
A	D807 00M	Voltmeter-ammeter indicator ELECTRONICS INTERNATIONAL		0 806	20.77
		24-40 - External power supply			
S		Ground power receptacle TB20 61840		2 579	91 73
A	C641 00M	Ground power extension		4 740	91.73
		24-60 - Distribution			
R		Standard circuit breakers panel TB20 61212		1 962	29.92
R		Printed circuits assembly on firewall TB20 61210 including fuses printed circuit lights warning printed circuit pitot and alternator output printed circuit		0 946	0 39

S/R/A/O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	.	WEIGHT per unit lb (kg)	ARM in. (m)
		25 - EQUIPMENT AND FURNISHINGS			
		25-10 - Cockpit			
O	25-003A	Leather seats assembly with head-rests . - Front seats (Qty 2) PMV - Rear seat PMV		55.115 19.621	50.20 84.65
		25-11 - Front seats			
R		Front seats with head-rests TB10 74203		52.029	50.20
		25-12 - Rear bench			
R		Rear seats with head-rests TB10 74204		18.299	84.62
		25-13 - Safety and harnesses belts			
R		Front seat belt TB10 79013 P/N 10.4622.300.002 ANJOU AERO		2.646	47.24
S		Rear seat safety belt TB10 79000		2.646	106.30
A	064000 M	3rd rear seat safety belt		1.918	106.30
		25-14 - Central pedestal			
S		Lighter R.V.I - Plug 5000 361 037 R.V.I - Fixed part 5000 361 635 R.V.I - Light 5000 462 170 R.V.I		0.154	37.80
S		Front ash-tray		0.882	43.31
S		Rear ash-tray		0.353	65.35
		25-18 - Upper duct			
S		Sun visor PLEXIGLAS		0.683	41.34

S/R/V/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT		WEIGHT per unit lb (kg)	ARM in. (m)
		25-60 - Emergency equipment			
A	F902-00M	Axe		2.535	37.40
A	F903-00M	Life jackets (Qty 4)		8.816	124.80
A	H881-00M	First aid case		4.409	90.96
		25-61 - Emergency locator transmitter			
A	25-001A	Emergency locator transmitter ELT 91 SOCATA P/N ELT 91A 2560 000 000 (TSO)		3.351	103.15
A	J971-00M	Emergency locator transmitter POINTER		2.756	103.54
A	J908-00M	Three-frequency emergency locator transmitter ELT 96 SOCATA (EUROCAE)		3.638	106.30
A	J909-00M	Three-frequency emergency locator transmitter ELT 96 SOCATA (EUROCAE)		4.079	106.69
A	J924-00M	Emergency locator transmitter ELT 90 SOCATA (EUROCAE)		3.351	103.15
A	J931-00M	Emergency locator transmitter ELT 200 ARTEX (For export only)		2.866	103.15
A	J931-50M	Provisions assy for ELT 200 ARTEX (For export only)		0.220	103.15
A	J903-00M	Three-frequency emergency locator transmitter ELT 97 SOCATA (TSO)		3.535	106.30
A	051730 M	Emergency locator transmitter JOLLIET (forward baggage compartment)		3.086	109.45

S/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		26 - FIRE PROTECTION			
A	F823 00M	Cabin halon extinguisher FH 15N ARECFEU		4.409	37.80
A	F823 10M	Cabin halon extinguisher H1 - 10 AIR VIA P		4.850	37.80
A	F823 20M	Cabin halon extinguisher H1 - 10 AIR VIA P (with special support)		5.213	37.80
A	F823 30M	Cabin halon extinguisher L'HOTELLIER		3.638	37.68
A	F985 00M	Cabin powder extinguisher AFT 15N ARECFEU		4.409	37.80

S/R/A/D	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		27 - FLIGHT CONTROLS			
		27-60 - Wing flaps (control)			
R		Flaps actuator TB20 E1203 P/N 70C-228 LPMI		5.203	86.04
R		Flaps control selector TB20 E1234		0.320	31.50
R		Flaps position indicator TB20 E1232		0.132	31.50
R		Flaps relay + support TB20 E1260 . - 2 relays HG2-24 VDC MATSUSHITA - 2 supports HG2 SS MATSUSHITA		0.65 0.110	79.26 79.26

SRAO	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		28 - FUEL SYSTEM			
		28-10 - Fuel tanks			
A	058040 M	Ferry fuel tank (TB20 62925)		63.933	78.35
		28-20 - Fuel supply			
R		Fuel electric pump TB20 61218 P/N 66120-H WELDON		2.425	21.80
R		Fuel selector/filter TB20 62026		1.301	44.49
		28-40 - Fuel indication			
S		Fuel low level warning		0.728	33.46

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		30 - ICE AND RAIN PROTECTION			
		30-00 - T.K.S. airframe deicing			
A	C687 0SM	TKS ice protection systems (empty tank) (icing conditions authorized - with two-blade propeller)		40.565	74.80
A	C687 1SM	TKS system (empty tank) (icing conditions not authorized - with two-blade propeller)		40.565	74.80
A	C687 2SM	TKS ice protection systems (empty tank) (icing conditions authorized - with three-blade propeller)		40.565	74.80
		30-60 - Propeller deicing			
A	C522 30M	Propeller deicing (two blade propeller) TKS		9.545	11.42
A	C522 40M	Propeller deicing (three-blade propeller) TKS		9.545	11.42

S/R/A/O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		31 - INDICATING/RECORDING SYSTEMS			
		31-10 - Control and indicating panels			
R		Engine and fuel controls PEINTATEC or MORITZ TB20-76201		1.102 2.998	24.80 24.80
S		Raised radio console TB10-76050		3.131	23.62
O	F634-10M	Raised radio console (Post-MOD.420)		1.014	23.62
		31-20 - Independent instruments			
A	C571-00M	Hourmeter DAICON		0.551	23.62
A	C638-00M	Digital chronometer (L.H. station) ASTROTECH		0.507	35.43
A	C638-10M	Digital chronometer (R.H. station) ASTROTECH		0.507	35.43
A	C638-20M	Digital chronometer (R.H. station) ASTROTECH		0.507	35.43
A	C680-00M	Quartz chronometer THOMMEN (60 minutes elapsed time indicator) P/N Q18.945.22.28.1KB or Q18.945.22.28.1ME		0.486	35.43
A	C680-10M	Quartz chronometer THOMMEN (60 minutes elapsed time indicator) P/N Q18.945.22.28.1KD or Q18.945.22.28.1MF (R.H. station)		0.486	35.43
A	C680-20M	Quartz chronometer THOMMEN (60 minutes elapsed time indicator) P/N Q18.945.22.28.1KB or Q18.945.22.28.1ME		0.485	35.43
A	C680-30M	Quartz chronometer THOMMEN (12 minutes elapsed time indicator) P/N Q18.948.22.28.1ME		0.485	35.43
A	C806-00M	Three-axis accelerometer		0.992	23.62

S/R/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
A	D829 COM	Mechanical chronometer THOMMEN P/N 316.945.22.28.1K		0.485	35.43
A	D829 10M	Mechanical chronometer THOMMEN P/N 316.945.22.28.1K (R.H. station)		0.485	35.43
A	D833 COM	Digital clock/chronometer LC2 ASTROTECH		0.33	23.62
O	D911 COM	Hourmeter "Flight duration" DATCON NOTE - Tachometer-Hourmeter, refer to ATA 77		0.66	31.50
		31-50 - Central warning systems			
R		Advisory panel TB20 61285		0.529	23.62
R		LDG/stall warning unit TB30 59030		0.529	66.6
S		LDG GR hydraulic generator operation light TB20 72032		0.176	47.24
A	C561 COM	Starter warning light		0.132	39.37

S/A/O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		32 - LANDING GEARS			
		32-30 - Extension and retraction			
R		LDG relay TB20 61278 P/N MS 24197-D1		1.499	70.87
		32-35 - Hydraulic generation			
R		LDG hydraulic generator TB20 61267 P/N MC108 BI 19 AL4VT (697177) C LDYNE		11.640	73.23
R		LDG hydraulic generator TB20 61267 P/N 108 BI 19 SP AL4VT (641534) OILDYNE		11 640	73.23
		32-40 - Wheels and brakes			
R		Main LDG wheel assy (2) 40-84B CLEVELAND		5 620	61.42
R		Main LDG brake assy (2) 30-41B CLEVELAND		2 595	57.48
R		Main LDG tire (2) 15.6.00-6 6 PRTT DUNLOP		6.107 or 7 500	57.48
R		Main LDG tire (2) 15.6 00-6 6 PR GOODYEAR		6 330	57.48
R		Main LDG tire (2) 15.6 00-6 6 16/TT MICHELIN		7 200	57.48
R		Main LDG tube (2) 15.6.00 6 DUNLOP		2.425	57.48
R		Main LDG tube (2) 6.00-6 DUNLOP		1 653	57.48
R		Main LDG tube (2) 15 6 00-6-5 00.6 GOODYEAR		1 653	57.48
R		Main LDG tube (2) TR20 P/N 092-500-0 MICHELIN		1 653	57.48
R		Main LDG tube (2) 15 6 00-6 "R GOODYEAR		1 653	57.48
R		Nose LDG wheel assy 40-77 B CLEVELAND		2 822	- 17.72

S/R/V/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
R		Nose LDG tire 5.00-5 6 PRTT DUNLOP		5.798 to 6.400	- 17.72
R		Nose LDG tire 5.00-5 6 120TT MICHELIN		6.400	- 17.72
R		Nose LDG tire 5.00-5 6 120TT AVIATOR		5.500	- 17.72
R		Nose LDG tire 5.00-5 6 PR P/N 506C61 8 GOODYEAR		5.300	- 17.72
R		Nose LDG tube 5.00-5 DUNLOP		1.455	- 17.72
R		Nose LDG tube TR67A P/N 092-306-0 MICHELIN		1.455	- 17.72
R		Nose LDG tube 5.00-5 TR67 GOODYEAR		1.455	- 17.72
S		Braking control (R.H. pos.) TB20 45000		3.307	11.81
		32-60 - Position indicating system and alarms			
R		LDG configuration and control panel TB20 61202		0.309	23.62

S/R/A/O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	.	WEIGHT per unit lb (kg)	ARM in. (m)
		33 - LIGHTS			
		33-10 - Cockpit			
S		Rear cabin lighting TB20 64202		0.220	65.35
S		Instrument panel lighting TB20 64201		0.486	23.62
S		Front cabin lighting (ornarg) TB20 64202		0.507	41.00
S		Maps reading light		0.176	25.59
A	EB73 00M	Emergency lighting system		4.079	104.72
		33-40 - External lighting			
S		Landing light G.E. 4591		0.353	35.43
S		Taxi light G.E. 4626		0.353	35.43
S		Navigation and anticollision lights assy WHELEN TB20 63212		4.431	64.96
A	33-001A	Recognition lights WHELEN		0.463	33.46
A	E537 00M	Strobe light JPC on vertical stabilizer		1.874	145.67
A	E537 10M	Strobe lights JPC on vertical stabilizer and under fuselage		3.197	140.55
A	E537 20M	Strobe light JPC on vertical stabilizer (red glass)		1.874	145.67
O	E626	Strobe light WHELEN (all)		2.094	145.67
O	FB4F 00M	Light control box JX 128 FLASHER FK		0.551	55.31

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		34 - NAVIGATION			
		34-10 - Flight environment data			
		34-11 - Air data systems			
R		Altimeter TB20 76222 P/N 5534 PD1 or PD3 Code A253 UNITED INSTRUMENTS		0 816	25.59
R		True airspeed indicator with integrated lighting TB20 76223 P/N 6125 Code 3605 UNITED INSTRUMENTS		0 726	24.80
R		Vertical speed indicator TB20 76224 P/N 7000 Code C53 UNITED INSTRUMENTS		1 014	23.62
S		Air data systems TB10 77200 : - Heated pitot Alternate static source (in cabin)		1 190 0 837	53.15 23.62
A	C635 COM	2nd heated pitot (R.H. wing)		1 190	47.24
A	D691 COM	2nd altimeter 20000 ft		1 433	19.69
A	D803 COM	Installation of 2nd airspeed indicator		1 213	23.62
A	D811 COM	Alti-coder KE 127 KING		1 433	17.72
A	D830 COM	Alti coder 20000 ft TRANSCALL		1 433	17.72
A	D831 COM	Alti-coder 30000 ft TRANSCALL		1 433	17.72
A	D832 COM	2nd altimeter 35000 ft		1 433	19.69
A	D897 COM	2nd vertical speed indicator (R.H. station) P/N 7000 C53 UNITED INSTRUMENTS		1 521	23.62
A	D915 COM	Mini altimeter # 3 P/N 5940 UNITED INSTRUMENTS		0 926	23.62
O	K608 20M	Alti-coder KEA 133A (35000 ft) KING		1 764	21.65
O	K608 30M	Alti coder 20000 ft UNITED INSTRUMENTS		1 764	21.65

S/A/O	ITEM OPT1C	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT		WEIGHT per unit lb (kg)	ARM in. (m)
A	N846 0CM	Altitude encoder AR900 NARCO		1 323	19 69
		34-13 - Outside temperature			
S		Outside air temperature indicator (water-tight connector on sensor) 1820 76202		0.551	23 62
A	C810 2CM	Outside air temperature indicator (water-tight connector on sensor) DAVTRON		0.551	23 62
		34-20 - Attitude and direction			
		34-21 - Heading reference system			
A	34-002A	HSI assy KCS 55A HONEYWELL		12.721	67 32
A	C914 0CM	Heading gyro indicator SIGMATEK (on L.H. instrument panel)		2.668	23 62
A	C914 1CM	Heading gyro indicator SIGMATEK (on R.H. instrument panel)		2 976	19 69
A	C922 0CM	Electric heading gyro indicator 205 15L BFG		3 219	20 62
A	K86C 20M	HSI assy KING (30/400 Hz) with heading recopy capability and vertical KA 51B		12.720	67 32
A	K86C 30M	HSI assy KING (30/400 Hz) with heading recopy capability and horizontal KA 51B		12.720	67 32
A	K86C 60M	HSI assy KING with horizontal KA 51B (if GPS KLN 90B installed)		12.720	67 32
A	K86C 60M	HSI assy KING with vertical KA 51B (if GPS KLN 90B installed)		12.720	67 32
A	067140 M	Heading indicator KG 107		2.690	20 47
		34-22 - Turn and bank indication			
R		Turn-and-bank indicator T820 76625 UNITED INSTRUMENTS		1 675	23 62
O	34-002A	Electrical turn coordinator UNITED INSTRUMENTS		1 223	23 62

S/R/V/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT		WEIGHT per unit lb (kg)	ARM in. (m)
O	0697 00M	Electrical turn coordinator CASTLEBERRY		1 696	23 62
A	0878 10M	Slip indicator (R.H. station) UNITED INSTRUMENTS		1 075	23 62
		34-23 - Magnetic compass			
R		Compass T320 76225 P/N 62400 L 4P (26 V) AIRPATH		0 596	20 47
		34-24 - ADI and standby horizon			
A	34-001A	Electrical attitude gyro indicator 100-28L(5F) BFG (Not valid for U.K. aircraft)		2 866	24 4"
A	34-001B	Electrical attitude gyro indicator 100-28LK(5F) BFG (Specific for U.K. aircraft)		2.866	24.4"
A	34-001C	Electrical attitude gyro indicator 100-28LS(5F) BFG (or L.H. instrument panel) (Not valid for U.K. aircraft)		2.866	24.4"
A	34-001D	Electrical attitude gyro indicator 100-28LS(5F) BFG (or L.H. instrument panel) (Not valid for U.K. aircraft)		2 866	24 4"
A	067330 M	Attitude gyro indicator with Flight Director KI 256 for KFC 150		3.285	20.47
		34-25 - Radio magnetic indication			
A	KS81 00M	RMI KI 22930 (without switching) KING		3.086	21.65
A	KS84 10M	RMI KI 22930 (with switching) KING		3 307	21 65
A	KI819 00M	RMI KNI 582 KING		3.417	21.65

S/ R/ A/ O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		34-28 - Electronic flight instrumentation system			
A	K923 00M	Radionavigation assy KING with EHI 40 EFIS system KING (EHSI only) : - KMA 24H70 audio control box - VHF1 VOR/ILS KX 165-25 - VHF2 VOR/ILS KX 165-25 with KI 206 indicator - DME KN 63 - ADF KR 87 - MARKER KR 21 - RMI KI 229 - GPS KLN 90B - KCS 305 gyro unit The EHI 40 part components are as follows - SG 465 symbol generator - ED 461 EHSI indicator - KN 40 adapter		94.577	68.11
		34-30 - Landing and taxiing aids			
		34-31 - Marker			
A	K676 00M	Marker receiver indicator KR 21 KING		1.257	21.65
		34-40 - Independent position determining			
		34-41 - Stormscope			
A	54-502A	Stormscope WX 500 BFG		4.960	117.32
A	J820 00M	Stormscope WX 1000 BFG (on panel strip)		15.432	63.07
A	J820 10M	Stormscope WX 1000 BFG (on R.H. instrument panel)		15.432	63.07
A	J826 10M	Stormscope WX 1000 + BFG		15.432	63.07
A	J816 00M	Stormscope WX-900 BFG		4.800	65.43

S/R/A/O	ITEM OPT'O	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		34-60 - Dependent position determining			
		34-61 - NAV 1 installation			
A	K663 51M	VHF assy COM1/NAV1 (VOR/LOC) KX 155 KING		7 100	23.23
A	K663 61M	VHF assy COM1/NAV1 (VOR/ILS) KX 155 KING		5 173	23.23
A	K663 71M	VHF assy COM1/NAV1 (VOR/ILS/DME) KX 155 with audio amplifier KING		7 870	24.80
A	KB12 51M	VHF assy COM1/NAV1 (VOR/LOC) KX 165 KING		7 165	23 23
A	KB12 61M	VHF assy COM1/NAV1 (VOR/ILS) KX 165 KING		5 644	23.23
A	KB13 00M	VOR/ILS indicator KI 206-04 KING		1 63'	21.65
A	KB13 10M	VOR/ILS indicator KI 206-05 KING		1 764	21 65
A	KB14 00M	VOR/ILS indicator KI 204 KING		1 916	21 65
A	KB47 00M	Converter VOR/LOC KN 72 KING		1 653	43 3'
		34-62 - NAV 2 installation			
A	K663 21M	VHF assy COM2/NAV2 (VOR/LOC) KX 155 KING		7 276	20.08
A	K663 31M	VHF assy COM2/NAV2 (VOR/ILS) KX 155 KING		5 415	23 23
A	KB12 11M	VHF assy COM2/NAV2 (VOR/ILS) KX 165 KING		5 997	22 83
A	KB12 31M	VHF assy COM2/NAV2 (VOR/LOC) KX 165 KING		7 34'	23.23
A	KB13 00M	VOR/ILS indicator KI 206-04 KING		1 63'	21.65
A	KB13 10M	VOR/ILS indicator KI 206-05 KING		1 764	21 65
A	KB14 00M	VOR/ILS indicator KI 204 KING		1 916	21 65

S/A/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		34-53 - Transponder			
A	34-601A	Transponder GTX 320 GARMIN		3.086	29.53
A	34-604A	Transponder GTX 327 GARMIN		3.968	21.65
A	K656 00M	ATC KT 76 A KING on radio console		3.682	80.08
A	K656 20M	ATC KT 76 A KING on R.H. panel strip (with support)		3.836	21.65
A	K656 30M	ATC KT 76 A KING on R.H. panel strip (with support) (EHSI version)		3.836	21.65
A	K976 00M	Transponder ATC KT 71 KING		4.630	22.44
A	K976 10M	Transponder ATC KT 71 KING (on R.H. panel strip)		4.630	22.44
A	K929 00M	Transponder ATC KT 76C KING (on R.H. panel strip)		3.527	23.62
		34-54 - Automatic Direction Finder (ADF)			
A	34-300A	ADF assy KR 87 SC+ (indicator KI 227.01) HONEYWELL		8.885	90.16
A	34-300B	ADF assy KR 87 SC+ (indicator KI 227.00) HONEYWELL		8.885	90.16
A	34-300C	ADF assy KR 87 SC+ (indicator KI 229) HONEYWELL		11.046	76.77
A	34-300D	ADF assy KR 87 SC+ (indicator KNI 582) HONEYWELL		11.177	76.77
A	K655 00M	ADF KR 87.01/04 (indicator KI 227.00) KING (on radio console)		8.730	90.16
A	K655 10M	ADF KR 87.01/04 (indicator KI 227.01) KING (on radio console)		8.730	90.16
A	K655 20M	ADF KR 87 KING		8.025	95.06
A	K655 40M	ADF KR 87 (indicator KI 227.01) KING (on R.H. panel strip)		8.730	90.16

S/R/V/O	ITEM OPTION	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT		WEIGHT per unit lb (kg)	ARM in. (m)
A	K917 00M	ADF2 KR 87 KING		9.436	94.49
		34-55 - DME installation			
A	34-306A	DME KN 62A SC+ HONEYWELL		3.527	30.7
A	K657 00M	DME KN 62A KING		3.682	21.26
A	K657 10M	DME KN 64 KING		3.682	21.26
A	K664 00M	DME KN 65 KING		5.489	40.94
		34-57 - Global Positioning System (GPS)			
A	34-301A	GPS KLN 94 HONEYWELL interfaced with HSI		5.952	25.98
A	34-306A	GPS KLN 94 HONEYWELL "Stand alone"		4.850	28.74
A	34-500A	Color Skymap capability GM 2000 SKYFORCE		0.970	33.5
A	K920 10M	GPS KLN 89B KING "Stand alone"		4.519	25.20
A	K926 10M	GPS KLN 89B KING interfaced with HSI KI 525A (KCS 55A compass system)		5.576	22.83
A	K927 10M	GPS KLN 90B KING interfaced with HSI and A/P without HMI (KA52 antenna)		10.097	23.23
		34-60 - Flight management computing			
		34-62 - Multifunction display			
A	34-304A	MFD KMD 550 HONEYWELL		6.614	21.65

S/ R/ A/ O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		35 - OXYGEN			
A	F921-00M	Oxygen constant-flow masks with radio (crew) (Qty 2) PURITAN BENNETT		0.706	65.12
A	092105 M	Oxygen system equipment (constant-flow type) PURITAN BENNETT		32.187	115.35
A	052300 M	Oxygen constant-flow mask without radio (rear passenger) PURITAN BENNETT		0.529	90.55

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		37 - VACUUM			
		37 - 11 - Distribution (normal)			
S		Vacuum pump SIGMA-TEK (with filter) or Vacuum pump CHAMPION or AERO ACCESSORIES (with AIRBORNE filter) TB20 76817		5.225	- 0.79
A	A904 10M	Vacuum pump SIGMA-TEK (with filter) (when stormscope installed, refer to ATA 34)		5.225	- 0.79
		37 - 12 - Distribution (emergency)			
A	C802 00M	Auxiliary dry air pump		12.456	30.7
		37 - 20 - Indicating			
S		Vacuum system warning light TB20 76817		0.196	0.39

S/A/O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		52 - DOORS			
		52-40 - Inspection doors			
A	H882 00M	Doors (Qty 2) on lower engine cowl		0.441	- 26.30

S/ R/ A/ O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		53 - FUSELAGE			
A	B896 COM	Tail cone protection		0.661	216.67
A	H885 COM	Centering cup jack rest (convex contact area)		/	/

S/R/A/O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		56 - WINDOWS			
S		Colourless windows assy TB10 21000			
		- Windshield		11 640	27 56
		- Door window		4 C56	55 12
		- Rear side window		2 535	86 61
A	F868 00M	Ventilation scoops		0.220	79 53

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		61 - PROPELLER			
R		Propeller HC-C2YK-1BF/F 8477-1 HARTZELL		65.115	- 47.64
O	61-001A	Three-blade propeller HC-C3YR-1RF/F 7663F (Not deiced propeller) HARTZELL		Δ14.550	- 47.60
O	61-001B	Three-blade propeller HC-C3YR-1RF/F 7663FIB: (Deiced propeller) HARTZELL		Δ14.550	- 47.60
		61-20 - Controls			
R		Propeller governor F210 761 WOODWARD		2.645	- 39.37

S/ R/ A/ O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		72 - PISTON ENGINE			
R		Engine IO-540-C4D5D LYCOMING with starter and magneto		428.715	- 25.69
O	A805 00M	Engine IO-540-C4B5D LYCOMING with starter, magneto and vibrator :		439.377	- 25.59
		- Magneto selector P/N 10 357210-1 TCM		[illegible]	[illegible]
		- Starting vibrator P/N 10 382808-24 TCM		0.661	4.72
		- Dual magneto P/N 10 765146-108 TCM		11.508	- 9.06

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		73 - FUEL SYSTEM AND CONTROLS			
		73-30 - Indicating system			
A	73-001A	Digital fuel management system MICROFLO-I™ SHADIN		1.157	39.46
A	0905-00M	Digital fuel management system SHADIN		1.157	39.46
A	0905-30M	Digital fuel management system SHADIN (EHSI coupled)		1.157	39.46

SW R/ A/ O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	.	WEIGHT per unit lb (kg)	ARM in. (m)
		74 - IGNITION			
		74-10 - Electric generation system			
R		DLail magneto DSLN 3000 BENDIX		11.508	– 9.06
R		DLail magneto DSLN 2031 BENDIX		11.508	– 9.06

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		77 - ENGINE INDICATING			
		77-10 - Power			
R		Manifold pressure - fuel flow/pressure TB20 76220 P/N 6331 Code 4139 UNITED INSTRUMENTS		0.946	25.59
R		Tachometer-Hourmeter N-RF 80 P/N LM 021/022/023/024 LMI		0.860	23.62
		77-20 - Temperature			
S		EGT/CHT ALCOR TB20 76202		1.323	19.69
A	0906 COM	EGT/CHT multiple indicator EDM 700 6C JP INSTRUMENT		3.595	1.18

SW R/ A/ O	ITEM OPTIC	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	.	WEIGHT per unit lb (kg)	ARM in. (m)
		79 - LUBRICATION			
		79-10 - Storage			
A	065820 M	Oil drain door		0.220	- 25.59
		79-20 - Distribution			
R		Oil cooler 20006A NOM		3.086	14.17
A	AB86 00M	2nd oil cooler		4.079	- 13.39

S/R/A/O	ITEM OPT10	REQUIRED (R) OR STANDARD (S) OR OPTIONAL (A or O) EQUIPMENT	*	WEIGHT per unit lb (kg)	ARM in. (m)
		80 - STARTING			
R		Starter : - PRESTOLITE/ELECTROSYSTEMS MHB 4016 or MHB 6016 or - LYCOMING LW 15572 or 31322474		 17.990 8.09 17.990 8.09	 - 39.37 - 37.40 - 39.37 - 37.40
R		Starter 21B 21064 LYCOMING		11.376	- 39.37
R		Starter relay CE 1971 050 F PARIS RHONE		1.499	87.40

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SECTION 7

DESCRIPTION

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GENERAL

This section provides description and operation of the SOCATA Model TB 20 airplane and its systems. Some of the equipment described herein is optional and may not be installed in the airplane. Details of other optional systems and equipment are presented in Section 9 "Supplements" of this Manual and any airplane/country specifics are given in Section "Specifics" hereto.

AIRFRAME

The TB 20 is an all-metal, five-place, cantilever low wing, single-engine airplane equipped with retractable tricycle landing gear and is designed to be used in normal category .

The fuselage consists of an all-metal aluminium alloy structure of semimonocoque design. It includes 10 frames. The main frames are as follows .

- Frame No. 0 on which firewall, engine mount and nose gear mount are fixed
- Frame No. 1 on which wing front attachments are fixed.
- Frame No. 2 double frame which allows crossing and attachment of the wing spar
- Frame No. 3 on which wing rear attachments are fixed
- Frame No. 7 on which vertical stabilizer front attachment is fixed.
- Frame No. 8 on which vertical stabilizer rear attachment is fixed
- Frame No. 9 on which horizontal stabilator hinge fittings are fixed

The cabin section, from frame No. 0 to frame No. 6, is reinforced by horizontal spars made of extruded aluminium sections

The streamlined fairing is ensured by a composite material upper dust which includes the two access "gull-wing" doors.

Access to the baggage compartment (behind the bench seat) is provided through a door located on the L.H. side of the fuselage.

WINGS

The wings contain integral fuel tanks. They consist of stamped metal ribs riveted to the wing skin and to monobloc spar.

Wings characteristics :

Profile	RA16-3C3
Aspect ratio	8
Dihedral	6°3
Aerodynamic chord	4.002 ft - 1.220 m
True chord	4.065 ft – 1.245 m
Wing area	128.091 sq.ft - 11.90 m²
Wing setting	+ 3°

Ailerons :

Unit area	4.897 sq.ft - 0.46 m²
Mean span	4.081 ft 1.244 m

Recoil and slotted type wing flaps :

Unit area	10.010 sq.ft - 0.93 m²
Mean span	8.366 ft - 2.550 m

EMPENNAGE

The vertical stabilizer consists of a fin, a rudder and a controlled tab.
The horizontal stabilizer is of stabilator type with an automatic anti-tab controlled in its stabilator tab function
Both are of conventional metal structure type (spar, ribs and skin).

Empennage characteristics :

Conventional type vertical stabilizer :

Fin area (fixed section) Pre-MOD.151	9.472 sq.ft - 0.88 m²
Fin area (fixed section) Post-MOD.151	11.194 sq.ft - 1.04 m²
Rudder area	6.761 sq.ft - 0.63 m²
Controlled rudder tab	0.474 sq.ft - 0.04 m²

Stabilator type horizontal stabilizer :

Span	12.07 ft - 3.680 m
Stabilator area, anti-tab included	32.968 sq.ft - 3.06 m²
Tab area	5.328 sq.ft - 0.50 m²
Tab automaticity	104 %

FLIGHT CONTROLS

SURFACES

The airplane is equipped with a conventional three-axis surface system, consisting of aileron, stabilator and rudder surfaces.

Each front seat is provided with a control wheel which actuates ailerons and stabilator through rods and bellcranks.

The control wheel being actuated fully, ailerons deflection must be :

- upwards 15° ± 1.5°
- downwards 15° ± 1.5°

Stabilator deflection must be :

- nose-up - 16° ± 1°
- nose-down + 3° ± 1°

The stabilator consists of an automatic anti-tab, which automatically is 104 %. This anti-tab can also be controlled through the pitch trim.

Each front seat is provided with a rudder pedal which controls the rudder through rods and bellcranks.

Rudder deflection to the left and to the right is 25° ± 2°

Rudder has a controlled tab.

TRIM SYSTEMS

Manually-operated pitch and rudder trims are provided.

Stabilator trimming is accomplished by actuating on stabilator anti-tab through a control wheel vertically mounted on L.H. side of the control panel.

This control wheel actuates stabilator anti-tab through cables and an irreversibility system.

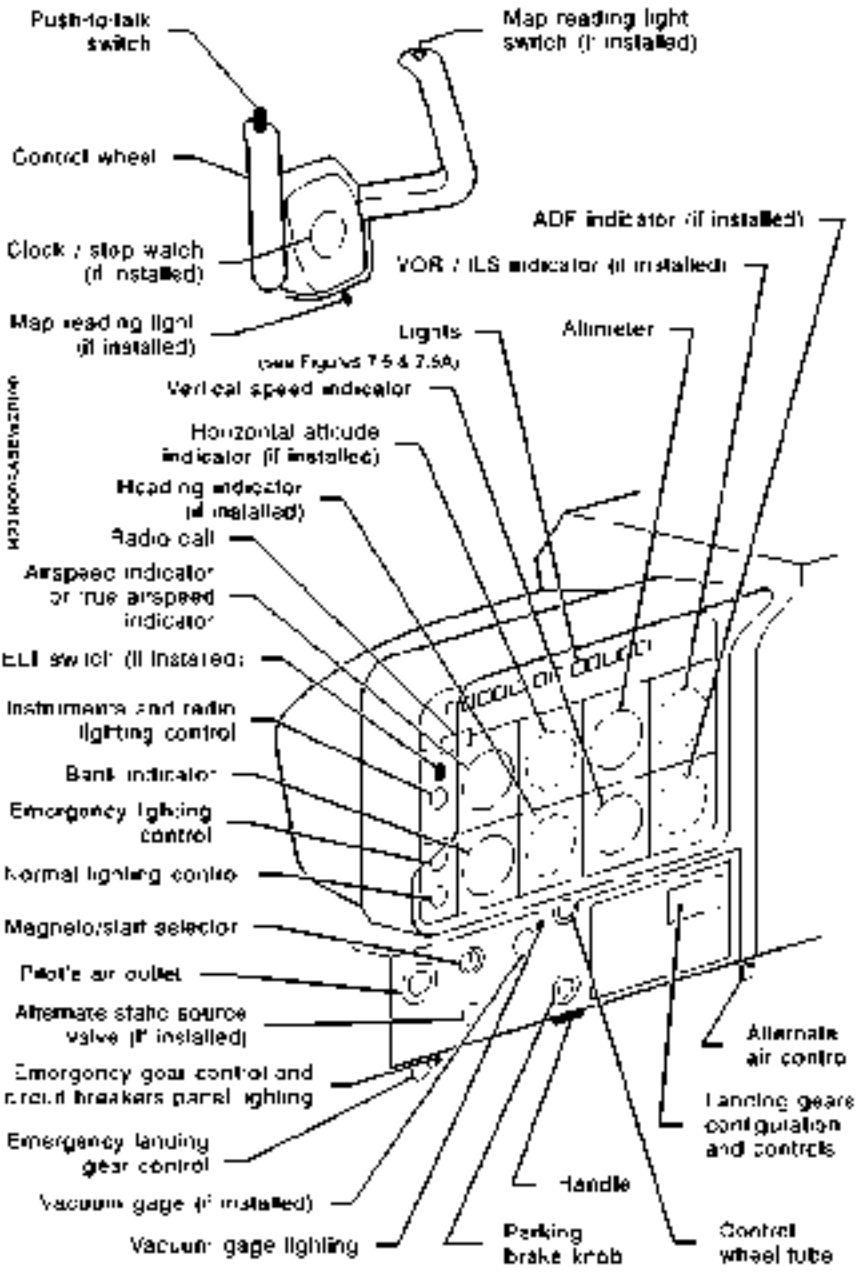

Figure 7.1 – EXAMPLE OF INTRUMENT PANEL AND L.H. SUBPANEL

A pointer indicator located on the right of the trim control wheel gives the anti-tab position. Forward rotation of the control wheel will trim nose-down, conversely, rearward rotation will trim nose-up.

Stabilator tab deflection with stabilator in maximum nose-up attitude must be :

- nose-up 0° ± 0.5°
- nose-down 15° ± 1.5°

Rudder trimming is accomplished by rotating a control knob (rudder trim) deflecting horizontally, located on the control pedestal. This trim actuates the rudder tab through a sheathed control. Rotating the trim to the right will trim nose-right , conversely, rotating it to the left will trim nose-left.

Rudder tab deflection must be :

- to the right 10° ± 2°
- to the left 25° ± 2°

INSTRUMENT PANEL

L.H. instrument panel (see Figure 7.1) is designed around the basic "T" configuration.

The gyros (if installed) are located in front of the pilot and arranged vertically. The airspeed indicator or the true airspeed indicator and the altimeter are to the left and right of the gyros, respectively.
The upper edge of the instrument panel contains the advisory panel (see Figures 7.5 and 7.5A) and registration (enabling airplane radio call).
The left side of the panel contains lighting controls, emergency locator transmitter switch (according to ELT model) (if installed).

The L.H. panel strip (see Figure 7.1) contains from left to right : L.H. air outlet, magneto/start selector, parking brake knob, landing gears configuration and controls ; under the panel strip, on L.H. side, emergency landing gear control, on R.H. side, the "Alternate Air" control; alternate static source valve and vacuum gage (if installed) complete the L.H. panel strip.

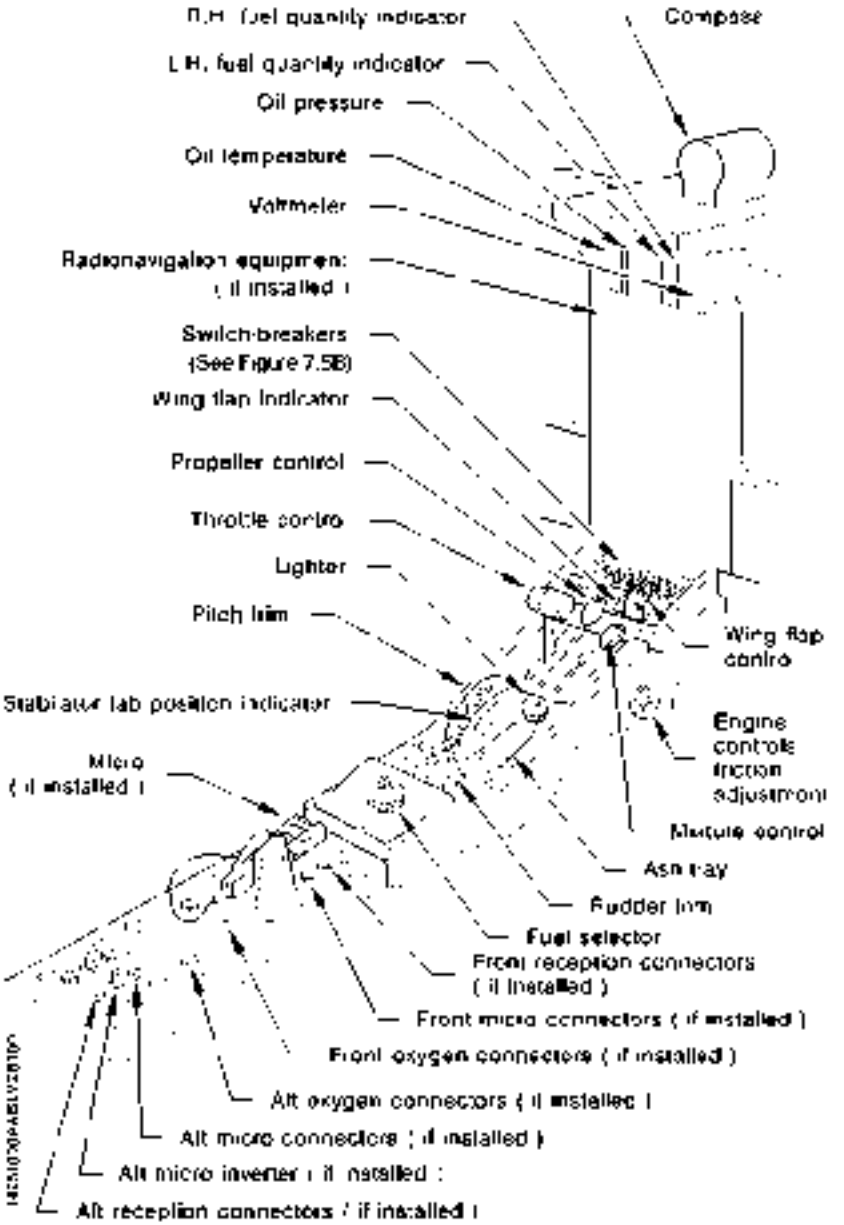

Figure 7.2 - EXAMPLE OF CONSOLE AND PEDESTAL

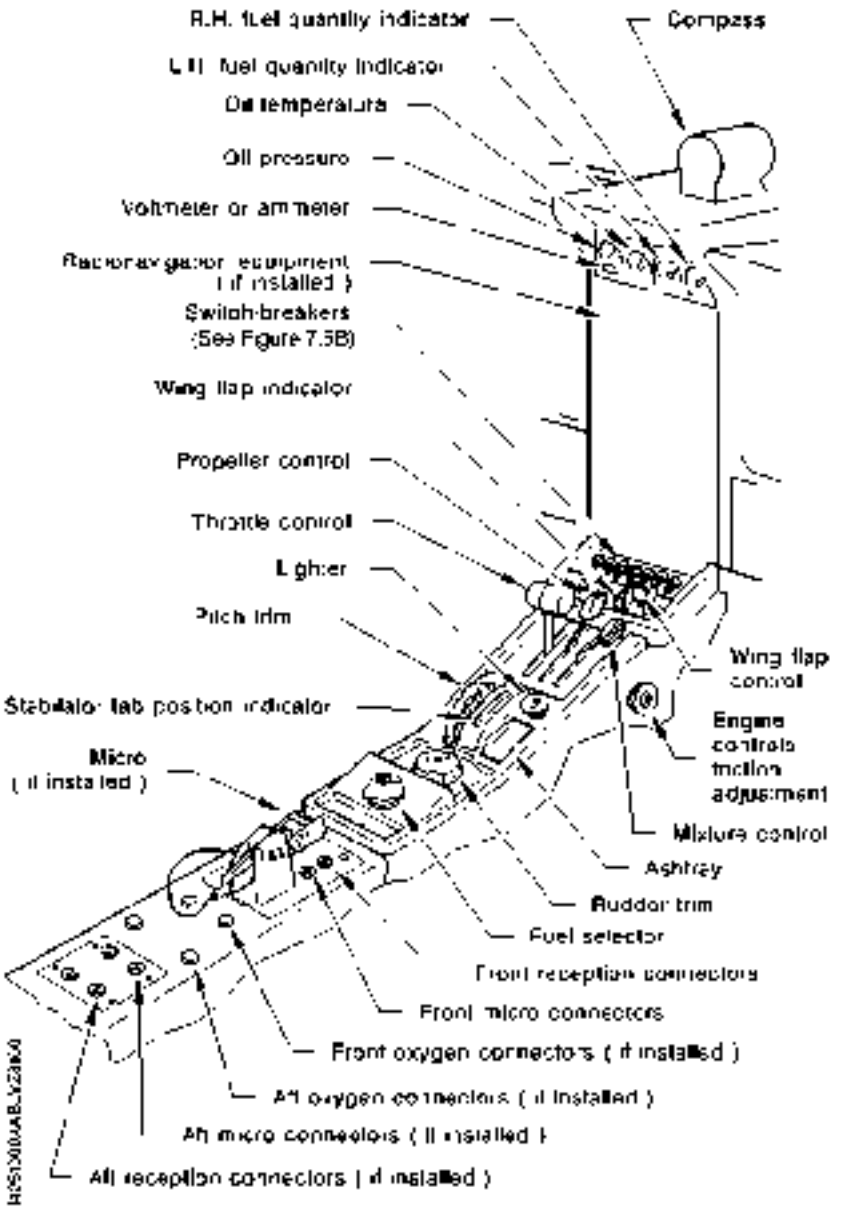

Figure 7.2A - EXAMPLE OF CONSOLE AND PEDESTAL

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The central console (see Figure 7.2 or 7.2A) contains in the upper edge, the engine monitoring cluster, then radio-navigation equipment vertically mounted to console lower edge, where switches and push-buttons as "RADIO MASTER", "COM GND PWR" (Ground clearance), etc ... may be installed.

The central pedestal (see Figure 7.2) contains fore to aft :

- the switch-breakers panel, flap control and indicator
- the engine controls (from left to right : throttle, propeller, mixture)
- the pitch trim and its indicator
- the lighter and the ash-tray
- the rudder trim
- the fuel selector
- the micro (if installed)
- the reception and micro jacks (if installed)
- the oxygen masks connector (if installed)
- on pedestal R.H. side, engine controls friction device.

Pre-MOD.151

The R.H. instrument panel (see Figure 7.3) contains the tachometer or tachometer-hourmeter and the manifold pressure-fuel flow/pressure dual indicator and spare locations for additional equipment (2nd altimeter, VOR/LOC indicator, outside air temperature, cylinder head temperature, exhaust gas temperature, ELT (according to ELT model) ..)

Post-MOD.151

The R.H. instrument panel (see Figure 7.3A) contains the tachometer-hourmeter, the manifold pressure-fuel flow/pressure dual indicator, the outside air temperature indicator (OAT), the exhaust gas temperature/cylinder head temperature indicator (EGT/CHT) and spare locations for additional equipment (2nd altimeter, VOR/LOC indicator, ELT (according to ELT model) ...).

The R.H. panel strip (see Figure 7.3) contains a location for radio equipment or any other one, cabin air selector, R.H. air outlet.

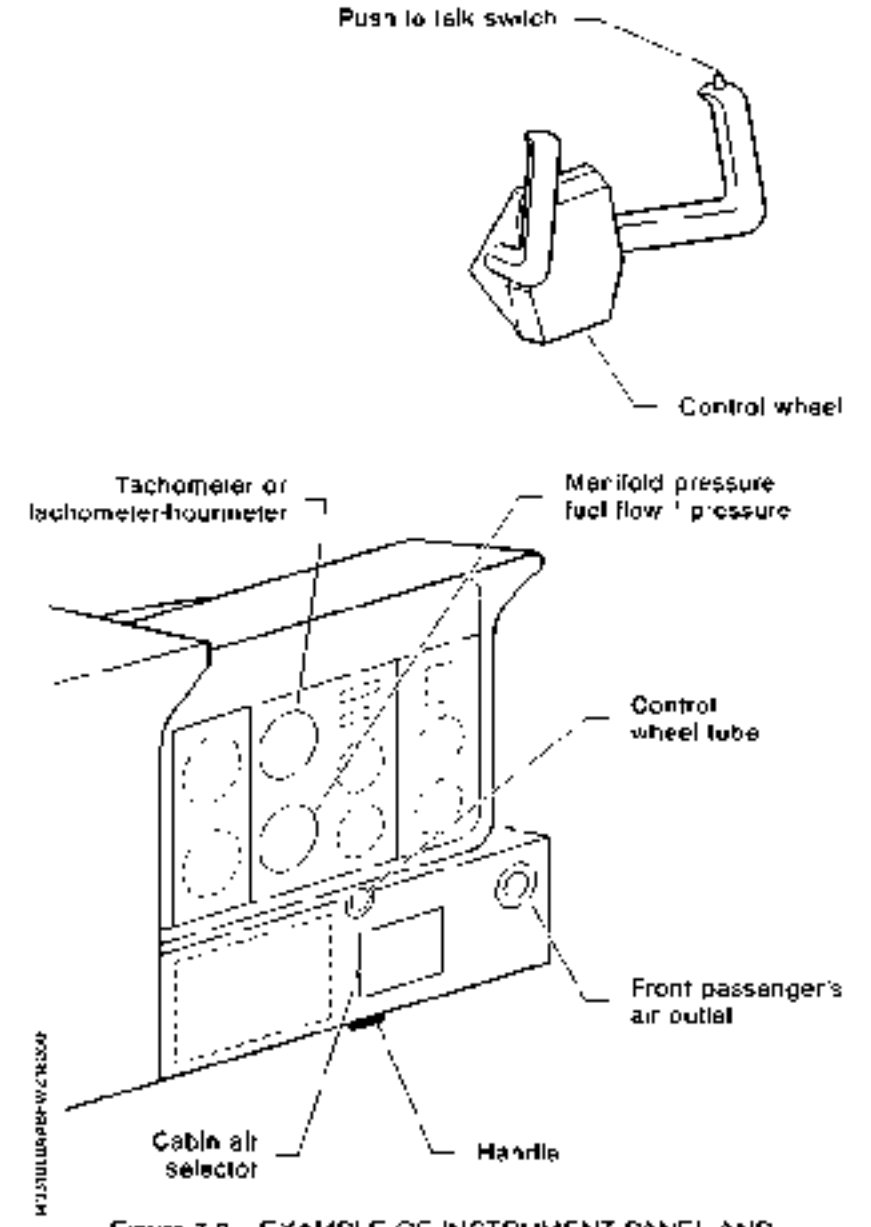

Figure 7 3 - EXAMPLE OF INSTRUMENT PANEL AND R.H. SUBPANEL

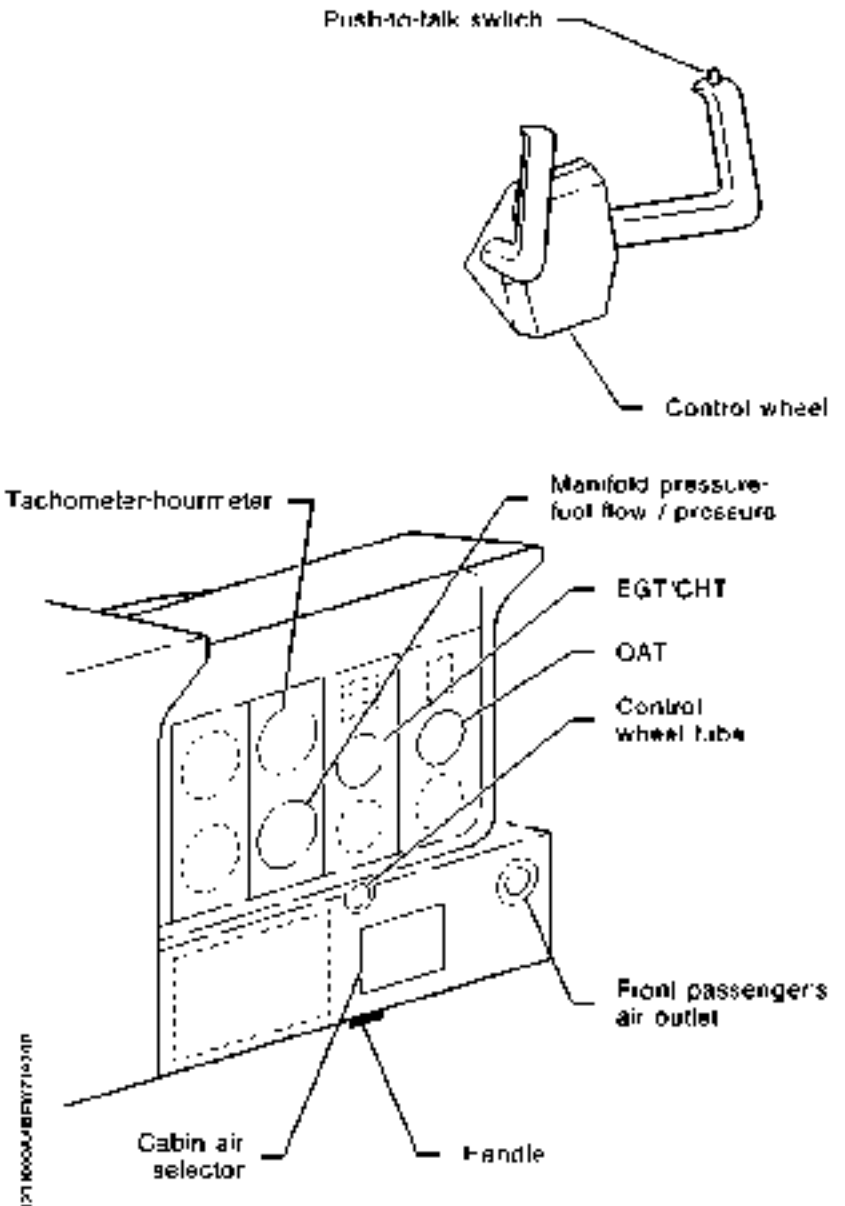

Figure 7.3A - EXAMPLE OF INSTRUMENT PANEL AND R.H. SUBPANEL

Upper duct central part (see Figure 7.4 or 7.4A) contains fore to aft :

- Front air outlets (if installed) Post-MOD.151
- "Flight conditions" placard
- "Instruction" plate
- Front overhead lights
- Radio loud-speaker (if installed)
- Oxygen control and pressure gage (if installed)
- Alarms loud-speaker
- Blower switch (if installed)
- Autopilot alarm (if installed)
- Altitude selector alarm (if installed)
- Autopilot alarm and altitude selector alarm (if installed) Post-MOD.151
- Rear overhead light
- Rear air outlets

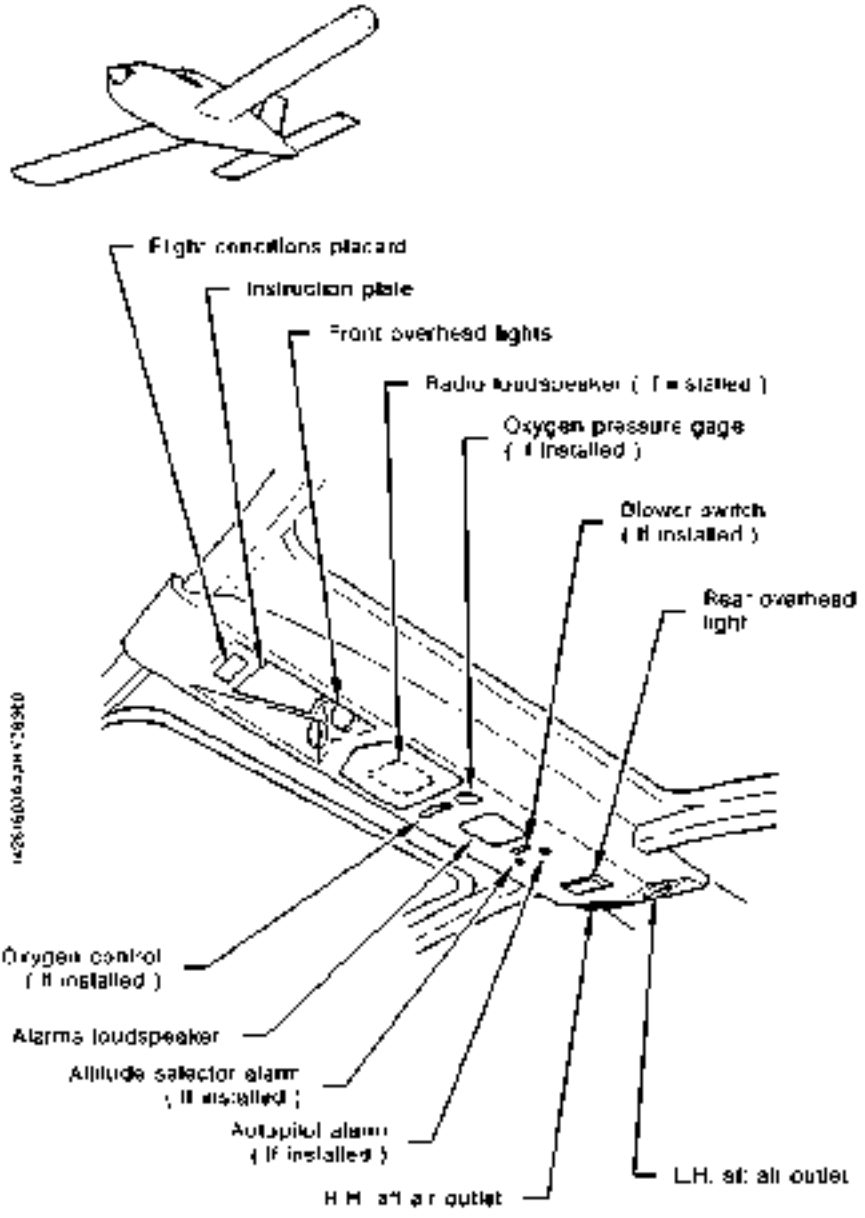

Figure 7.4 - UPPER DUCT CENTRAL PART

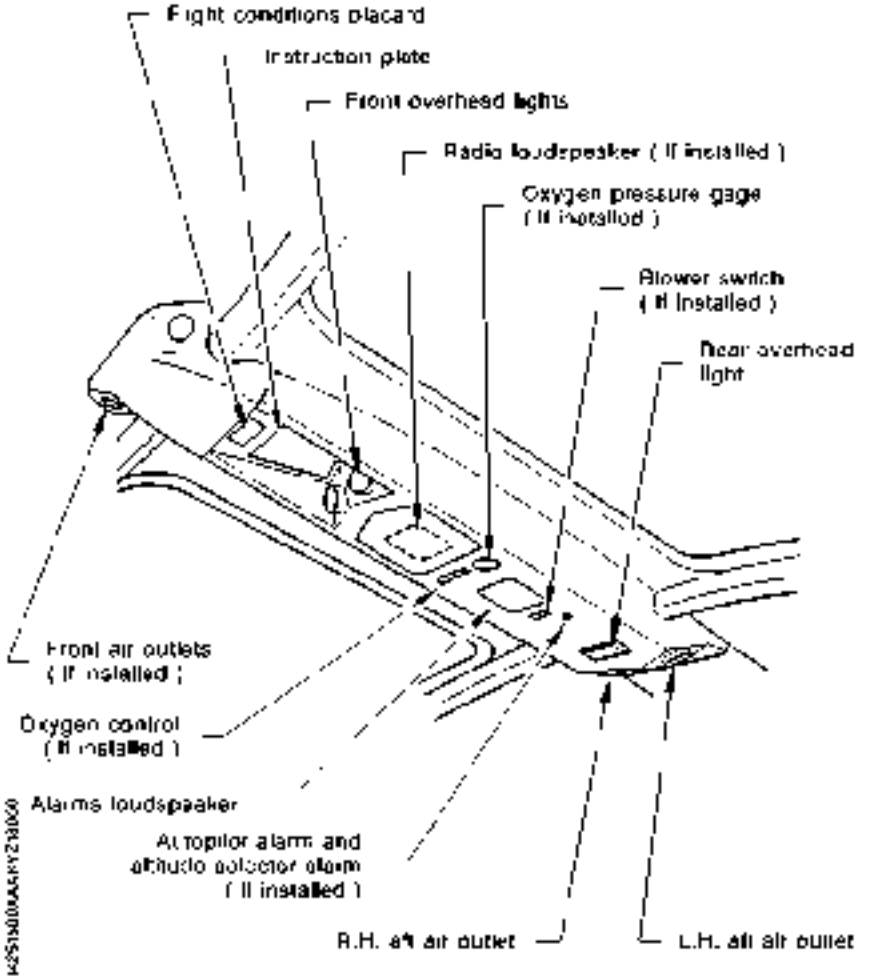

Figure 7.4A - UPPER DUCT CENTRAL PART

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ADVISORY PANEL

The advisory panel (see Figure 7.5 or 7.5A) is located at the top edge of the L.H. instrument panel, directly in front of the pilot. The panel contains separate indicator lights which illuminate green, amber or red when a specific condition occurs in the associated airplane system. A green colored light is illuminated to indicate a normal or safe condition in the system. However, an illuminated amber lamp indicates that a cautionary condition exists, but which may not require immediate corrective action. When a hazardous condition exists requiring immediate corrective action, a red light illuminates.

A day / night switch is installed in the centre of the advisory panel to control the intensity of the green indicator lights and of the GPS annunciators (if GPS installed).

Additional annunciators, associated to the GPS (if installed) are installed in the centre of the advisory panel.

SWITCH-BREAKERS PANEL

The general electrical equipment switch-breakers are located on the front part of the central pedestal.

The switch-breakers located on this panel are illustrated in Figure 7.5B.

CIRCUIT BREAKERS PANEL

The electrical equipment circuit breakers are located on a separate panel mounted on the L.H. cabin sidewall adjacent to the pilot.

Circuit breakers located on this panel are illustrated in Figure 7.6 or 7.6A.

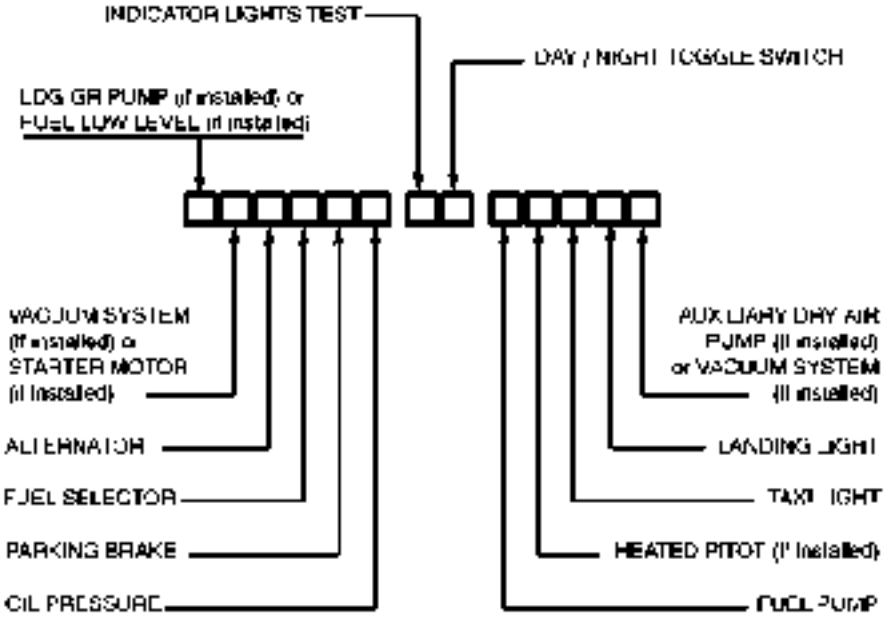
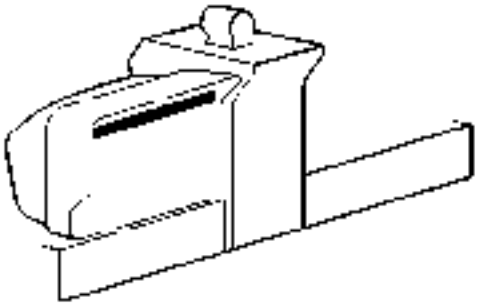


Figure 7.5 – ADVISORY PANEL (BASIC)



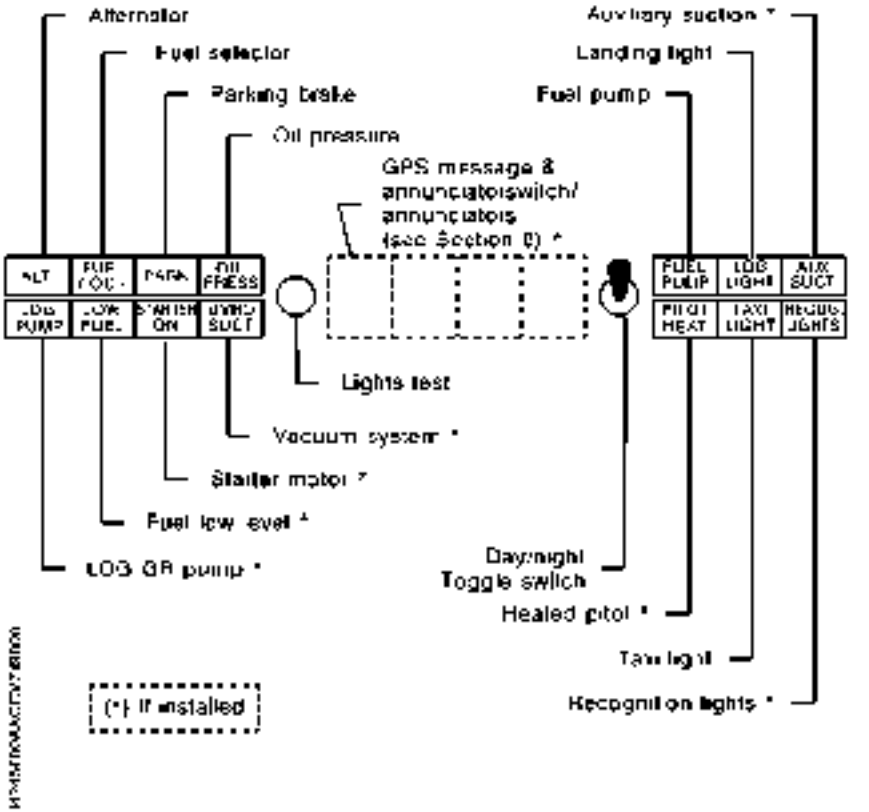
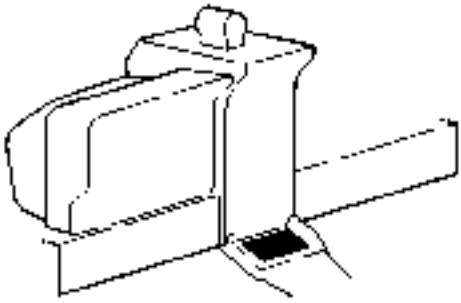


Figure 7.5A - ADVISORY PANEL (EXTENDED)



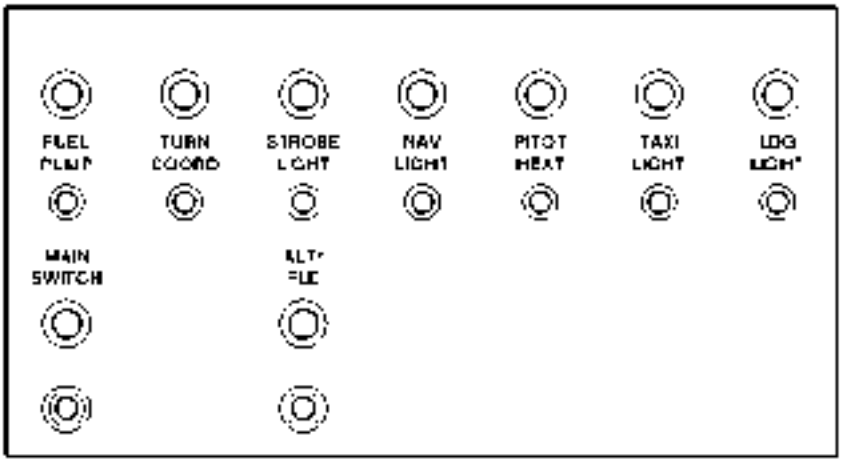


Figure 7.5B - SWITCH-BREAKERS (SB)

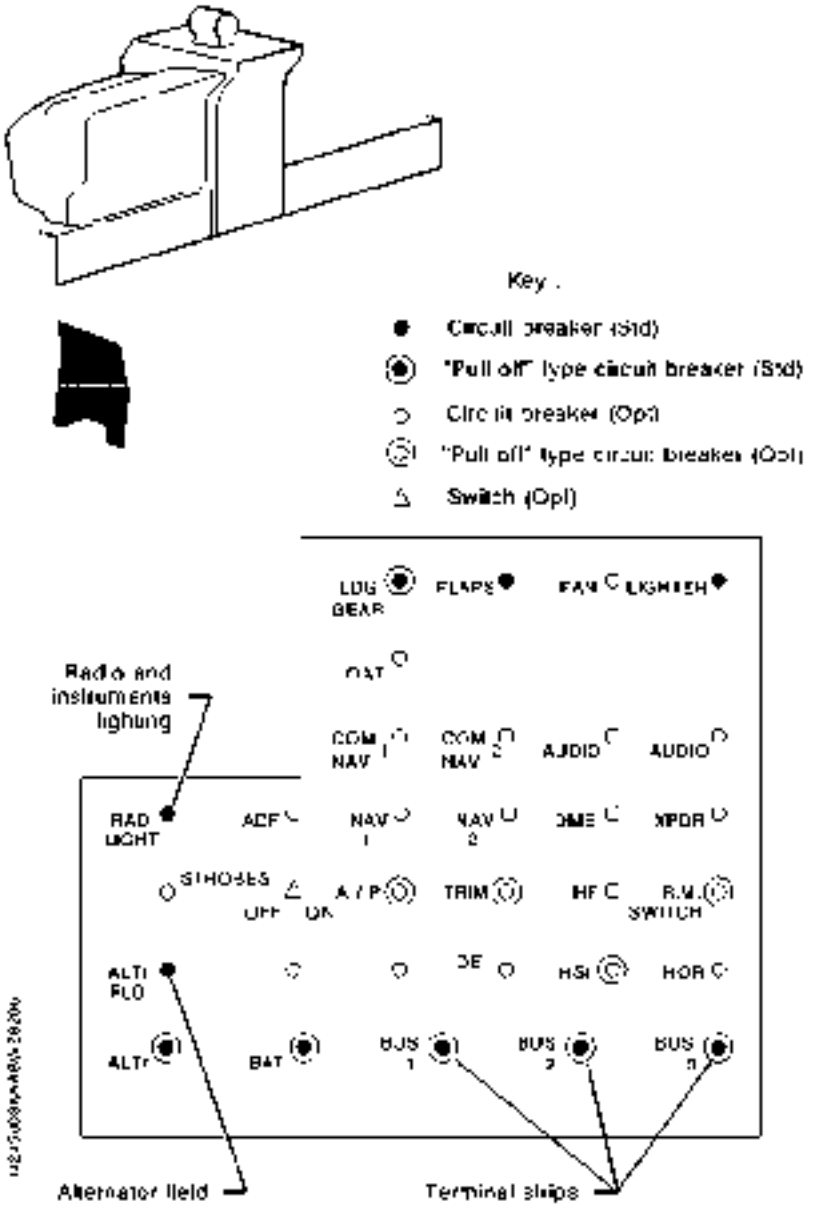


Figure 7.6 - CIRCUIT BREAKERS ASSEMBLY
(Typical arrangement)

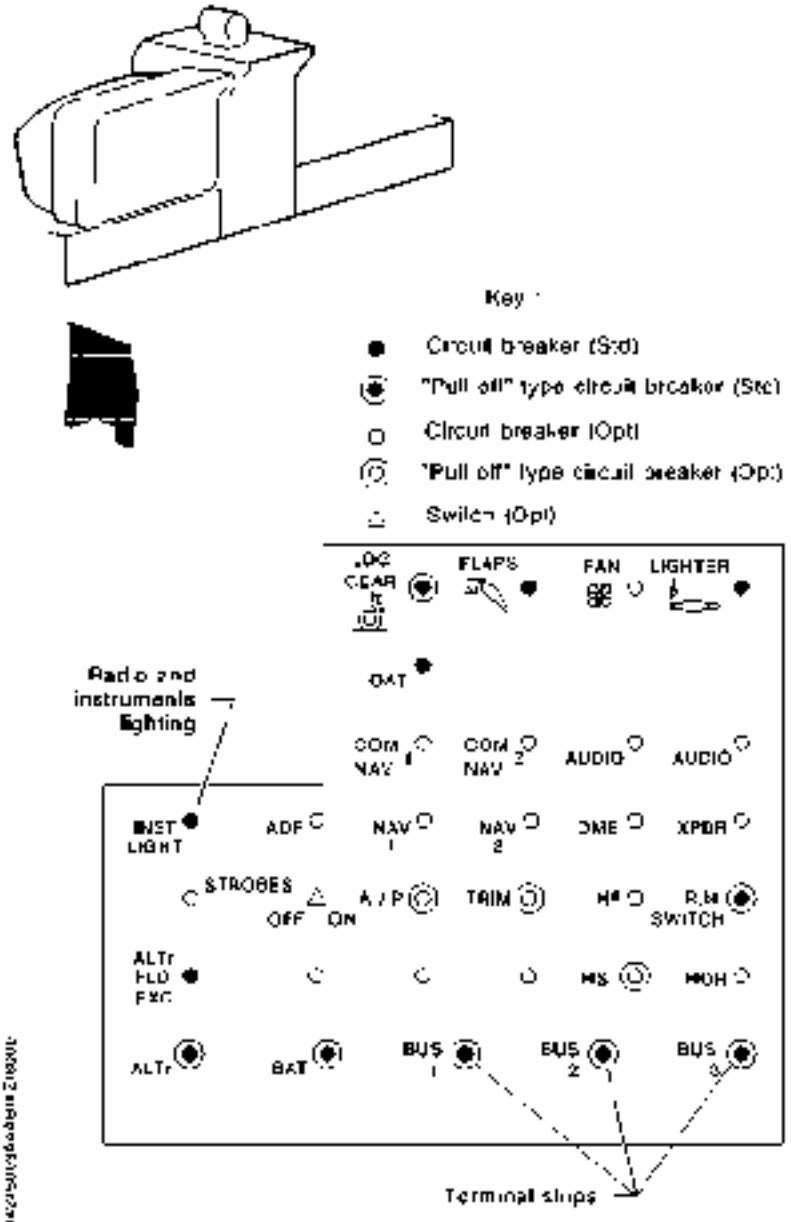


Figure 7.6A - CIRCUIT BREAKERS ASSEMBLY
(Typical arrangement)

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GROUND CONTROL

Effective ground control while taxiing is accomplished through nose-wheel steering by using the rudder pedals connected to nose-wheel through rods.

When a rudder pedal is fully pushed, the nose-wheel rotates through an arc of approximately 18°30' each side of the center. By applying either left or right brake, the degree of turn may be increased.

The minimum turning radius of the airplane is obtained by using differential braking and nose gear steering (see Figure 7.7).

Moving the airplane by hand is most easily accomplished by attaching a tow bar (stowed in the baggage compartment) to the nose gear leg.

If the airplane is to be towed by vehicle, never turn the nose gear more than 18°30' either side of center or structural damage to the nose gear could result.

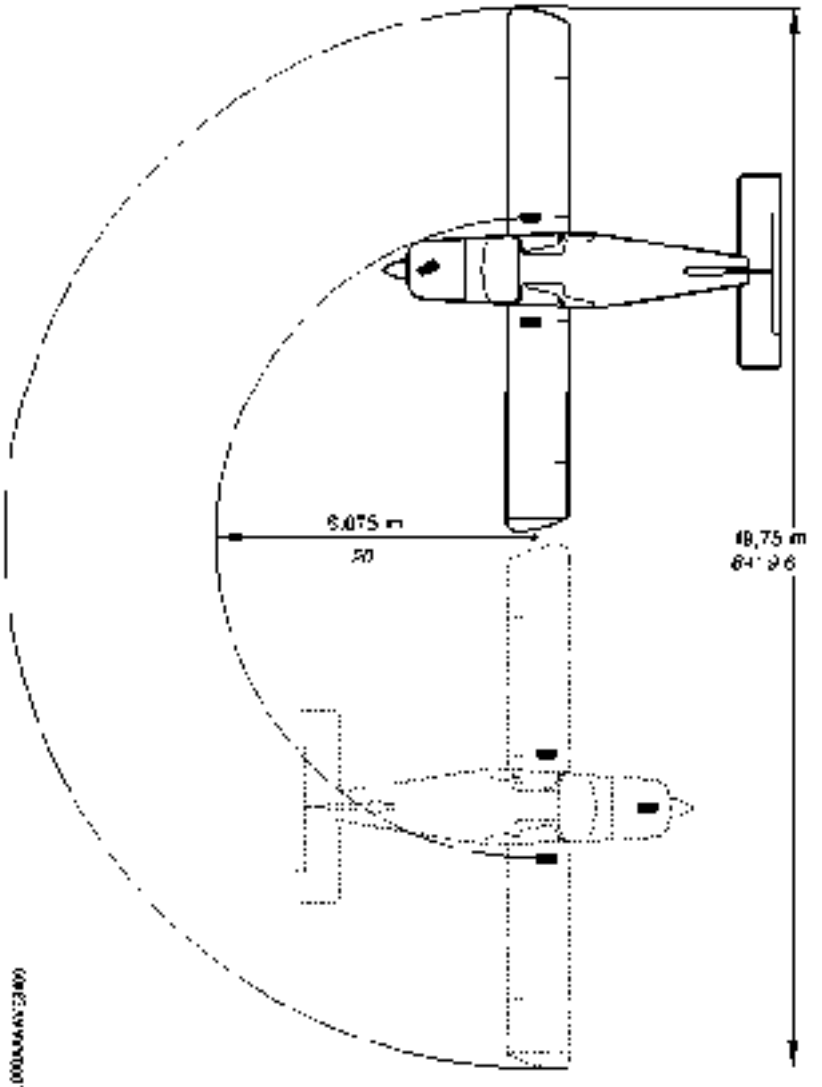

Figure 7 7 - MINIMUM TURNING RADIUS

WING FLAPS

The wing flaps are of the large span, single-slot type. They are retracted or extended by positioning to the desired flap deflection position the flaps control located on the pedestal, on R.H. side of the switch-breakers.

The switch lever is moved up or down in a slotted panel with mechanical stops at "retracted" (0°) ; "take-off" (10°) and "landing" (40°) positions (see Figure 7.2). An indicator located near the control provides various flaps positions.

The wing flaps system is protected by a 10-amp circuit breaker, labelled "FLAPS" located on L.H. circuit breakers side panel (see Figure 7.6).

LANDING GEAR

The landing gear system is a retractable tricycle type utilizing a conventional steerable nose gear and a trailing beam type main landing gear. Nose gear and main gears are provided with oil / air shock absorbers. Each main gear wheel is equipped with a hydraulically-actuated, single-disc brake on the inboard side of the wheel.

Landing gear extension or retraction is accomplished by actuators powered by an electrically-driven hydraulic power pack : the hydraulic generator. The latter is located under the rear seat.

The hydraulic system fluid level may be checked by utilizing the dipstick/filler cap located on the rear R.H. side of the generator. The dipstick/filler cap is accessible through a door located under the rear seat. The level should be checked at 100-hour intervals. When the fluid level is at or below the slot on the dipstick, hydraulic fluid (MIL-H-5606 D) should be added to bring the level to the top of the dipstick/filler cap opening.

A normal operating pressure is automatically maintained in the landing gear system ; this pressure is sufficient to provide a positive up pressure on the landing gear.

A hinge strut provides the mechanical downlock of the nose and main gears. Mechanically-actuated wheel well doors connected to landing gear are provided for the nose and main gears.

Hydraulic generator operator is started and stopped by a pressure switch when landing gear control is on "up" position

Post-MOD. 151

The footsteps extension/retraction is combined with that of main landing gears.

LANDING GEAR CONTROL

The landing gear lever is located on the R.H. side of the L.H. panel strip. The lever has two positions, up and down, which give a mechanical indication of the gear position selected. From either position, the lever must be pulled out to clear a detent before it can be repositioned ; operation of the landing gear system will not begin until the lever has been repositioned. After the lever has been repositioned, it directs hydraulic pressure within the system to actuate the gear to the selected position.

LANDING GEAR POSITION INDICATOR LIGHTS

Position indicator lights located adjacent to the landing gear lever indicate the gear is either down and locked or unlocked.

Separate green gear "down" indicator lights are provided for each gear and a red single gear unlocked light illuminates anytime one gear at least is not locked down or fully up.

The landing gear system is also equipped with gear safety (scuat) microswitches, an emergency extension control and a gear-up warning system

The gear unlocked red light and the green gear down lights (one for each gear) are tested using a push-knob labeled "TEST" on the annunciator panel. The green lights are dimmed with the toggle switch labeled "D/N" located on the annunciator panel.

LANDING GEAR OPERATION

To retract or extend the landing gear, pull out on the gear lever and move it to the desired position. During a normal cycle, the gear retracts fully or extends and locks, limit microswitches close and green indicator lights illuminate (down cycle only), indicating completion of the cycle.

While the gear is in transit, or whenever any gear is not fully retracted or locked down, the red gear unlocked light will illuminate.

The hydraulic generator will continue to run :

- during landing gear extension, until the green indicator lights illuminate and the red indicator light goes out ;
- during landing gear retraction, until the green and red indicator lights go out.

If pressure in the system drops, the pressure switch starts operation of the hydraulic generator which increases pressure.

During cruising flight with the landing gear retracted, automatic cycling on the hydraulic generator motor to restore system pressure bleed down may normally occur a few times per hour. Frequent cycling is an indication of an abnormal pressure loss and the cause of such condition should be investigated.

The safety (squat) microswitches, actuated by the main gears, electrically prevent inadvertant retraction whenever the gear shock-absorber is compressed by the weight of the airplane. A pull-off type circuit breaker is also provided in the system as a maintenance safety feature. With the circuit breaker pulled out, landing gear operation by the gear generator is prevented. After maintenance is completed, and prior to flight, the circuit breaker should be pushed back in.

EMERGENCY LANDING GEAR EXTENSION

In the event the landing gear fails to extend normally, slowing the airplane below 97 kt (180 km/h) and placing the landing gear lever in the down position should allow the landing gear to "free fall" to the down and locked position, as evidenced by the green gear down lights illuminating. Following this procedure, should the gear lights indicate that the gear is still not down and locked, utilize the emergency landing gear control under the L.H. panel strip to extend the gear.

For this, push on central knob before pulling the lever rearward. For complete procedures, refer to Section 3 "Emergency procedures"

The emergency landing gear control cannot be used to retract the gear, however, it is necessary to push back this control to retract the landing gear in a normal way.

LANDING GEAR WARNING SYSTEM

The airplane is equipped with a landing gear warning system designed to help prevent the pilot from inadvertently making a wheels-up landing. The system consists of a throttle-actuated microswitch which is electrically connected to an aural warning unit.

In gear up configuration, when throttle is retarded at approximately ½ inch (12 mm) of the aft stop (battery switch-breaker ON), the throttle linkage will actuate on a microswitch which is electrically connected to the gear aural warning unit.

If the landing gear is retracted (or not down and locked), a continuous tone will be heard on the alarm loud-speaker. In addition, a microswitch connected to the wing flap system also sounds a tone when the flaps are extended beyond 10° with the landing gear retracted.

A "LDG PUMP" amber indicator light (if installed) located at advisory panel L.H. side, illuminates to indicate operation of the hydraulic generator

BAGGAGE COMPARTMENT

The baggage compartment extends from the rear bench or, Post-MOD.151, rear seats to the rear bulkhead of the cabin (former No. 6). The access is possible either through a lockable door located on the left side of the airplane, or from the inside of the cabin.

Prior to any flight, check that this door is locked.

To open the access door, proceed as follows :

POUSSER POUR TOURNER
PUSH TO TURN - DRÜCKEN UM ZU DREHEN

Figure 7.8

WARNING

ANY PARCEL OR BAGGAGE MUST BE FIXED WITH STRAPS. IT IS FORBIDDEN TO TRANSPORT PEOPLE IN THE BAGGAGE COMPARTMENT.

ANY MATERIAL THAT MIGHT BE DANGEROUS FOR THE AIRPLANE OR THE OCCUPANTS SHOULD NOT BE PLACED IN THE AIRPLANE

CARGO CONFIGURATION

The rear bench or, Post-MOD.151, rear seats may be taken off for easy loading in cargo configuration. For further information, refer to Section 6 "Weight and balance".

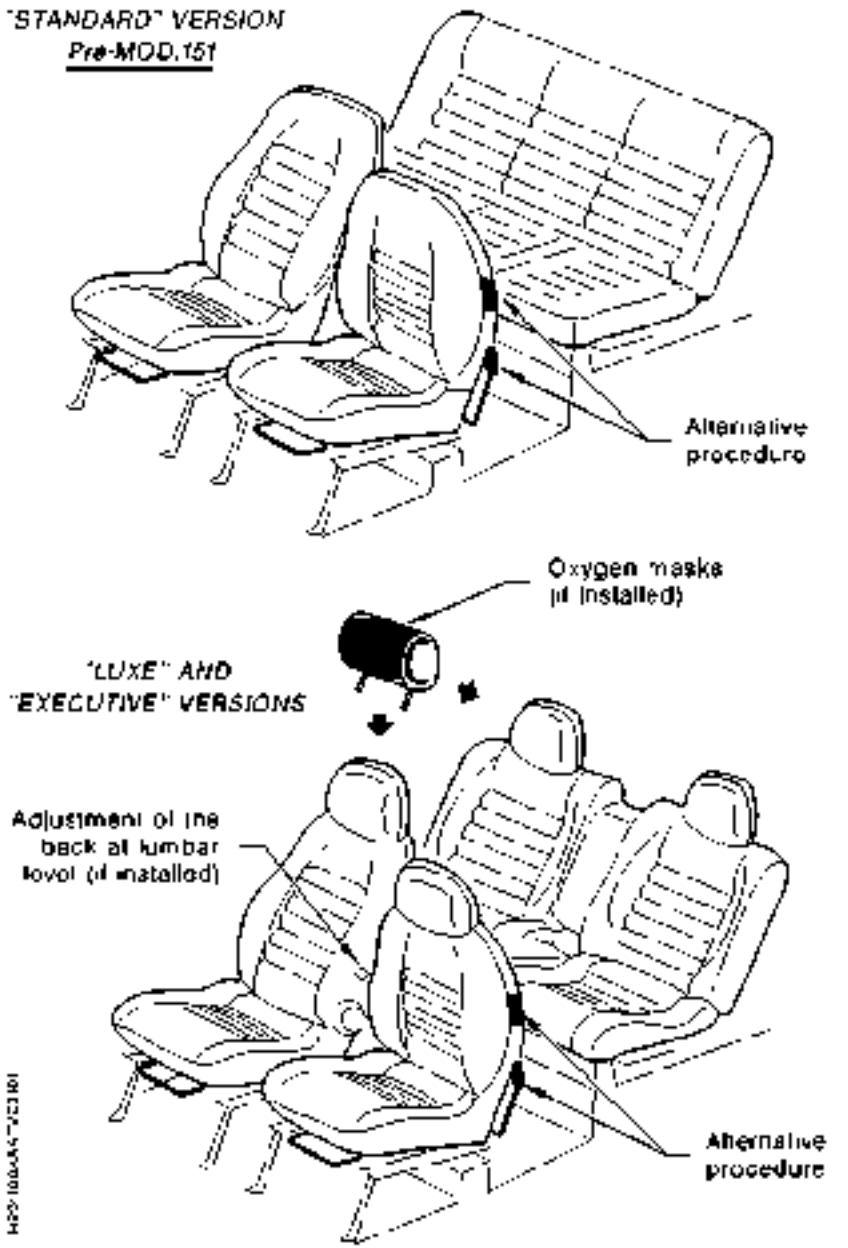

Figure 7.9 - FRONT SEATS AND REAR SEAT

SEATS, SEAT BELTS AND SHOULDER HARNESSES

FRONT SEATS

The various possibilities of seats adjustment depend on the version chosen.

- To move the seat forward and rearward (*) :
  Use the adjustment bar located on the front part of the seat, under the seating and grasp handle under instrument panel strip.
- To tilt the seat (*) .
  Use the lever located on the outboard side of the seat.
- To change the seat back angle (if installed) :
  Use the knurled knob located at the bottom part on the inboard side of the seat back.

  To adjust the back, at lumbar level (if installed)
  Use the knob located over the knurled knob on the inboard side of the seat back
  Press on the knob and moderately lean back to the desired position, release the button. The seat back should fit perfectly with your back.

  (*) Lift up adjustment bar or lever to unlock ; when in desired position, release it and make sure it is locked.

REAR BENCH OR, Post-MOD.151, REAR SEATS

- To remove rear bench or rear seats, refer to Section 6 "Weight and Balance"
  Rear bench or rear seats is/are not adjustable

HEAD-RESTS (if installed)

- Before Model "95"

  To adjust and remove the head-rest :
  Simply make it slide vertically.

  - To fit the head-rest into the seat back :
    Turn the centering bush (bearing an arrow) of ¼ turn clockwise (in the arrow direction) and maintain it to fit the head-rest in the seat back.
  - If oxygen equipment is installed, the masks are stored inside the head-rests.

- Model "95" .

  - To install, adjust and remove the head-rest, simply make it slide vertically.

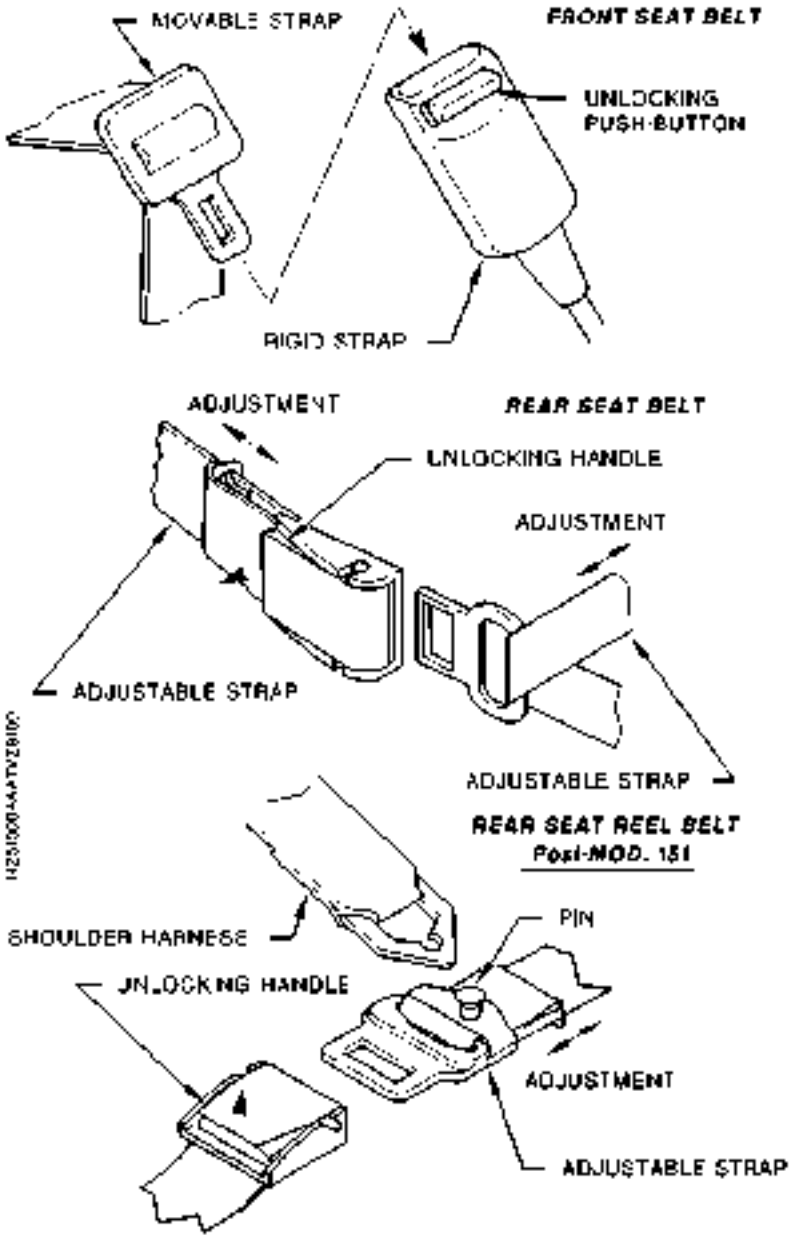

Figure 7.10 - SEAT BELTS

SEAT BELTS (see Figure 7 10)

RECOMMENDATIONS

Misuse of the safety belt may introduce a risk.
Be sure the belt is tightened when it is fastened.
To be effective, the seat belt shall not be twisted.
In any case and for all types of belts, check that they are not impeded in their operation.
Further to a severe accident, replace the belts which were installed when the accident happened

Front seat belts

- To lock them :
  Engage movable strap into rigid strap up to clipping.
  Should a blocking occur during operation, slightly ease back (5 in (10 cm) approximately), then unwind strap again.
- To unlock them :
  Depress red unlocking push-button to free movable strap.

Rear seat belts

- To lock them :
  Engage both straps up to clipping.
  Be sure the belt is properly tightened (adjustement is possible on both straps).
- To unlock them :
  Pull on unlocking handle to release straps.

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Rear seat reel belts

- To lock them :
  Engage reel shoulder harness rigid part on adjustable strap pin. Then engage straps so attached in the locking handle up to clipping.
  Be sure the belt is properly tightened
- To unlock them :
  Pull on unlocking handle to release straps.
  Disengage shoulder harness rigid part from the pin.

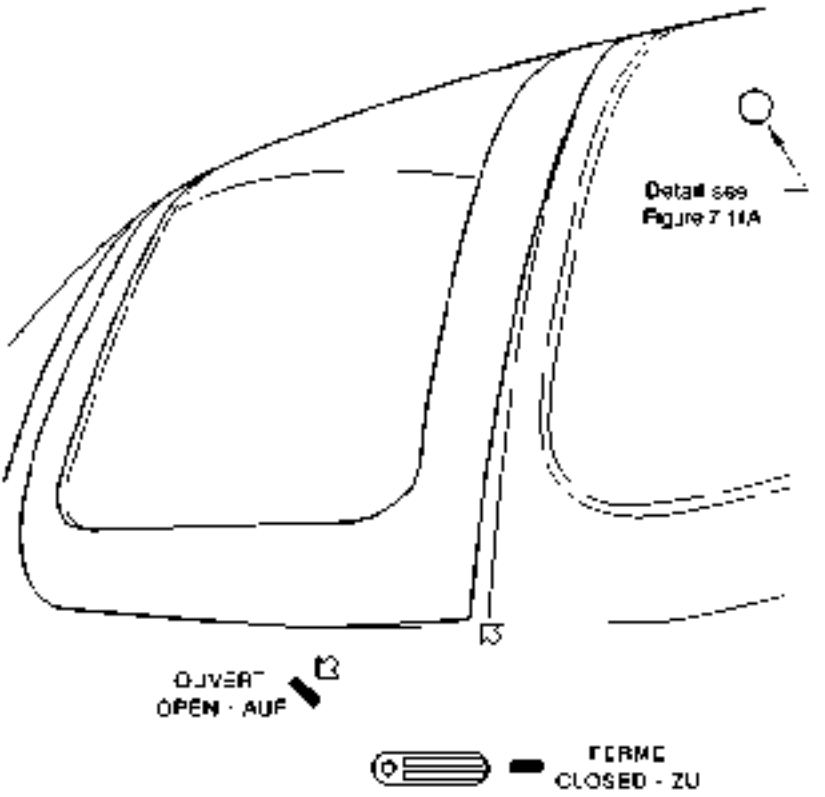

Figure 7.11 - DOORS OPENING AND CLOSING

Figure 7.11A - EMERGENCY EXIT - Pre-MOD.151

DOORS AND EXITS (see Figure 7.11)

DOORS

- To open them :
  Push handle forward.
  Lift the door at the location marked with a shaded arrow.
  Follow door up to maximum position.

- To close them :
  Close the door and set handle to "Closed" position.

WARNING

PRIOR TO EACH FLIGHT, CHECK THAT BOTH CABIN ACCESS DOORS ARE NOT KEY-LOCKED

CHECK THAT BOTH LOCKING HOOKS ARE PROPERLY NOTCHED

EXITS

Pre-MOD.151

In case of L.H. and R.H. doors locking, and if it is necessary to leave the airplane in a hurry (risks of fire, drowning...) jettisson one or both rear windows, kicking out at the location of the placard.

The placard (see Figure 7.11A) is located on both rear windows and is legible from the inside of the airplane.

CONTROLS LOCK

A locking pin located in lateral case on pilot's side is provided to block the control wheel.

To insert the blocking pin into the control wheel tube pull the control wheel backwards to approximately half-way and line up the tube hole with that of the fixed part on the panel. The blocking pin will be inserted vertically from top to bottom.

A safety device preventing the introduction of the magneto/start selector key forbids operation of the engine with blocked control wheel.

Pull the blocking pin upwards to free the control wheel and the magneto/start selector.

ENGINE

The TB 20 airplane is powered by a six-cylinder, horizontally opposed, direct drive LYCOMING IO-540-C4-D5D (or IO-540-C4-B5D, if the starting vibrator, optional equipment A86500M is installed) engine rated at 250 BHP at 2575 RPM. It is provided with a starter, a 24-volt / 70-amp alternator, an all-weather shielded ignition harness, a dual magneto, a vacuum pump drive, a fuel pump and a manifold air filter.

The engine cowl is a laminate cantilever structure, fixed on the firewall and made of two elements. The upper cowl is fitted with an inspection door provided to check oil level ; it can also be fitted with an access door to the propeller deicing fluid tank. The lower cowl is fitted with incorporated air intakes and may be fitted with an inspection door to easy quick drain. Both cowls are completely removable without requiring removal of the propeller.

The engine mount is made of steel tube, rigidly attached on firewall. Engine attachment is provided by dynafocal mounting brackets to attenuate vibrations.

Engine and accessories cooling is provided by a downwards airflow. Air penetrates through holes located on each side of the propeller cone, is guided around the engine by airproof deflectors, then conducted to two air outlets located on the lower cowl.

Engine inlet air penetrates through an air intake located at the front of the lower cowl and goes directly through a filter, before being admitted in the air duct under the injection unit.

The air duct can also be air-feeded by an alternative air supply source "Alternate air" which is mechanically actuated by pushing the control lever located on the R.H. side under the L.H. instrument panel. From S/N 948 push central knob before pulling control lever rearward or pushing it back forward. This air source provides the injection unit with heated air if icing conditions are unintentionally encountered.

The stainless steel exhaust system comprises a silencer with a heat exchanger in order to provide cabin hot air supply. Exhaust gases are evacuated through the exhaust duct at the basis of engine lower cowl, on R.H. side.

In order to obtain the maximum engine performance and T.B.O. the pilot should apply the procedures recommended by Lycoming Operator's Manual concerning the engine.

ENGINE CONTROLS

- Engine manifold pressure is controlled by the throttle (large black knob) located on the control pedestal on the L.H. side. In the forward position, the throttle is open (full power) ; in the aft position, it is closed (engine idling).
  At approximately ½ in. (12 mm) of its rear stop, the throttle actuates an landing gear alarm microswitch.
- The propeller governor is controlled by the propeller control (blue or black notched knob) located at the centre of the central pedestal. In the forward position, the propeller moves to "low pitch" position (high RPM), in the aft position, it moves to "high pitch" position (low RPM).
- The mixture is controlled by the mixture control (red notched knob) located on R.H. side of the central pedestal. In the forward position, the mixture is open (full rich) : in the aft position, the mixture is closed (idle cut-off).
- Engine controls friction is controlled by a knurled knob located in the alignment of the controls on the R.H. side of the pedestal.

ENGINE INSTRUMENTS

Indicators enable the pilot to assure a permanent check of oil pressure, oil temperature, tachometer, manifold pressure, flowmeter and (if installed) EGT and CHT.

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A "TEST" knob, located on the engine monitoring cluster front face, enables to test :

- digital indicators,
- analogue indicators (pointers at 12 o'clock),
- lamps (VDC, AMP and PSI),
- equipment: both power supplies are available. In case of loss of one of the power supplies, the yellow lamp (AMP) flashes during the test.

IGNITION - STARTER SYSTEM

Engine ignition is provided by a dual magneto on two spark plugs per cylinder.

The R.H. part of the magneto fires the R.H. lower and L.H. upper spark plugs; the L.H. part of the magneto fires the L.H. lower and R.H. upper spark plugs.

Ignition is controlled by a key-operated rotating selector, located on L.H. side of the L.H. panel strip.

The selector operates clockwise :

If the airplane is not equipped with the starting vibrator

OFF ; L.H. magneto ; R.H. magneto ; L.H. + R.H. magnetos . STARTER by pushing.

- if the airplane is equipped with the starting vibrator (CPT A365) :

OFF ; R.H. magneto : L.H. magneto ; L.H. + R.H. magnetos ; STARTER by pushing.

CAUTION

RELEASE THE PRESSURE ON THE KEY AFTER ENGINE START

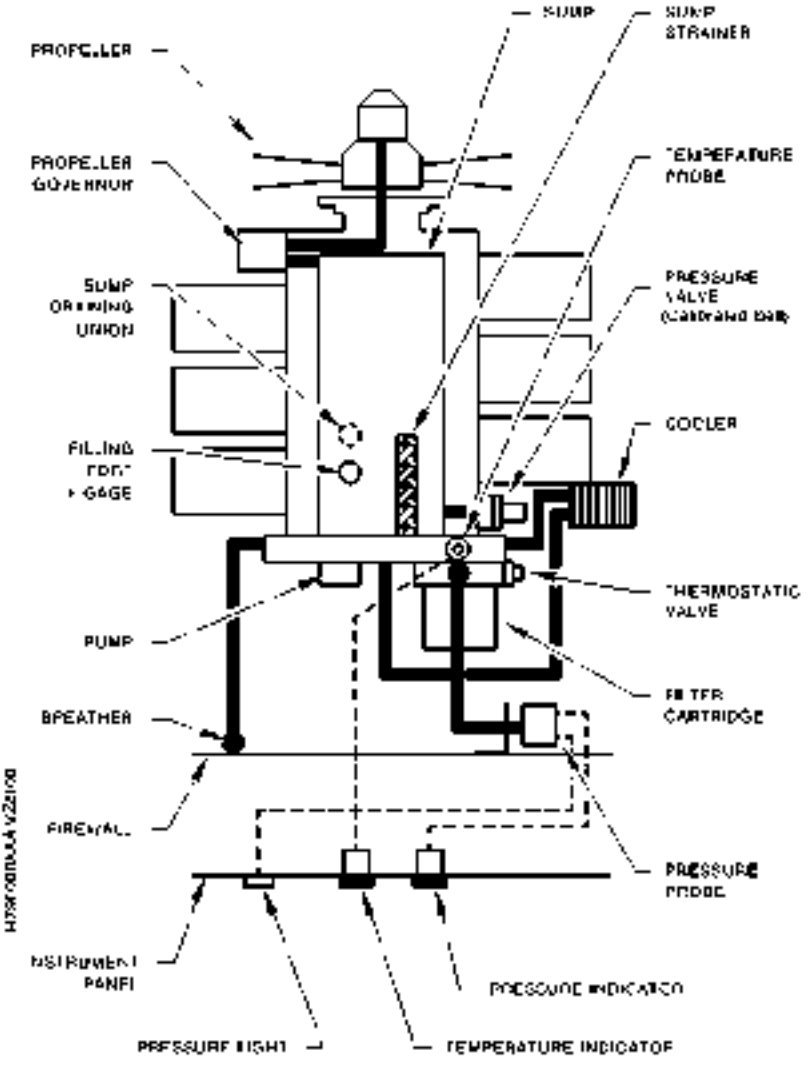


Figure 7.12 - OIL SYSTEM

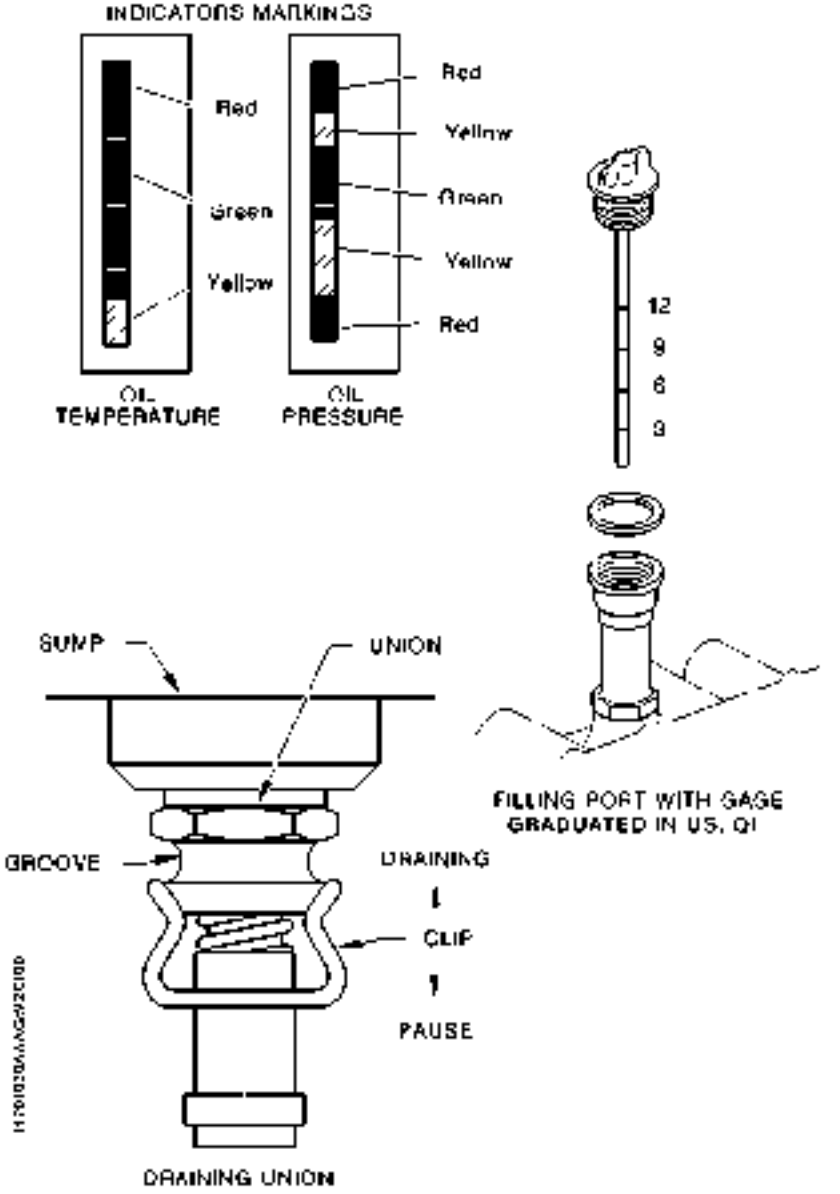
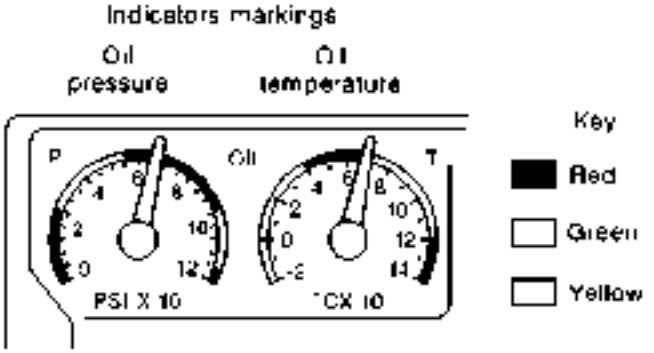


Figure 7.12A - OIL SYSTEM



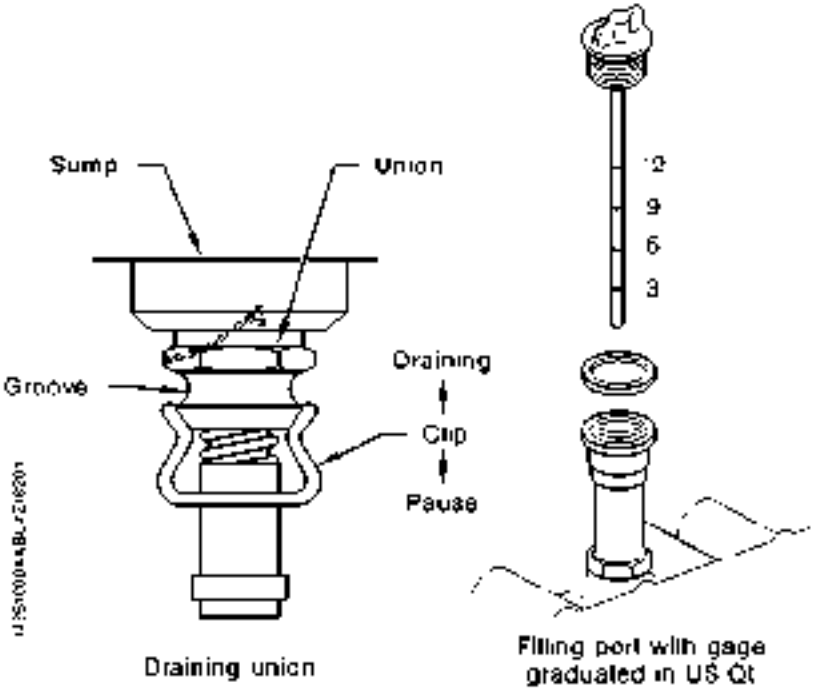


Figure 7.12B - OIL SYSTEM

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NEW ENGINE BREAK-IN AND OPERATION

The engine has undergone a break-in at the factory and is ready for the full range of use. It is, however, recommended that cruising flights be accomplished at 65 to 75 % until a total of 50 hours has accumulated or oil consumption has stabilized.

However for new, remanufactured or recently overhauled engines, as well as engines on which cylinders have been recently installed, it is required to perform according to TEXTRON LYCOMING Service Bulletin No. 480 at last revision the following inspections :

- an inspection within the 10 first flight hours,
- an inspection within the 25 following flight hours.

Use dispersant oil in compliance with Specification MIL-L-22851 only after the first 50 hours.

ENGINE LUBRICATION SYSTEM

The engine is lubricated by an oil system (see Figures 7.12 and 7.12A or 7.12B) powered by a pump located on engine rear accessory housing. A sump located at the bottom of the engine allowing oil recovery, a cartridge throw-away type filter located on engine rear accessory housing and a strainer type filter located in the sump complete the system.
A pressure probe and a temperature probe transmitting the values to two indicators located on upper edge of the console enable the pilot to check the oil system.
An inspection door located on engine upper cowl provides access to oil system filling port.
A dipstick attached on the port blanking cap enables to check oil level in the sump. A union located under the engine case enables a quick drain of the latter.

AIR INDUCTION SYSTEM

The engine is supplied with an air intake located under the propeller cone. This air intake is fitted with a filter which removes dust and other foreign matters from the induction air so that they do not penetrate into the air duct. However, in the event the air filter becomes blocked, pull on "Alternate Air" control to open an alternate air door allowing air to enter the engine.
For flights in sandy or dusty atmosphere, install a second specific filter.

EXHAUST SYSTEM

Exhaust gas from each cylinder is collected by pipes to be conducted, in order to reduce its noise level to an exhaust duct which vents it outboard on R.H. side of lower engine cowl.

PROPELLER

The airplane is fitted with all-metal, two-bladed, constant-speed, governor-regulated propeller. The propeller control actuates on the governor. According to the control position, the governor determines propeller rotation speed, and thus the engine speed to be maintained. The governor controls flow of engine oil, boosted to high pressure by the governing pump, on a piston located in propeller hub. Oil pressure twists the blades toward high pitch (low RPM). When oil pressure to the piston is relieved, the blades twist to low pitch (high RPM).

FUEL SYSTEM

The fuel system (see Figures 7.13 and 7.14, 7.14A or 7.14B, 7.14C) consists of two vented integral fuel tanks (one in each wing), a selector valve, a filter, an auxiliary fuel pump as well as an engine-driven fuel pump, a fuel distributor and six fuel-injection nozzles.

Engine driven fuel pump suction draws fuel from L.H. or R.H. tank through the three-position selector valve and a filter.
The selector valve is controlled through a knob labelled "FUEL SELECTOR". The selector valve knob has following positions labelled : "CLOSED", "LEFT", "RIGHT".

Then, the fuel goes through the auxiliary fuel pump (electric) and supplies the engine fuel pump. The engine pump supplies fuel under pressure to injection unit. The fuel is then conducted to the divider, to the injectors in the cylinders.

A dual indicator gives the manifold pressure as well as the fuel flow and pressure (the fuel pressure is a nozzle pressure picked up on the flow divider).

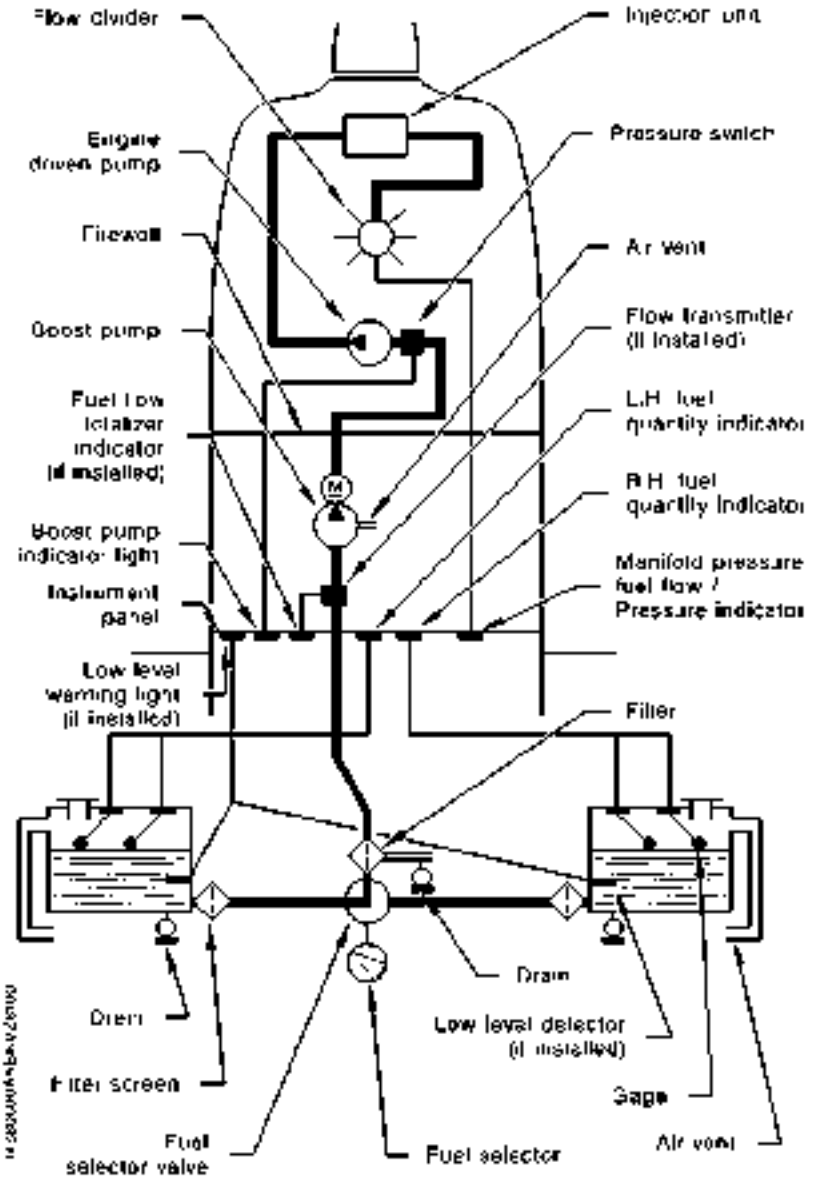

Figure 7.13 - FUEL SYSTEM

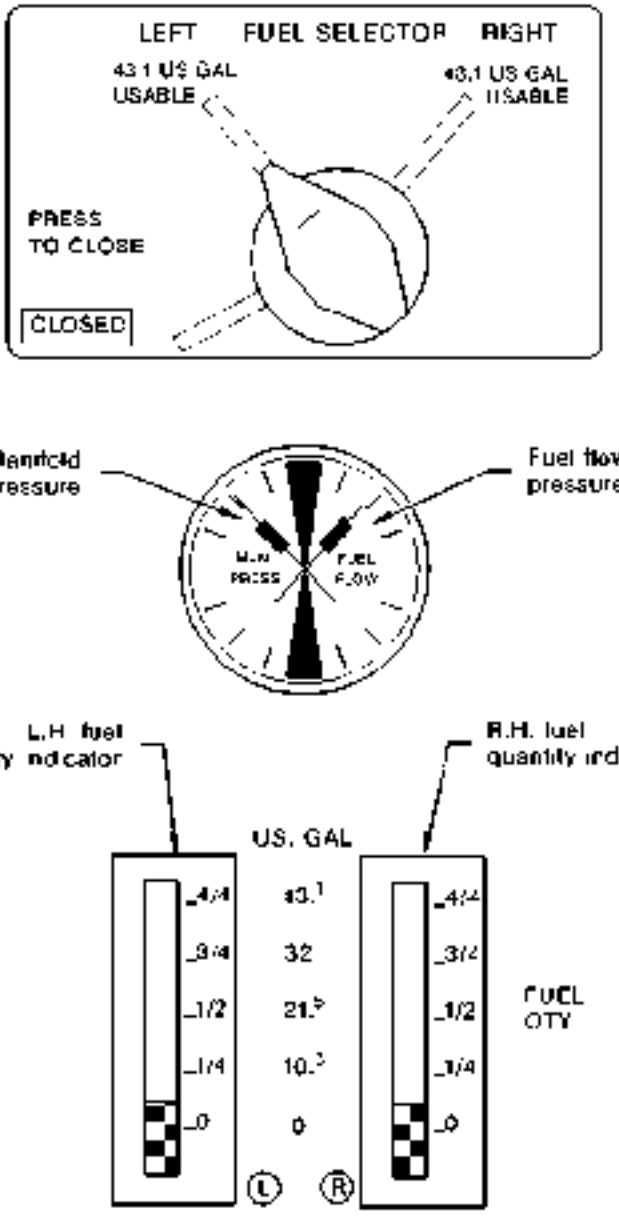

Figure 7.14 - FUEL SYSTEM MARKINGS (U.S. Gallons)

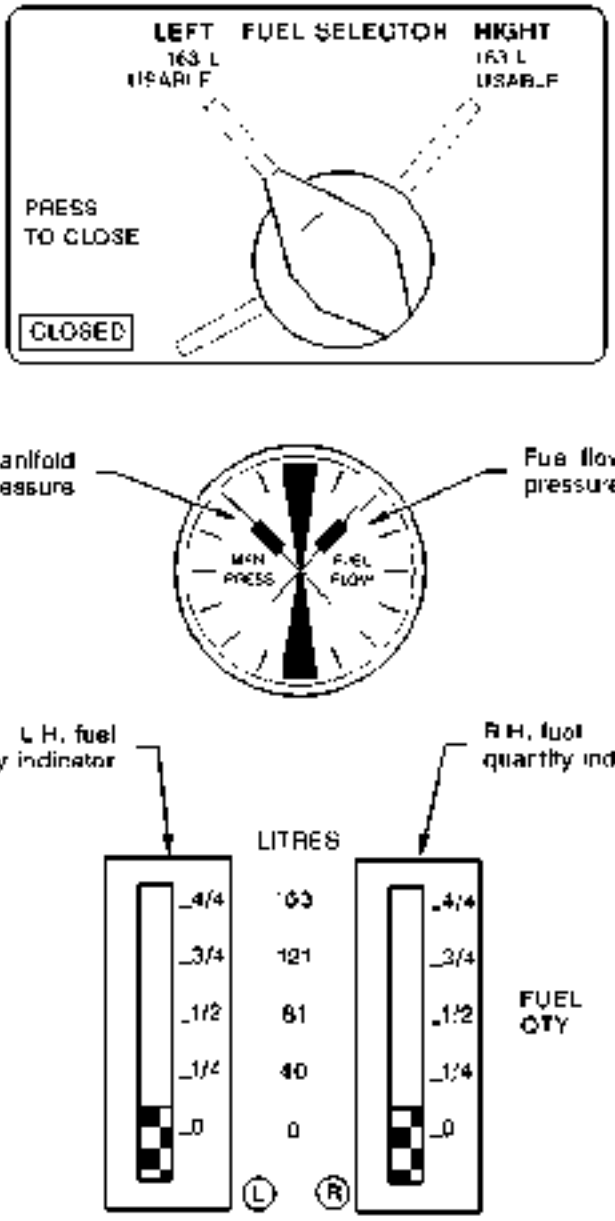

Figure 7.14A – FUEL SYSTEM MARKINGS (Litres)

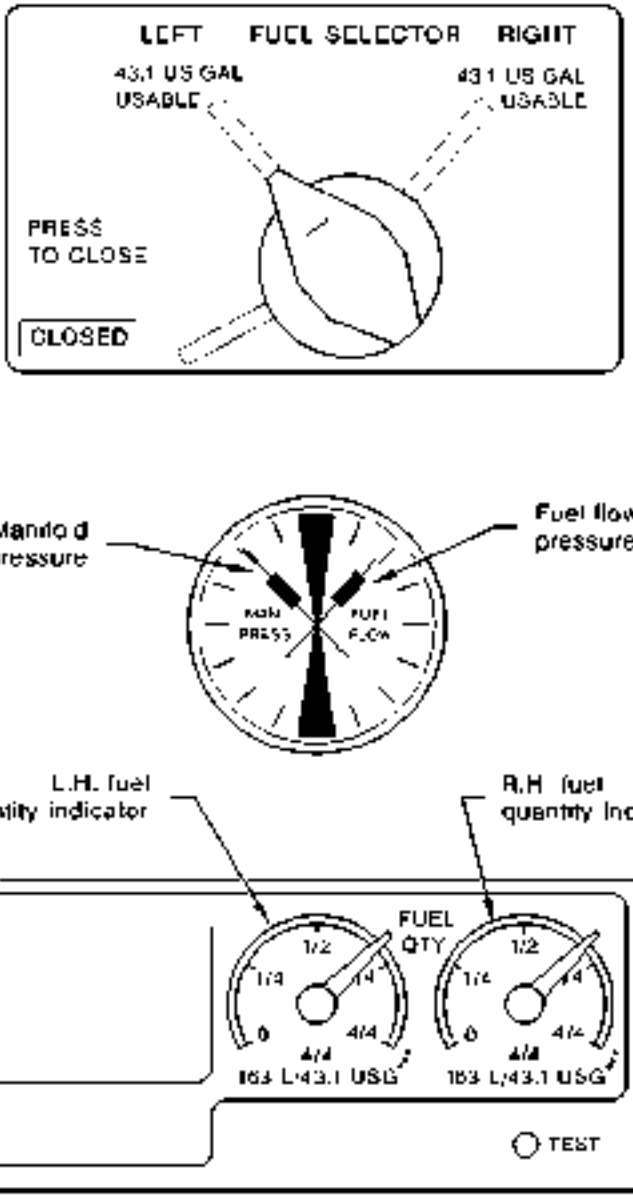

Figure 7.14B - FUEL SYSTEM MARKINGS (U.S. Gallons)

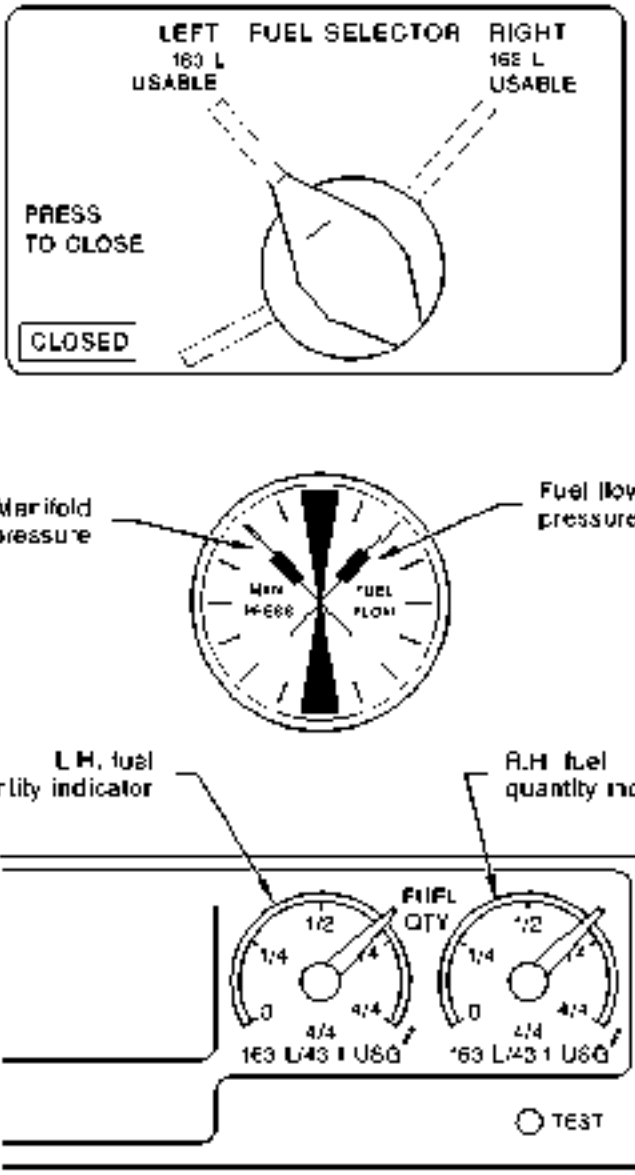

Figure 7.14C - FUEL SYSTEM MARKINGS (Litres)

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Fuel quantities :

- Total maximum : 89.8 U.S Gal (336 l)
- Total usable : 86.2 U.S Gal (326 l)
- Unusable : 2.6 U.S Gal (10 l)

In cruise flight, a continuation of fuel flow must be assured as the new tank is being selected. When switching from one tank to the other, proceed the auxiliary fuel pump switch momentarily in the "ON" position until normal fuel flow has been restored.

Each fuel tank is equipped with its own ventilation system, an essential element in the operation of the fuel system. Should a vent become blocked, the fuel flow from the tank concerned is reduced and the engine may cut out. The ventilation is ensured by ducts which run to the lower surface of each wing.

Fuel quantity is measured by four fuel quantity gages and is shown by two fuel quantity indicators located on the upper portion of the central console.

Airplanes equipped with resistor/float gages

The float type gages, two on each wing, are attached to the rear of the tanks.

Airplanes equipped with capacity gages

The capacity type gages, two on each wing, are attached to the rear of the tanks, on the wing spar.

Fuel quantity measured by the gages is transmitted to the fuel quantity indicators by a gaging conditioner located under the seating of the rear bench or, Post-MOD.151, the rear seats.

All

The indicators are graduated in 1/4, 1/2, 3/4 and 4/4, with the zero indicating an empty tank. When the pointer of the indicator is at zero, approximately 1.3 U.S. Gal (5 litres) of unusable fuel remains in the tank. The indicators cannot be relied upon for accurate readings during skids, slips or unusual attitudes. If both indicator pointers should rapidly move to a zero, check voltmeter and oil temperature indicators. If no indication can be read, an electrical malfunction has occurred.

Post option C866 00M or Post-MOD 151

A low level warning light, located on the advisory panel, comes on whenever usable fuel quantity, remaining in one of both tanks, (airplane in line of flight) reaches approximately 6.6 U.S. Gal (25 litres). In this configuration, the warning light illumination is controlled by a low level detector, located in each tank.

Post-MOD-171

A dual low level warning light, located on the L.H. instrument panel, receives information from R.H. and L.H. fuel tanks.
The warning light corresponding to the wing comes on whenever usable fuel quantity (airplane in line of flight) reaches approximately 6.6 U.S. Gal (25 litres). In this configuration, the warning light illumination is controlled by a low level detector, located in each tank.

All

The auxiliary fuel pump is controlled by a switch-breaker located on front part of pedestal.
An indicator light located on the advisory panel shows operation of the auxiliary pump.

The fuel system is equipped with drain valves to provide a means for the examination of the fuel in the system for contamination and grade. The system should be drained every day before the first flight and after each refueling by using the fuel sampler provided to drain fuel from the wing tank sump drain and the fuel strainers drains. The fuel tank sump drains are located just outboard of each main landing gear well and the fuel strainer drain is located under the R.H. front fuselage, near its intersection with R.H. wing.

The fuel tanks should be filled after each flight to minimize condensation, respecting the weight and balance limits.
The tanks are provided with a gage visible from the filling port.
Fuel tanks are full (fuel level not marked on the gage) when fuel is at the level of the filling port.

RETRACTABLE LANDING GEAR HYDRAULIC SYSTEM

The only function of the hydraulic generator located under rear seat is to supply hydraulic power necessary for operation of the retractable landing gear.

BRAKE SYSTEM

BRAKING (see Figure 7.15 or 7.15A)

Braking is provided by disc brakes hydraulically actuated by brake pedals located on the L.H. station rudder pedals.

The R.H. station may also be equipped with brake pedals.

Differential braking helps to maneuver during taxiing :

- L.H. pedal actuates the L.H. wheel brake,
- R.H. pedal actuates the R.H. wheel brake

PARKING BRAKE

- Parking brake is constituted with a knob located on the lower section of the L.H. strip, actuating a valve.
- To apply the parking brake, depress the pedals and turn the parking brake knob rightward.
- To release the parking brake, depress the pedals and set knob again in its vertical position (turn it leftward).
- An indicator light located on the advisory panel shows the position of the parking brake knob.

NOTE:
Operating the brake knob does not cause the parking brake to operate

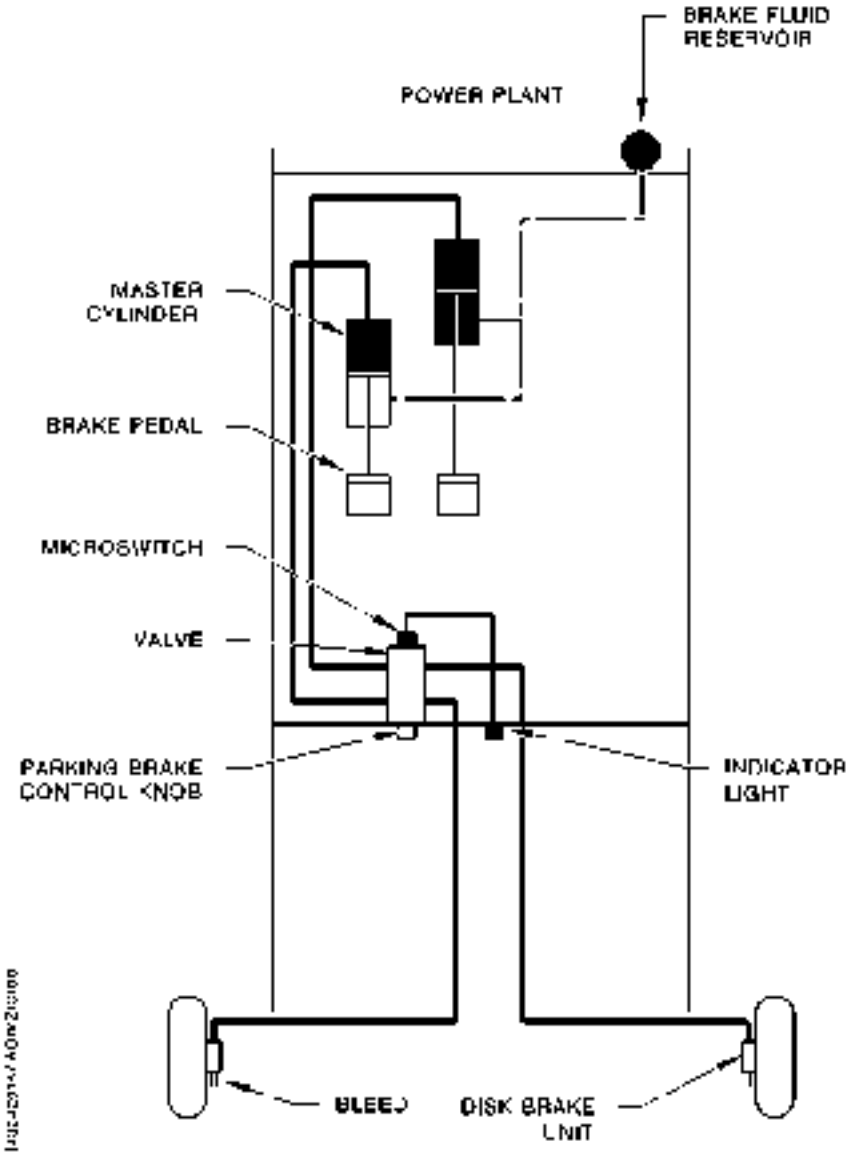

Figure 7.15 - BRAKE SYSTEM (L.H. station only)

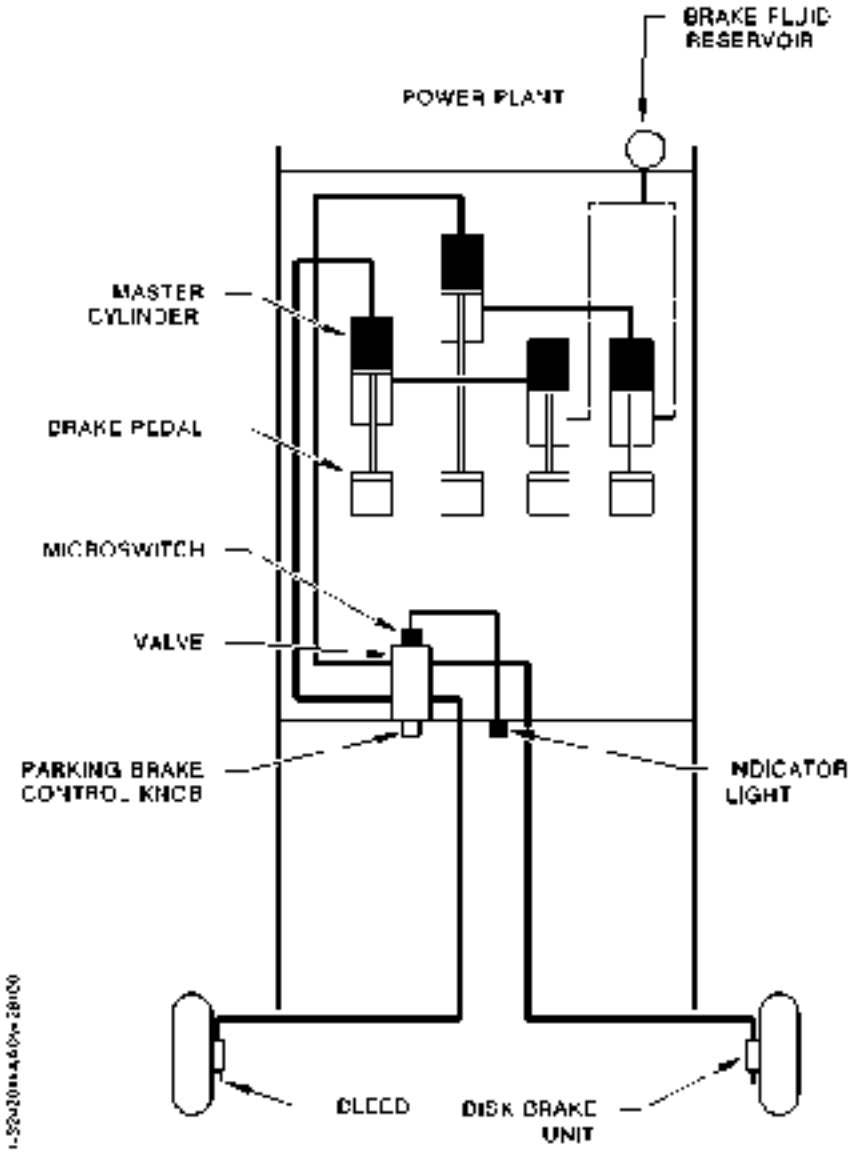

Figure 7.15A – BRAKE SYSTEM (L.H. + R.H. stations) (i' installed)

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STANDARD ELECTRICAL SYSTEM

The airplane is equipped with a 28-volt, direct-current electrical system (see Figures 7.16 and 7.16A). A belt-driven 70-amp alternator installed on the engine and, in standard version, a battery located in a compartment under the baggage compartment floor, supply the system. In optional version, the battery is located in a compartment over the front table, forward the R.H. instrument panel.

The alternator is controlled by an alternator control unit providing voltage regulation, plus overvoltage sensing.

A "pull-off" type circuit breaker calibrated at 60 amps limits the alternator electrical load to the battery and the networks.

ALTERNATOR CONTROL UNIT

The alternator control unit located on the firewall, on cabin side provides the alternator voltage regulation and overvoltage protection.

In the event of overvoltage, the alternator control unit cuts off the alternator field and the amber (red on UK airplanes) warning light labelled "ALTr" illuminates. In this case only the battery powers the airplane mains.

The reset of the alternator control unit is operated by disconnecting and closing the switch-breaker labelled "ALTr FLD".

MAIN SWITCH

Battery connection to the electrical network is made through the switch-breaker labelled "MAIN SWITCH".

Before connecting ground power receptacle (if installed) on external power unit, check that main switch is OFF.

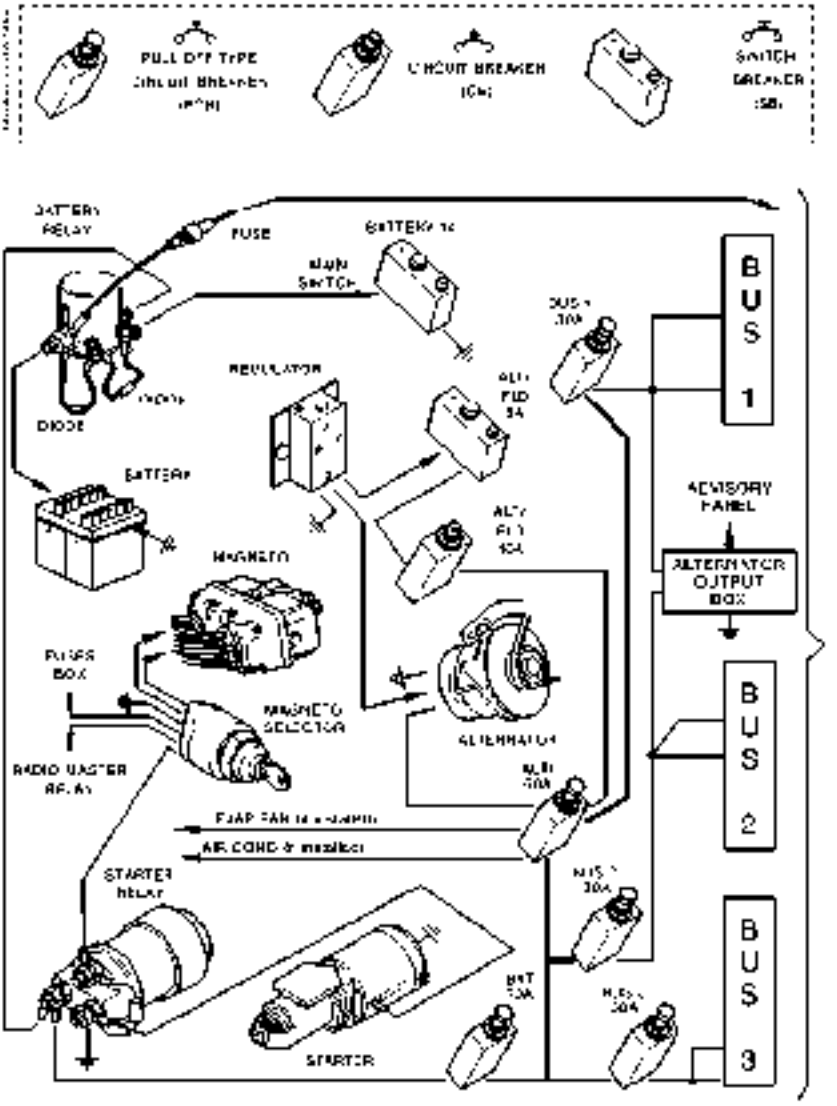

Figure 7.16 - TYPICAL ELECTRICAL SYSTEM

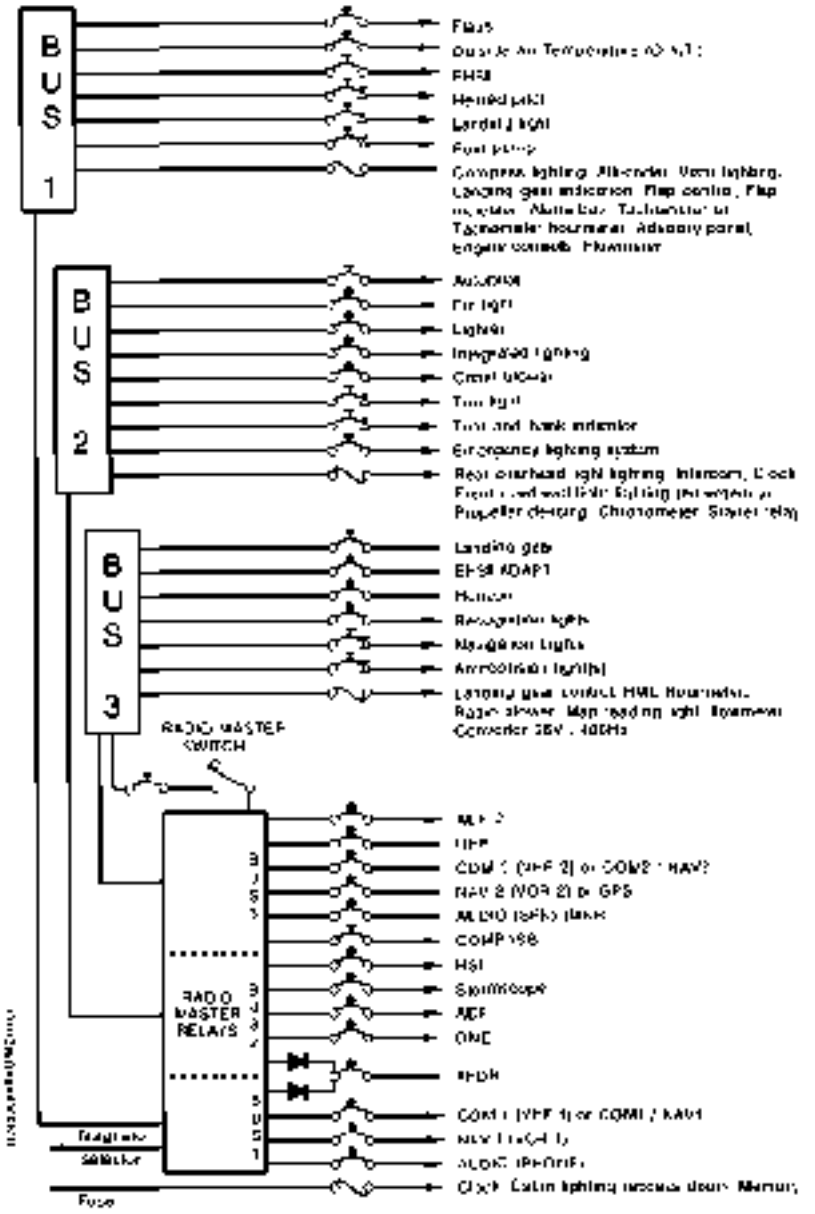

Figure 7 16A - TYPICAL ELECTRICAL SYSTEM

ALTERNATOR CONTROL

Located on the R.H. side of the main switch, the alternator switch-breaker labelled "ALTr FLD" controls the operation of the alternator through the regulator.

In the event of an alternator disconnection, should the flight be continued, only the necessary electrical equipment will be used.

The tripping of "MAIN SWITCH" and "ALTr FLD" switch-breakers in flight cuts off simultaneously all electrical power supplies.

AVIONICS POWER SWITCH (If installed)

A switch labelled "RADIO MASTER" is installed on R.H. side of the L.H. strip or at the top of switch-breakers to control power supply to avionics and enables automatic disconnection of avionics systems when the engine starts, or manual disconnection during abnormal conditions.

When the switch is in OFF position, no electrical power will be applied to the avionics equipment. The avionics power switch "RADIO MASTER" should be placed in the OFF position prior to turning main switch ON or OFF, or applying an external power source and may be utilized in place of the individual avionics equipment switches.

Opening of the "R.M. SWITCH" circuit breaker enables to inhibit the "RADIO MASTER" switch operation, and so to recover the power supply of the radio set in case of faulty operation of the "RADIO MASTER" switch.

"RADIO MASTER" function does not concern some optional equipment such as electric trim, autopilot, HF transceiver...

VOLTMETER

A voltmeter is incorporated to the engine control instruments module, located on the upper part of the console, to monitor electric generation system efficiency.

With the alternator operating, the indication must stabilize in the green sector.

With the alternator off, indication may go down to the yellow sector.

If indication is within lower red sector, remove and charge the battery.

If indication is within the upper red sector with the alternator operating, the regulator has to be adjusted.

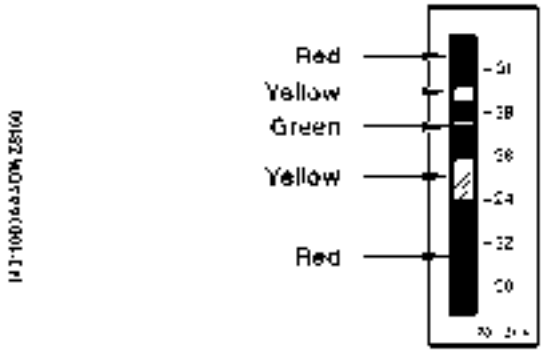

Figure 7.17 - VOLTMETER MARKING

AMMETER (if installed – standard equipment for "BRAZIL")

The ammeter indicates current flow, in amperes, from the alternator to the battery, or from the battery to the electrical systems.

VOLTMETER AND AMMETER

A digital indicator displaying the voltmeter or ammeter data is incorporated to the engine monitoring cluster, located on the upper part of the console. A switch, located on L.H. side of this indicator, enables to select either the voltmeter function (V) or the ammeter function (A).

Voltmeter

The main function of the voltmeter is to monitor electric generation system efficiency.

With the alternator operating, the indicated value must stabilize between 28 and 29 Volts. With the alternator off, the indicated value may decrease below 24 Volts.

Red LED (VDC), located on the indicator R.H. side, illuminates for a voltage greater than 30.4 Volts or lower than 24 Volts :

- Illuminated LED with displayed voltage lower than 24 Volts :
  - engine stopped : voltage lower than 22 Volts, remove and charge the battery.
  - engine running : check alternator regulator system.
- Illuminated LED with displayed voltage greater than 30.4 Volts .
  - check alternator regulator system.

Ammeter

The ammeter indicates current flow in amperes from the alternator to the battery or from the battery to electrical systems.

Yellow LED (AMP), located on indicator R.H side, illuminates when battery is discharging.

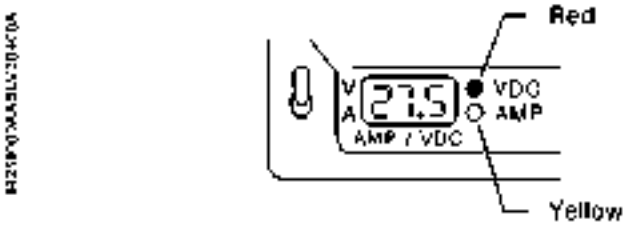

Figure 7.17A – VOLTMETER OR AMMETER MARKING

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CIRCUIT BREAKERS AND FUSES

Most of electrical circuits are protected by circuit breakers installed on the L.H. side panel, adjacent to the pilot. Should an overload occur on a circuit, the circuit breaker opens and will switch off the circuit. Allow it to cool for three minutes approximately, then the circuit breaker may be closed again (pressed down).

Avionics equipment are protected by circuit breakers grouped in the lower part of the L.H. side circuit breakers panel.

In addition to protection of the alternator supply with a 60-amp pull-off type circuit breaker labelled "ALTr", the following pull-off type circuit breakers have been installed :

- 70 A labelled "BAT" between battery and network
- 30 A labelled "BUS 1" on bus bar 1 supply
- 30 A labelled "BUS 2" on bus bar 2 supply
- 30 A labelled "BUS 3" on bus bar 3 supply

These five pull off type circuit breakers are manually operated and can isolate the various sources or bus bars.

Fuses located on L.H. firewall door protect following circuits (from left to right) :

Upper row :	advisory panel, landing gears warning lights, advisory panel, compass lighting, rear cabin light, starter relay, electric tachometer, emergency lighting.
and if installed :	propeller de-icing, RMI, converter 26 V / 400 Hz, radio fan, spare.
Lower row :	engine monitoring cluster, engine monitoring cluster, landing gears control, flaps indicator, flaps control, alarms box (landing gear - stall), visor lighting.
and if installed :	chronometer, intercom, clock, alti-coder, maps light, spare, hourmeter, fuel flowmeter.

"ALTr" WARNING LIGHT (LOW VOLTAGE)

Anytime electrical system voltage falls below approximately 26 volts, as directly sensed by the distribution systems, an amber (red on UK airplanes) warning light labelled "ALTr" illuminates on advisory panel to warn the pilot.

GROUND POWER RECEPTACLE (if installed)

A ground power receptacle permits the use of an external power source for cold weather starting and during maintenance work on the airplane electrical system. Details of the ground power receptacle are presented in Section 9 "Supplements".

IFR AND NIGHT VFR ELECTRICAL SYSTEMS (if installed)

See Section 9 "Supplements".

LIGHTING SYSTEMS

EXTERIOR LIGHTING

Pre-MOD.151

Basic exterior lighting consists of conventional navigation lights located on the wing tips and tail cone, a landing light and a taxi light mounted on the L.H. wing leading edge.

The airplane may be equipped with an anticollision assembly, including a light on each wing tip and, as a replacement for the navigation light at the tail cone end, if required, with a double-function light (navigation light/strobe light).

Post-MOD.151

Basic exterior lighting consists of :

- a unit located on each wing tip including side and rear navigation lights, as well as an anticollision light,
- a landing light and a taxi light installed in the L.H. wing leading edge.

The airplane may be equipped, on each wing tip, with a recognition light.

All

In addition to the navigation lights, the exterior lighting may include a strobe light installed on the vertical stabilizer and/or under the fuselage.

Lighting controls :

The switch-breakers, located on the central pedestal front part (see Figure 7.5B), control the lighting of the landing and taxi lights, the navigation lights and anticollision lights

NOTE:
The amperage of the wing tip anticollision light switch-breaker is increased when the airplane is equipped with the tail cone strobe light.

A switch, located on the circuit breaker panel (see Figure 7.6), controls the strobe light illumination. This circuit is protected by a circuit breaker located on the left of the switch.

Post-MOD.151

A switch, located on R.H. side of L.H. strip or at the top of switch-breakers, controls illumination of the recognition lights (if installed). These lights are intended to make easier the airplane detection among many airplanes by Air Traffic Control, when in final approach over an airport.

All

Anticollision lights and strobe lights should not be used when flying through clouds or overcast, the flashing light reflected from water droplets or particles in the atmosphere, particularly at night, can produce vertigo and loss of orientation.

INTERIOR LIGHTING

Instrument panel and control panels lighting is provided by integral, flood, post lights and electroluminescent lighting. Three lighting control knobs are grouped together on the L.H. part of the L.H. instrument panel

These three controls vary the intensity of all instrument panel and L.H. sidewall circuit breakers panel lightings, except for the rear overhead light. The following paragraphs describe the function of these controls.

Lighting controls :

They allow the operating from down to up of :

- 'Normal' control which controls and modulates L.H. and R.H. instrument panels visors lighting.
- 'Emergency' control Pre-MOD 151

  which modulates lighting of overhead lights controlled by rotating them.
- 'Emergency' control Post-MOD 151 :

  which controls and modulates lighting of front overhead lights

- "Radio and instruments" control which controls and modulates console visor lighting, instruments and equipment on instrument panel, emergency landing gear control and circuit breakers panel.

NOTE :

- *Both "normal" and "radio and instruments" controls and, Post-MOD.151, the emergency control operate and modulate lighting ; from high position "OFF", turn clockwise for "FULL INTENSITY OPERATION" then still clockwise, modulate towards "MINIMUM INTENSITY", turn back to "OFF" position turning counterclockwise.*

- *"Emergency" control, Pre-MOD.151, modulates lighting , from high position "FULL INTENSITY" turn clockwise to modulate towards "MINIMUM INTENSITY" ; turn back to high position "FULL INTENSITY" turning counterclockwise.*

A courtesy light is installed in the cabin headliner, in front of the air outlets, to facilitate boarding or deplaning the airplane during night operations. The light circuit does not require power to be applied to the main electrical system bus bars for operation (Main switch may remain OFF) .

This light is controlled by a toggle switch integrated to the light. Throwing this overhead light provides its extinguishing, a continuous or an intermittent lighting controlled by the opening of the L.H. front door.

A maps reading light may be installed on the bottom of the control's wheel. This light illuminates the lower portion of the cabin in front of the pilot and is used for reading maps and other flight data during night operation. It is controlled by a switch located on the right horn of the pilot's control wheel.

DEMISTING, AIR REGULATION, VENTILATION, FIRE CUT-OFF

The temperature and air flow to the cabin are regulated by the cabin air regulation system and the air outlets (see Figure 7.18).

DEMISTING

The air intake located on the L.H. side of the propeller cone provides air supply to the exchanger located around the exhaust duct, the heated air supplies a box located on the upper portion of the aft face of the firewall. This box may be shut off by a fire cut-off shutter and allows hot air distribution on both sides of the windshield.

Hot airflow is regulated from the control panel located on R.H. side of instrument panel strip.

AIR REGULATION

Hot air

Comes from the exchanger (located around exhaust duct)

This heated air supplies a cabin air mixer located aft of the firewall (in front of front passenger's feet).

The hot airflow supplying this mixer is regulated by a fire cut off shutter from the control panel located on R.H. portion of the instrument panel strip

Cool air

Comes from R.H. NACA air intake which may be shut off by means of two flaps with simultaneous opening. This cool air supplies cabin air mixer.

NOTE :
Shutting off NACA air intakes reduces appreciably the cabin noise level.

Hot / cool air mixing in cabin air mixer

Hot and cool airflows in cabin air mixer are actuated through a single control. Regulation is obtained by moving the control : rightwards air becomes warmer, leftwards air becomes cooler, fully moved to the left in fire cut-off position for the cabin air mixer.

Distribution of regulated air

The mixed airflow in the cabin air mixer is regulated by a shutter before being distributed in the cabin towards pilot's feet, front and rear passengers' feet and in upper part of rear seat back-rest.

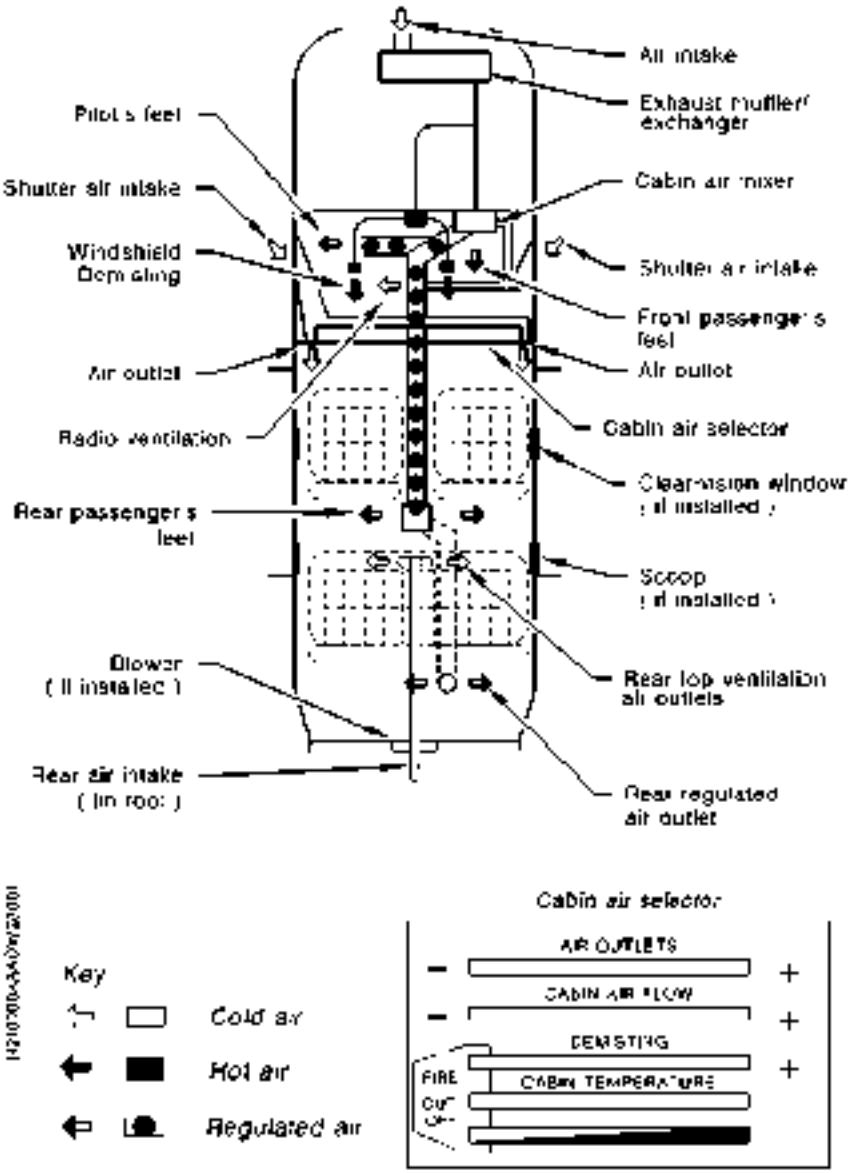


Figure 7-18 - DEMISTING, AIR REGULATION, VENTILATION, CUT-OFF SYSTEM

VENTILATION

Low ventilation

See "Cool air" and "Distribution of regulated air" of the previous "AIR REGULATION" paragraph.

High ventilation

Pilot + front passenger

Air (at outside temperature) coming from NACA L.H. shutter air intake supplies two swivelling air outlets which airflow may be regulated, located on both parts of the instrument panel strip. The upper control of cabin air selector allows adjustment of NACA opening.

NOTE:
To get air from the air outlets, combine their opening with opening of NACA air intake. Shutting off NACA air intakes reduces appreciably the cabin noise level.

A clear-vision window may be installed on the access doors to facilitate high ventilation for pilot and front passenger

- Rear passengers

  Air air intake (at outside temperature), located at the bottom part of the fin, supplies two air outlets (swivelling and with adjustable airflow) installed on the upper duct

  A swivelling scoop may be installed on rear windows to facilitate high ventilation for rear passengers.

A blower (if installed) attached on aft face of the baggage compartment (former 6) and picking up outside air in aft fuselage permits to accelerate the cool airflow at rear seats. The blower switch is located on the upper duct, in front of air outlets (see Figure 7.4).

FIRE CUT-OFF

CAUTION

TO PROVIDE THE CUT-OFF OPERATION, BOTH "DEMISTING" AND "CABIN TEMPERATURE" CONTROLS MUST BE POSITIONED FULLY TO THE LEFT

AIR CONDITIONING (if installed)

See Section 9 'Supplements'.

OXYGEN SYSTEM (if installed)

See Section 9 'Supplements'.

AIRSPEED INDICATING SYSTEM AND INSTRUMENTS

The airspeed indicating system (see Figures 7-19 and 7-19A) supplies pitot air pressure (dynamic system) to the airspeed indicator or to the true airspeed indicator and a static air pressure (static system) to the airspeed indicator or to the true airspeed indicator, the vertical speed indicator and the altimeter.

The system consists of a pitot, which can be heated, located on the lower surface of the L.H. wing, two static ports located on L.H. and R.H. side of aft fuselage, a static system drain located on the wings splicing.

The pitot heating system (if installed) is controlled by a switch-breaker located on the central pedestal.

The alternate static source (if installed) is controlled by a knob located on the L.H. strip, this knob controls a valve which supplies static pressure from inside the cabin.

Refer to Sections 3 "Emergency procedures" and 5 "Performance" of this manual for the pressure variations influence on instruments indication.

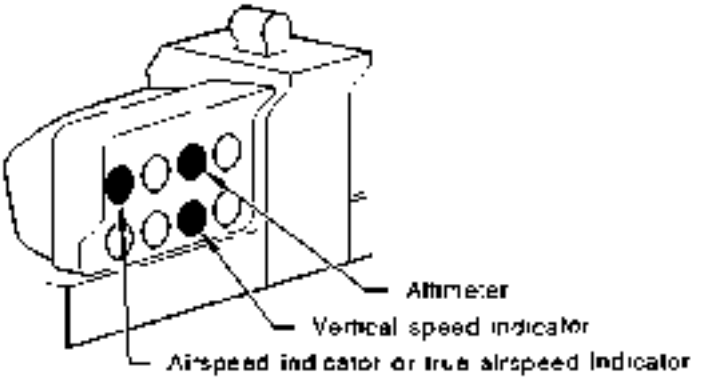
When stopped, protect the static ports and pitot with covers.

TRUE AIRSPEED INDICATOR (if installed)

The true airspeed indicator is fitted with a rotable ring which works in conjunction with its dial in a manner similar to a flight computer.

To set the indicator, first rotate the ring until pressure altitude is aligned with outside air temperature.

To obtain pressure altitude, set the barometric scale of the altimeter to 29.92 In.Hg (1013.2 hPa) and read pressure altitude. Pressure altitude should not be confused with QNH altitude.



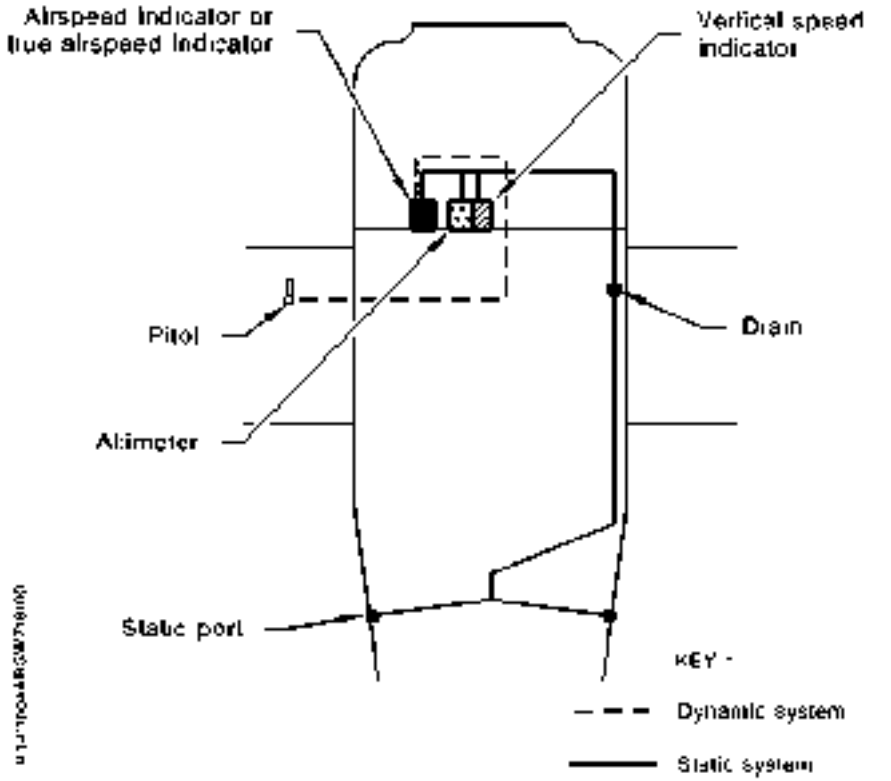
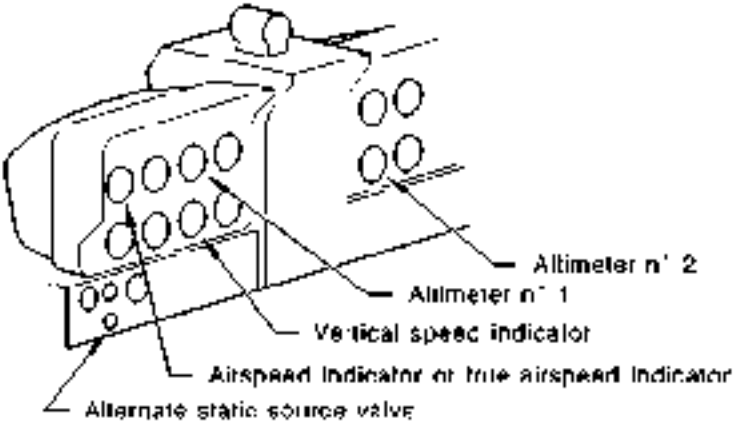


Figure 7.19 - AIRSPEED INDICATING STANDARD SYSTEM



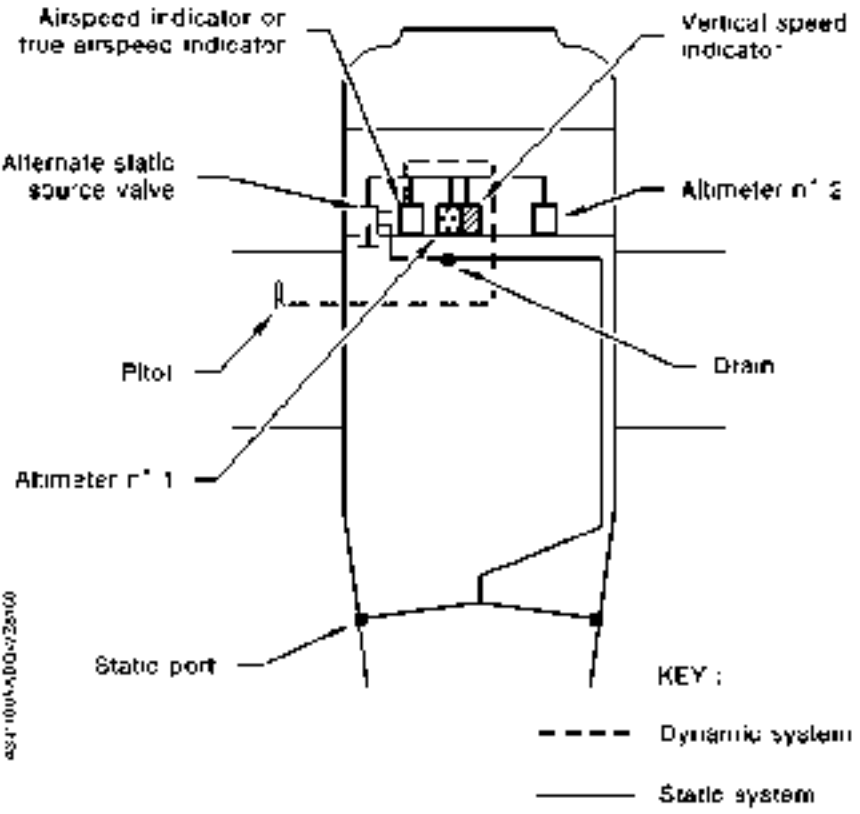


Figure 7.19A - AIRSPEED INDICATING SYSTEM WITH ALTERNATE STATIC SOURCE

Having set the ring to correct for altitude and temperature, read the true airspeed shown on the rotable ring by the indicator pointer.

For best accuracy, the indicated airspeed should be corrected to corrected airspeed by referring to the Airspeed calibration chart in Section 5 "Performance". Knowing the calibrated airspeed, read true airspeed on the ring opposite the calibrated airspeed.

VERTICAL SPEED INDICATOR

The vertical speed indicator depicts airplane rate of climb or descent in feet per minute. The pointer is actuated by atmospheric pressure changes resulting from changes of altitude as supplied by the static source.

ALTIMETER

Airplane altitude is depicted by a barometric type altimeter. A knob near the lower left portion of the indicator provides adjustment of the instrument barometric scale to the current altimeter setting.

ALTERNATE STATIC SOURCE (if installed)

A two position selector allows the normal static source system of the airplane to be isolated in case of clogging or icing of static ports.

The ON position ("PULL") of the alternate static source valve admits cabin static pressure to the static system (see Figure 7.19A).

VACUUM SYSTEM AND INSTRUMENTS

The airplane may be fitted with a vacuum system (see Figures 7.20 and 7.20A) providing the suction necessary to operate an attitude gyro indicator and heading indicator.

The system consists of an engine-driven vacuum system, a vacuum relief valve and an air filter installed between the firewall and instrument panel, vacuum-operated instruments installed on L.H. instrument panel and a vacuum gage installed on L.H. panel strip, near the pilot's control wheel.

The system may be provided with an alarm, red warning light labelled "GYRO SUCT" on the advisory panel, this warning light indicating an insufficient suction illuminates between 3 and 3.5 in.Hg.

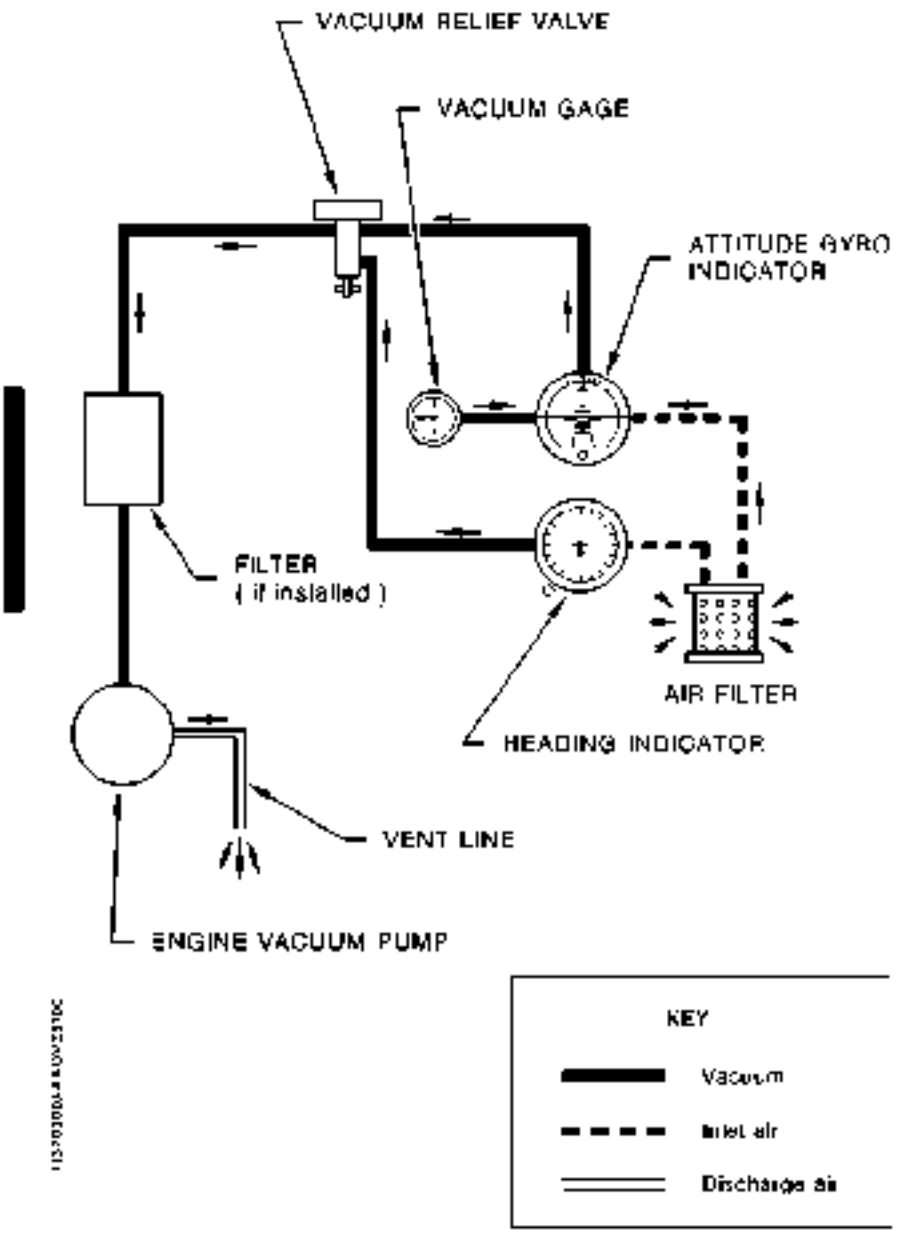


Figure 7.20 - VACUUM SYSTEM (With heading indicator)

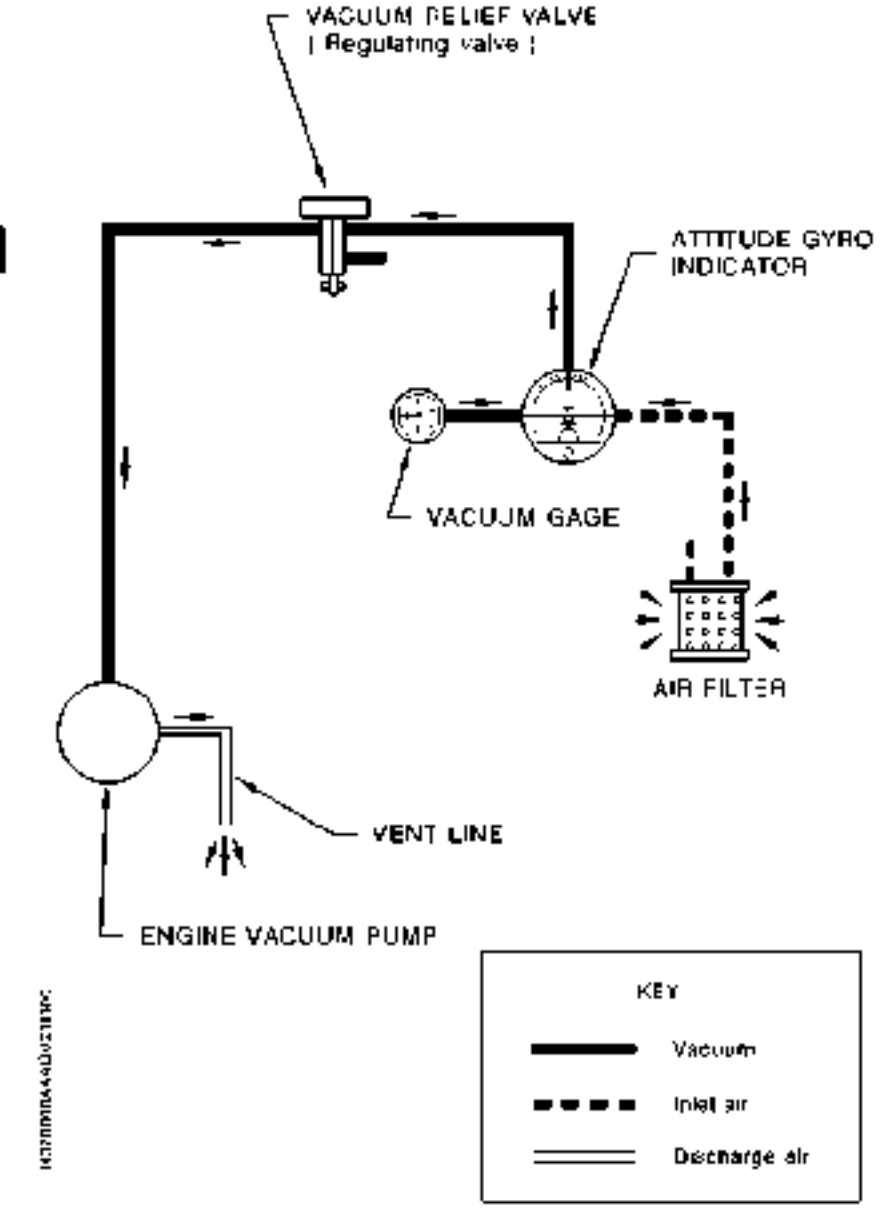


Figure 7.20A – VACUUM SYSTEM (Without heading indicator)

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ATTITUDE GYRO INDICATOR (if installed)

The attitude gyro indicator gives a visual indication of flight attitude. Bank attitude is presented by an index at the top of the indicator relative to the bank scale which has index marks at 10°, 20°, 30°, 60° and 90° either side of the center mark.

Pitch and roll attitudes are presented by a miniature airplane superimposed over a symbolic horizon area divided into two sections by a white horizon bar. The upper "sky blue" area and the lower "ground" area have arbitrary pitch reference lines useful for pitch attitude control.

A knob at the bottom of the instrument is provided for in-flight adjustment of the miniature airplane to the horizon bar for a more accurate flight attitude indication.

HEADING INDICATOR (if installed)

The heading indicator displays airplane heading on a compass card in relation to a fixed simulated airplane image and index. The heading indicator will precess slightly over a period of time. Therefore, the compass card should be set in accordance with the magnetic compass just prior to take-off and regularly re-adjusted on extended flights. A knob on the lower left edge of the instrument is used to adjust the compass card to correct for any precession.

VACUUM GAGE (if installed)

The vacuum gage is calibrated in inches of mercury and indicates the suction available for operation of the attitude and heading indicators. The desired suction range is 4.4 to 5.2 in.Hg.

A suction reading out of this range may indicate a system malfunction or improper adjustment, and in this case, the indicators should not be considered reliable.

AUXILIARY DRY AIR PUMP (if installed)

Refer to Section 9 "Supplements".

AUTOPILOT (If Installed)

Refer to Section 9 "Supplements"

STALL WARNING SYSTEM

The airplane is equipped with a vane-type stall warning unit in the leading edge of the left wing. The unit is electrically connected to an aural warning. The vane in the wing senses the change in airflow over the wing and operates the warning unit, which produces a tone over the alarms speaker. This warning tone begins between 5 and 10 knots above the stall in all configurations.

The stall warning system should be checked during the preflight inspection by momentarily turning on the battery switch and actuating the vane in the wing. The system is operational if a continuous tone is heard on the alarms speaker.

STATIC DISCHARGERS (If Installed)

As an aid in IFR flights, wick-type static dischargers are installed to improve radio communications during flight through dust or various forms of precipitation (rain, snow or ice crystals).

Under these conditions, the build-up and discharge of static electricity from the trailing edges of the wings (flaps and ailerons), rudder, stabilator, propeller tips and radio antennas can result in loss of usable radio signals on all communications and navigation radio equipment. Usually, the ADF is first to be affected and VHF communication equipment is the last to be affected.

Installation of static dischargers reduces interference from precipitation static, but it is possible to encounter severe precipitation static conditions which might cause the loss of radio signals, even with static dischargers installed. Whenever possible, avoid known severe precipitation areas to prevent loss of dependable radio signals. If avoidance is impractical, minimize airspeed and anticipate temporary loss of radio signals while in these areas.

DE-ICING SYSTEM (If Installed)

Refer to Section 9 "Supplements".

RADIO EQUIPMENT

Refer to Section 9 "Supplements".

TURN AND BANK INDICATOR (if installed)

The bank indicator located under the airspeed indicator or the true airspeed indicator may be replaced by a turn and bank indicator ; it is controlled by a switch-breaker located in front of the pedestal and labelled "TURN COORD.".

CLEAR-VISION WINDOW (if installed)

In case a lot of mist appears on the windshield, turn both clear-vision window attachment knobs upwards and tilt window downwards.

NOTE:
Close the clear-vision window and lock it with both knobs prior to opening "gull wing" access door.

SUN VISOR

To remove sun visor, firmly pull downwards the foamed attachment pin.

Up to S / N 1115, the attachment pin is equipped (in its upper part) with an adjusting screw which provides friction on arm swivelling. After adjustment, lock the screw using varnish.

From S / N 1116, an adjusting knurled knob located under the attachment pin stiffens sun visor arm rotation without removing the pin.

To reinstall the sun visor, hit it firmly upwards, at the base of the foamed attachment pin.

FIRE EXTINGUISHER (If Installed)

The fire extinguisher is located under L.H. front seat. It is accessible by moving the seat full backwards. It is attached on the floor by means of a quick-disconnect clamp. A pressure gage allows checking the fire extinguisher condition. Follow the recommendations indicated on the extinguisher.

EMERGENCY LOCATOR TRANSMITTER (If Installed)

The airplane may be equipped with an emergency locator transmitter, which enables to locate it in case of distress. It is located in the baggage compartment.

The emergency locator transmitter assembly is constituted of a transmitter supplied by a battery, of a retractable antenna integrated in the locator transmitter and allowing use of the latter outside the airplane and of a remote control located on the instrument panel.

Operation of the emergency locator transmitter is obtained as follows :

- from the instrument panel by setting "ELT" remote control switch to ON or MAN position (locator transmitter "MANU-OFF-AUTO" or "MAN/RESET-OFF-AUTO" control switch in stand-by on AUTO position),
- from the locator transmitter by setting its "MANU-OFF-AUTO" or "MAN/RESET-OFF-AUTO" control switch to MANU or MAN/RESET position,

  automatically in case of shock, when both switches are set to AUTO.

When locator transmitter "MANU-OFF-AUTO" or "MAN/RESET-OFF-AUTO" switch is set to OFF, transmission is impossible.

"XMIT ALERT" indicator light (if installed) located above "ELT" remote control switch indicates to the pilot the emergency locator transmitter is transmitting.

Reset after an inadvertent activation

ELT 90 (EUROCAE) - ELT 91 (TSO)

1) Set ELT switch to "MAN/RESET" or remote control switch to "MAN".	a) The ELT keeps on transmitting emergency signal. b) On remote control, the "XMIT ALERT" red warning light remains on. c) On ELT, the red warning light remains on.
2) Set again ELT switch or remote control switch to "AUTO".	a) The ELT does not transmit emergency signal any longer. b) On remote control, the "XMIT ALERT" red warning light goes off. c) On ELT, the red warning light goes off.

ELT 96 (EUROCAE) - ELT 97 (TSO)

1) Set ELT switch to "MAN/RESET", then to "AUTO" or press push button "AUTO TEST/RESET" on the remote control.	a) The ELT does not transmit emergency signal any longer. b) On remote control and on ELT switch, the "XMIT ALERT" red warning light illuminates during 2 seconds, then goes off.

JE2, ELT 10 AND POINTER 3000

On ELT, press on button "RESET".

SECTION 8

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

GENERAL

This section contains the procedures recommended by SOCATA for the proper ground handling and routine care and servicing of your SOCATA Model TB 20 airplane. Also included in this section are the inspection and maintenance requirements which must be followed if your airplane is to retain its performance and dependability.

It is recommended that a planned schedule of lubrication and preventive maintenance be followed, and that this schedule be tailored to the climatic or flying conditions to which the airplane is subjected.

For this, see Manufacturer's Maintenance Manual.

IDENTIFICATION PLATE

All correspondence regarding your airplane should include its serial number. This number together with the model number, type certificate number and production certificate number are stamped on the identification plate attached at the rear of the fuselage beneath the horizontal stabilizer.

PUBLICATIONS

When the airplane is delivered from the factory, it is supplied with a Pilot's Operating Handbook and supplemental data covering optional equipment installed in the airplane.

In addition, the owner may purchase the following :

- Maintenance Manual
- Illustrated Parts Catalog

  Price Catalog
- Labor Allowance Guide

CAUTION

PILOT'S OPERATING HANDBOOK MUST ALWAYS BE IN THE AIRPLANE

INSPECTION PERIODS

Refer to regulations in force in the certification country for information concerning preventive maintenance which is to be carried out by pilots.

A maintenance Manual should be obtained prior to performing any preventive maintenance to ensure that proper procedures are followed. Maintenance must be accomplished by licensed personnel

ALTERATIONS OR REPAIRS

It is essential that the Airworthiness authorities be contacted prior to any alterations or repairs on the airplane to ensure that airworthiness of the airplane is not violated. Alterations or repairs must be accomplished by licensed personnel.

GROUND HANDLING

TOWING

CAUTION

USING THE PROPELLER FOR GROUND HANDLING COULD RESULT IN SERIOUS DAMAGE, ESPECIALLY IF PRESSURE OR PULL IS EXERTED ON BLADE TIPS

The airplane should be moved on the ground with the aid of nose gear strut fork tow bar which is stowed in the baggage compartment or with a vehicle which will not damage the nose gear steering device or exert excessive loads on the latter

CAUTION

WHEN TOWING WITH A VEHICLE, DO NOT EXCEED THE NOSE GEAR TURNING ANGLE, OR DAMAGE TO THE GEAR AND STEERING DEVICE WILL RESULT
(see Figure 8.2)

PARKING

When parking the airplane, head into the wind. Do not set the parking brake when brakes are overheated or during cold weather when accumulated moisture may freeze the brakes. Care should be taken when using the parking brake for an extended period of time during which an air temperature rise or drop could cause difficulty in releasing the parking brake or damage the brake system

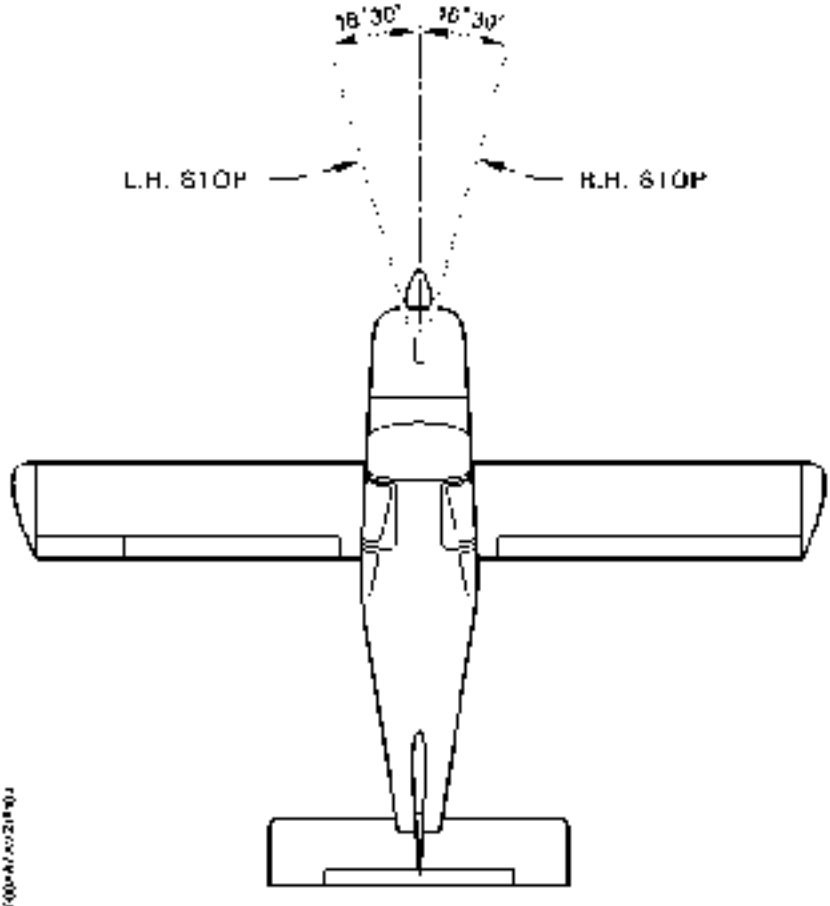

Figure 8.2 - TURNING ANGLE LIMITS

For long term parking, blanking covers (static ports, pitot), cockpit cover, tie–downs, wheel chocks and control wheel lock are recommended. In severe weather and high wind conditions, tie the airplane down as outlined in the following paragraph.

TIE-DOWN

Proper tie–down procedure is the best protection against damage to the parked airplane by gusty or strong winds. To tie-down the airplane securely, proceed as follows :

- Install control wheel lock.
- Chock all wheels.
- Tie sufficiently strong ropes or chains to hold airplane back ; insert a rope in each tie-down hole located on flaps hinge arms and in rear tie-down fitting, located under horizontal stabilizer ; secure each rope to a ramp tie–down.
- Check that doors are closed and locked.

JACKING

When it is necessary to jack the airplane off the ground or when jacking points are used, refer to Maintenance Manual for specific procedures and equipment required.

LEVELING

Level the airplane as described in Maintenance Manual.

FLYABLE STORAGE

Airplanes placed in storage for a maximum of 30 days or those which receive only intermittent use for the first 25 hours are considered in flyable storage.

Every seventh day during these periods, the propeller should be rotated by hand through several revolutions. This action "limbers" the oil and prevents any accumulation of corrosion on engine cylinder walls.

CAUTION

CHECK THAT THE MAGNETO SELECTOR IS OFF, THE THROTTLE IS CLOSED, THE MIXTURE CONTROL IS IN THE IDLE CUT-OFF POSITION, AND THE AIRPLANE IS SECURED BEFORE ROTATING THE PROPELLER BY HAND. DO NOT STAND WITHIN THE ARC OF THE PROPELLER BLADES WHILE TURNING THE PROPELLER

After 30 days in storage, the airplane should be flown for at least 30 minutes, or a ground runup should be made just long enough to produce an oil temperature within the lower green arc range. Avoid prolonged runups.

Engine runup helps to eliminate excessive accumulations of water in the fuel system and other air spaces in the engine. Keep fuel tanks full to minimize condensation in the tanks. Keep the battery fully charged to prevent the electrolyte from freezing in cold weather.

LONG TERM STORAGE WITHOUT FLYING POSSIBILITY

Refer to Maintenance Manual for the procedures to follow.

SERVICING

MAINTENANCE

In addition to the preflight inspection in Section 4, servicing, inspection, and test requirements for your airplane are detailed in the Maintenance Manual.

Maintenance Manual outlines all items which require attention at 50, 100, 400, 500 and 1000 hours intervals plus those items which require servicing, inspection or testing at special intervals, first 25 flight hours, yearly inspection, major inspection.

ENGINE OIL

CAUTION

DO NOT MIX DIFFERENT BRANDS OR TYPES OF OIL

Grade and Viscosity for temperature range (Reference : TEXTRON LYCOMING Service Bulletin No. 480 at last revision) :

Outside Air Temperatures	MIL-L-6082 Spec. Mineral Grades 50 first hours	MIL-L-22851 Spec. Dispersant Grades after 50 hours
All temperatures	.....	SAE 15W50 or SAE 20W50
Above 80°F (27°C)	SAE 60	SAE 60
Above 60°F (15°C)	SAE 50	SAE 40 or SAE 50
30°F (-1°C) to 90°F (32°C)	SAE 40	SAE 40
0°F (-18°C) to 70°F (21°C)	SAE 30	SAE 30, SAE 40 or SAE 20W40
0°F (18°C) to 90°F (32°C)	.....	SAE 20W50 or SAE 15W50
Below 10°F (-12°C)	SAE 20	SAE 30 or SAE 20W30

NOTE.
This airplane was delivered from the factory with a corrosion-preventive aircraft engine oil. If oil must be added during the first 50 hours, use only aviation grade straight mineral oil conforming to specification MIL-L-6082.

Capacity of engine sump : 12 U.S. qt (11.3 litres)

Do not operate on less than 6 U.S. qt (5.7 litres). To minimize loss of oil through breather, fill to 9 U.S. qt (8.5 litres) for normal flights of less than 3 hours. For extended flights, fill to 12 U.S. qt (11.3 litres). These quantities refer to oil dipstick level readings. During oil and filter changes 1.3 additional U.S. qt (1.2 litres) is required for the filter.

Oil and oil filter change :

In addition to the preflight inspection in Section 4, servicing, inspection and test requirements for your airplane are detailed in the Maintenance Manual.

Engine oil is changed with the filter. Drain the engine oil sump and replace the filter at least every 4 months even though less than the recommended hours have accumulated. Reduce intervals for prolonged operation in dusty areas, cold climates, or even when short flights and long idle periods result in sludging conditions.

FUEL

Approved fuel grades (and colors)

100 LL Grade Aviation Fuel (Blue)
100 Grade Aviation Fuel (Formerly 100 / 130) (Green).

CAUTION

NEVER FLY THE AIRPLANE WITH CONTAMINATED (WATER, SAND, RUST, DUST...) OR UNAPPROVED FUEL

NOTE.
Isopropyl alcohol or ethylene glycol monomethyl ether may be added to the fuel supply in quantities not to exceed 1 % or 0.15 % by volume, respectively, of the total. Refer to "Fuel Additives" paragraph hereafter for additional information.

Capacity each tank : 44.4 U.S Gal (168 l)

NOTE.
Service the fuel system after each flight and keep fuel tanks full to minimize condensation in the tanks, respecting weight and balance limits

WARNING

DO NOT OPERATE ANY AVIONICS OR ELECTRICAL EQUIPMENT ON THE AIRPLANE DURING FUELING. DO NOT ALLOW OPEN FLAME OR SMOKING IN THE VICINITY OF THE AIRPLANE WHILE FUELING

DURING ALL FUELING OPERATIONS, FIRE FIGHTING EQUIPMENT MUST BE AVAILABLE ; ATTACH GROUNDING WIRE TO ANGLE (IF INSTALLED) ON UPPER SURFACE OF WING NEAR THE CAP ; IN CASE THERE IS NO ANGLE, ATTACH CABLE TO A METALLIC PART OF THE AIRPLANE WHICH IS NOT PAINTED

Fuel additives

Strict adherence to recommended preflight draining instructions as called for in Section 4 will eliminate any free water accumulations from the tank sumps. While small amounts of water may still remain in solution in the gasoline, it will normally be consumed and go unnoticed in the operation of the engine.

One exception to this can be encountered when operating under the combined effect of use of certain fuels, with high humidity conditions on the ground followed by flight at high altitude and low temperature. Under these unusual conditions, small amounts of water in solution can precipitate from the fuel stream and freeze in sufficient quantities to induce partial icing of the engine fuel system.

While these conditions are quite rare and will not normally pose a problem to owners and operators, they do exist in certain areas of the world and consequently must be dealt with, when encountered.

Therefore, to alleviate the possibility of fuel icing occurring under these unusual conditions, it is permissable to add isopropyl alcohol or ethylene glycol monomethyl ether (EGME) compound to the fuel supply.

The introduction of alcohol or EGME compound into the fuel provides two distinct effects :

- It absorbs the dissolved water from the fuel.

  alcohol has a freezing temperature lowering effect.

Alcohol, if used, is to be mixed with the fuel in a concentration of 1 % by volume. Concentrations greater than 1 % are not recommended since they can be detrimental to fuel tank materials.

The manner in which the alcohol is added to the fuel is significant because alcohol is most effective when it is completely dissolved in the fuel.

To ensure proper mixing, the following is recommended :

- For best results, the alcohol should be added during the fueling operation by pouring the alcohol directly on the fuel stream issuing from the fueling nozzle.
- An alternate method that may be used is to premix the complete alcohol dosage with some fuel in a separate clean container (approximately 2 to 3 U.S. Gal - 7 to 11 litres) and then transferring this mixture to the tank prior to the fueling operation.

Any high quality isopropyl alcohol may be used, such as anti-icing fluid or isopropyl alcohol (Federal Specification TT-I-735a). Figure 8.3 provides alcohol - fuel mixing ratio information.

Ethylene glycol monomethyl ether (EGME) compounds, in compliance with MIL-I-27686, if used, must be carefully mixed with the fuel in concentration not to exceed 0.15 % by volume. Figure 8.3 provides EGME - fuel mixing ratio information.

CAUTION

MIXING OF THE EGME COMPOUND WITH THE FUEL IS EXTREMELY IMPORTANT. A CONCENTRATION IN EXCESS OF THAT RECOMMENDED (0.15 % BY VOLUME MAXIMUM) WILL RESULT IN DETRIMENTAL EFFECTS TO THE FUEL TANKS (DETERIORATION OF PROTECTIVE PRIMER AND SEALANTS) TO FUEL SYSTEM AND ENGINE COMPONENTS (DAMAGE TO SEALS). USE ONLY BLENDING EQUIPMENT RECOMMENDED BY THE MANUFACTURER TO OBTAIN PROPER PROPORTIONING

DO NOT ALLOW CONCENTRATED EGME COMPOUND TO COME IN CONTACT WITH THE AIRPLANE FINISH AS DAMAGE CAN RESULT

Prolonged storage of the airplane will result in a water build up in the fuel which "leeches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration can be checked using a differential refractometer. It is imperative that the technical manual for the differential refractometer be followed explicitely when checking the additive concentration.

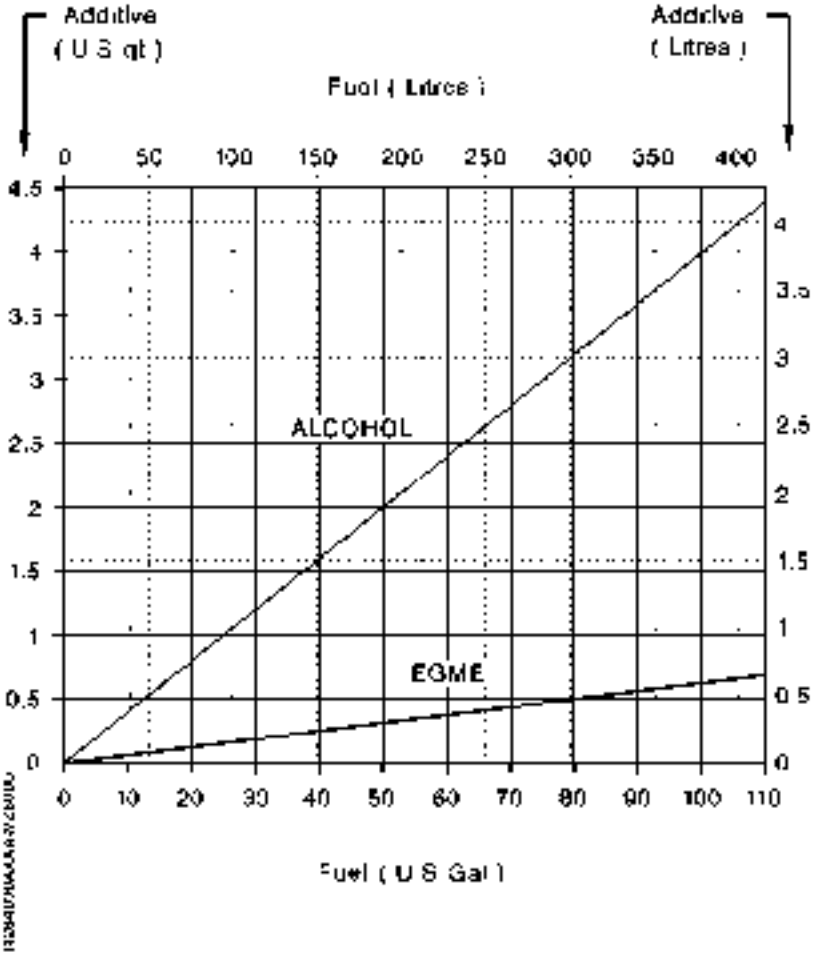

Figure 8.3 - ADDITIVE MIXING RATIO

LANDING GEAR

Nose gear tire :

5.00-5 6 PRTT - Inflating pressure : 56.5 psi (3.9 bars)

Main gear tires :

15 6.00-6 6 PRTT - Inflating pressure : 63.9 psi (4.4 bars)

Nose gear shock absorber :

Filling with hydraulic fluid MIL-H-5606 ; inflate with pressurized dry air or nitrogen to 108.7 psi (± 4) that is 7.5 bars (± 0.3) .

Main gears shock absorbers :

Filling with hydraulic fluid MIL-H-5606 ; inflate with pressurized dry air or nitrogen to 666 psi (+15 ; - 0) that is 45.9 bars (+1 ; - 0).

Check every 100 hours and service with MIL-H-5606 hydraulic fluid.

Brakes :

Service as required with MIL-H-5606 hydraulic fluid.

OXYGEN (if installed)

Aviator's breathing oxygen : Specification MIL-O-27210

Maximum pressure (cylinder temperature stabilized after filling) : 1850 psi (128 bars) to 70°F (21°C). Refer to Maintenance Manual for inflating pressures.

AIRPLANE CLEANING AND CARE

WINDOWS AND WINDSHIELD

The plastic windshield and windows should be cleaned with an airplane windshield cleaner. Apply the cleaner sparingly with soft cloths and rub with moderate pressure until all dirt, oil scum and bug stains are removed. Allow the cleaner to dry then wipe it off with soft flannel cloths.

CAUTION

NEVER USE GASOLINE, BENZINE ALCOHOL, ACETONE, FIRE EXTINGUISHER OR ANTI-ICE FLUID, LACQUER THINNER OR GLASS CLEANER TO CLEAN THE PLASTIC. THESE MATERIALS WILL ATTACK THE PLASTIC AND MAY CAUSE IT TO CRAZE

Follow by carefully washing with a mild detergent and plenty of water. Rinse thoroughly, then dry with a clean moist chamois. Do not rub the plastic with a dry cloth since this builds up an electrostatic charge which attracts dust. Waxing with a good commercial wax will finish the cleaning job. A thin, even coat of wax polished out by hand with clean soft flannel cloths will fill in minor scratches and help prevent further scratching.

Do not use a canvas cover on the windshield unless freezing rain or sleet is anticipated since the cover may scratch the plastic surface.

PAINTED SURFACES

Refer to Maintenance Manual for the procedures to follow.

PROPELLER CARE

Preflight inspection of propeller blades for nicks and wiping them occasionally with an oily cloth to clean off grass and bug stains will assure long blade life. Small nicks on the propeller, particularly near the tips and on the leading edges, should be dressed out as soon as possible since these nicks produce stress concentrations, and if ignored, may result in cracks. Never use an alkaline cleaner on the blades, remove grease and dirt.

ENGINE CARE

Refer to Maintenance Manual for the procedures to follow.

INTERIOR CARE

To remove dust and loose dirt from the upholstery and carpet, clean the interior regularly with a vacuum cleaner.

For additional information, refer to Maintenance Manual.

FRONT ASH-TRAY

To empty front ash-tray, remove it while holding it on its edges (if necessary, lift it up with a screwdriver wrapped up in a cloth).

REAR ASH-TRAYS

To empty a rear ash-tray, open it tilting its movable part to its stop, then push moderately on central part to disengage the ash-box.

To install again the ash-box, insert upper part then push on lower part.

SECTION 9

SUPPLEMENTS

This section consists of a series of supplements, each covering a single system which may be installed in the Model TB airplane. Each supplement contains a brief description, and when applicable, operating limitations, emergency and normal procedures, and performance. The supplements are arranged numerically (See "List of Supplements and Validities") to make it easier to locate a particular supplement. Some installed items of optional equipment, whose function and operational procedures do not require detailed instructions, are discussed in Section 7.

Limitations contained in the following supplements are Airworthiness Authorities approved and adherence to these limitations is mandatory.

NOTE

The Supplements Section must include approved Supplements for all optional equipment installed on the airplane. Additional Supplements for optional equipment not installed on this airplane may be included and can be removed if desired.

LIST OF SUPPLEMENTS AND VALIDITIES

Supp. No.		Edition No. - Date
A -	General	
	TB 9 / 10 / 200 / 20 / 21 - From S / N 1	0 - 31.01.93
1 -	Day and night IFR equipment	
	TB 9 / 10 - From S / N 1 to 947	1 - 31.01.88
	TB 9 / 10 / 200 - From S / N 948	2 - 30.09.89
1A -	Day and night IFR equipment	
	TB 20 - From S / N 1 to 947, except S / N 823 to 849 + 888	1 - 31.01.88
	TB 20 - From S / N 948, and S / N 823 to 849 + 888	2 - 30.06.88
1B -	Day and night IFR equipment	
	TB 21 - From S / N 1 to 947	1 - 31.01.88
	TB 21 - From S / N 948	2 - 31.05.89
2 -	Night VFR equipment	
	TB 9 - From S / N 1 to 878, except S / N 765	1 - 31.01.88
	TB 10 - From S / N 1 to 947	1 - 31.01.88
2A -	Night VFR equipment	
	TB 20 - From S / N 1 to 947, except S / N 823 to 849 + 888	1 - 31.01.88
	TB 20 - From S / N 948, and S / N 823 to 849 + 888	2 - 30.06.88
2B -	Night VFR equipment	
	TB 21 - From S / N 1 to 947	1 - 31.01.88
	TB 21 - From S / N 948	2 - 31.05.89
2C -	Night VFR equipment	
	TB 9 - From S / N 879 to 947, plus S / N 765	0 - 30.09.88
	TB 9 - From S / N 948	1 - 30.09.89
2D -	Night VFR equipment	
	TB 10 / 200 - From S / N 948	0 - 30.09.89

3 -	Electric pitch trim TB 20 / 21 - From S / N 1	1 -	31.01.88
4 -	Fuel flow totalizer FT 101 "HOSKINS" TB 20 / 21 From S / N 1 to 947, except S / N 823 to 849 + 888	1 -	31.01.88
5 -	Propeller de-icing "T.K.S." TB 20 / 21 - From S / N 1	1 -	31.01.88
6 -	"HARTZELL" constant speed propeller TB 9 - From S / N 1 to 878, except S / N 765	1 -	31.01.88
7 -	"KING" autopilot type KAP 100 TB 10 / 200 / 20 / 21 - From S / N 275	1 -	31.01.88
8 -	"KING" autopilot type KFC 150 and KAP 150 TB 10 / 200 / 20 / 21 - From S / N 275	1 -	31.01.88
9 -	Stormscope "3M" WX-10 A TB 9 / 10 / 20 / 21 From S / N 1 to 947, except S / N 823 to 849 + 888	1 -	31.01.88
10 -	Oxygen equipment "PURITAN-BENNETT" (Front seats pressure-demand type masks) TB 20 / 21 - From S / N 1	1 -	31.01.88
10A -	Oxygen equipment "PURITAN-BENNETT" (Front seats constant-flow type masks) TB 20 / 21 - From S / N 1	1 -	30.04.97
11 -	"MITCHELL" autopilot type CENTURY 21 TB 9 / 10 / 20 - From S / N 1	1 -	31.01.88
12 -	"MITCHELL" autopilot type CENTURY 31 TB 20 - From S / N 1	1 -	31.01.88
13 -	Ground power receptacle TB 9 / 10 / 20 / 21 From S / N 1 to 947, except S / N 823 to 849 + 888	1 -	31.01.88
	TB 9 / 10 / 200 / 20 / 21 From S / N 948 and S / N 823 to 849 + 888	2 -	30.06.88

14 - Auxiliary dry air pump
TB 10 / 200 / 20 / 21 - From S / N 1 ..... 1 - 31.01.88

15 - "TKS" ice protection systems
TB 20 / 21 - From S / N 1 ..... 0 - 29.02.88

16 - "MITCHELL" autopilot type CENTURY I
TB 9 / 10 - From S / N 1 ..... 1 - 31.01.88

17 - "MITCHELL" autopilot type CENTURY II B
TB 9 / 10 - From S / N 1 ..... 1 - 31.01.88

18 - Oxygen equipment "EROS"
TB 20 / 21 - From S / N 1 ..... 1 - 31.01.88

19 - Intentionally left blank

20 - Fuel flow totalizer FC / FT 10 "ARNAV"
TB 20 / 21 - From S / N 731 ..... 0 - 31.01.91

21 - Fuel flow totalizer FT 101 A "HOSKINS"
TB 20 / 21
From S / N 948 and S / N 823 to 849+868 .. 0 - 31.01.91

22 - "BFG" WX-1000 / 1000+ or WX-900 or WX-500 stormscope
TB 9 / 10 / 200 / 20 / 21
From S / N 948 and S / N 823 to 849+868 ..... 0 - 31.01.91

23 - Air conditioning system
TB 20 / 21
From S / N 948 and S / N 823 to 849+868 ..... 0 - 31.01.91

24 - "KEITH" air conditioning system
TB 20
From S / N 948 and S / N 823 to 849+868
TB 21
From S / N 2081 ..... 0 - 30.09.94

26 - "GARMIN" 100 AVD GPS navigation system
interfaced with HSI KI 208
TB 20 (Valid for aircraft under FAA regulations)
From S / N 948 and S / N 823 to 849+868 .. .. 0 - 30.09.94

26 - "BENDIX / KING" KLN90A GPS navigation system interfaced with HSI KI 525A
TB 9 / 10 / 200 / 20 / 21 - From S / N 1 ..... 0 - 15.01.95

27 - Low noise exhaust
TB 9 - From S / N 1 ..... 0 - 31.10.95

28 - Low noise exhaust
TB 10 - From S / N 1 ..... 0 - 31.10.95

29 - Low noise exhaust
TB 20 - From S / N 1 ..... 0 - 31.10.95

30 - "BENDIX / KING" vertical speed and altitude selector type KAS 297B
TB 10 / 200 / 20 / 21
From S / N 948 and S / N 823 to 849+888 ..... 0 - 31.12.95

31 - "BENDIX / KING" EHI 40
TB 20 / 21
From S / N 948 and S / N 823 to 849+888 ..... 0 - 30.04.96

32 - "BENDIX / KING" KLN90A GPS navigation system interfaced with EHI 40 EHSI
TB 20 / 21
From S / N 948 and S / N 823 to 849+888 0 - 30.04.96

33 - "BENDIX / KING" KLN90B GPS navigation system interfaced with the HSI KI 525A
TB 10 / 200 / 20 / 21
From S / N 948 and S / N 823 to 849+888 . . 0 - 30.04.96

34 - EDM 700
TB 20
From S / N 948 and S / N 823 to 849+888 . 0 - 15.11.96

35 - "SHADIN" digital fuel management system
TB 20 / 21
From S / N 948 and S / N 823 to 849+888 ..... 0 - 15.11.96

36 - Intentionally left free

37 - "BENDIX / KING" KLN89B GPS navigation system - "Stand Alone"
TB 9 / 10 / 200 / 20 / 21
From S / N 946 and S / N 823 to 849+888 . . 0 - 30.06.97

38 - "BENDIX / KING" KLN90B GPS navigation system interfaced with EHI 40 EHSI
TB 20 / 21
From S / N 946 and S / N 823 to 849+888 0 - 30.06.97

39 - "GARMIN" 150 GPS navigation system -"Stand Alone"
TB 9 / 10 / 200 / 20 / 21
From S / N 946 and S / N 823 to 849+888 . 0 - 31.08.97

40 - "BENDIX / KING" KLN89B GPS navigation system interfaced with the HSI KI 525A
TB 9 / 10 / 200 / 20 / 21
From S / N 946 and S / N 823 to 849+888 .. .. 0 - 30.09.97

41 - "TKS" system
TB 20 / TB 21
From S / N 946 and S / N 823 to 849+888 .... 0 - 15.11.98

42 - Intentionally left free

43 - "GARMIN" GNS 430 GPS navigation system interfaced with GI 106A CDI
TB 9 / 10 / 200 / 20 / 21
From S / N 2000, plus S / N 1833 + 1900 .. 0 - 31.08.00

44 - "KEITH" air conditioning system
TB 200
From S / N 2013 ..... 0 - 31.08.00

45 - Three-blade propeller
TB 20 / TB 21
From S / N 1 ..... 0 - 28.10.00

46 - Intentionally left free

47 - "HONEYWELL" KFC 225 automatic flight control system
TB 20 / TB 21
From S / N 948 and S / N 823 to 849+868 ..... 0 - 31.01.01

48 - "HONEYWELL" KLN 94 GPS (B-RNAV) navigation system interfaced with electromechanical instruments
TB 9 / 10 / 200 / 20 / 21
From S / N 2000, plus S / N 1633 and 1900 ..... 0 - 31.01.01

49 - "HONEYWELL" KMD 550 Multi-function display
TB 9 / 10 / 200 / 20 / 21
From S / N 948 and S / N 823 to 849+868 ..... 0 - 31.01.01

50 - "SHADIN" MICROFLO-L™ digital fuel management system
TB 200 / 20 / 21
From S / N 948 and S / N 823 to 849+868 ..... 0 - 15.05.01

51 - "GARMIN" GNS 430 GPS (B-RNAV) navigation system interfaced with electromechanical instruments
(GPS # 1 : B-RNAV / GPS # 2 : IFR)
TB 9 / 10 / 200 / 20 / 21
From S / N 2000, plus S / N 1633 + 1900 ..... 0 - 15.05.01

52 - "HONEYWELL" KLN 94 GPS navigation system - "Stand Alone"
TB 9 / 10 / 200 / 20 / 21
From S / N 2000, plus S / N 1633 and 1900 .. 0 - 30.05.01

53 - "GARMIN" GNS 530 GPS (B-RNAV) navigation system interfaced with electromechanical instruments
(GPS # 1 : B-RNAV)
TB 9 / 10 / 200 / 20 / 21
From S / N 2000, plus S / N 1633 + 1900 ..... 0 - 15.01.02

D.G.A.C Approval :

DGAC/SFACT/NAG
Chargé de Certification
Grégory POMMERA

30 MAI 2002

Date : .....

SUPPLEMENT

DAY AND NIGHT IFR EQUIPMENT

TABLE OF CONTENTS

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SECTION 1
GENERAL

EQUIPMENT REQUIRED FOR IFR OPERATION

The airplane is approved for day & night IFR operations when the appropriate equipment is installed and operating correctly.

The type certification requires following equipment in addition to the basic flight instruments. These equipment must be installed and operate perfectly according to the indicated type of use.

CAUTION

IT IS THE PILOT'S RESPONSIBILITY TO CHECK THAT THE FOLLOWING EQUIPMENT LIST IS IN ACCORDANCE WITH THE SPECIFIC NATIONAL OPERATING RULES OF THE AIRPLANE REGISTRATION COUNTRY DEPENDING ON THE TYPE OF OPERATION

NOTE
Systems and equipment mentioned hereafter do not include specific flight and radio-navigation instruments required by decree concerning the civil airplanes operating general conditions or other foreign regulations (for example FAR PART 91 and 135).

EQUIPMENT	Day IFR	Night IFR
Vertical speed indicator	yes	yes
Attitude gyro indicator	yes	yes
Turn-and-bank indicator	yes	yes
Heading indicator	yes	yes
Vacuum gage	yes	yes
Vacuum warning light	**	**
Heated pitot	yes	yes
OAT indicator	yes	yes
Stop watch	yes	yes
Alternate static source	yes	yes
Anticollision light	yes	yes
Landing and taxi lights	no	yes
Navigation lights	no	yes
Adjustable interior lighting	no	yes
Adjustable emergency lighting	no	yes
1 microphone and headset assy	yes	yes
1 hand microphone and cabin loud-speaker	yes	yes
<u>For reference</u>		
Flashlight with flashing device	no	yes
Day and Night IFR placard	yes	yes

** Optional equipment : mandatory for BRAZIL

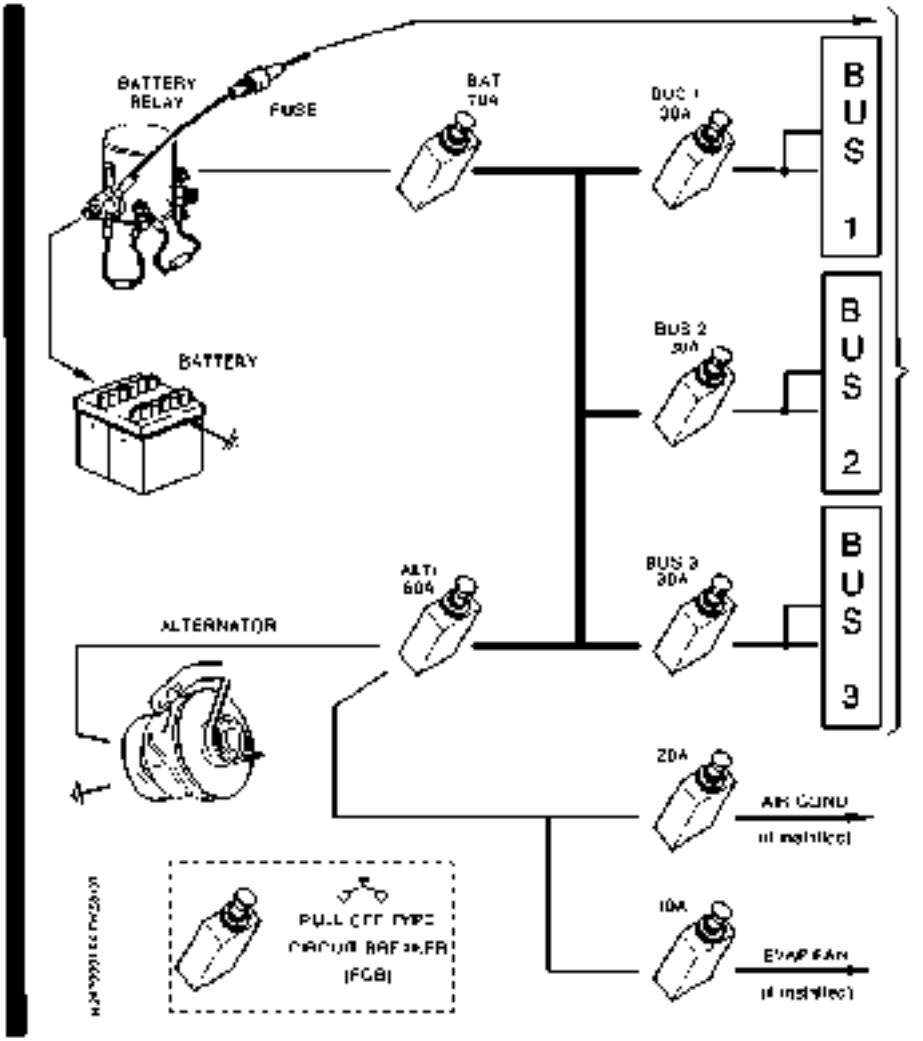

Figure 9.1.1 - BUS BARS POWER SUPPLY

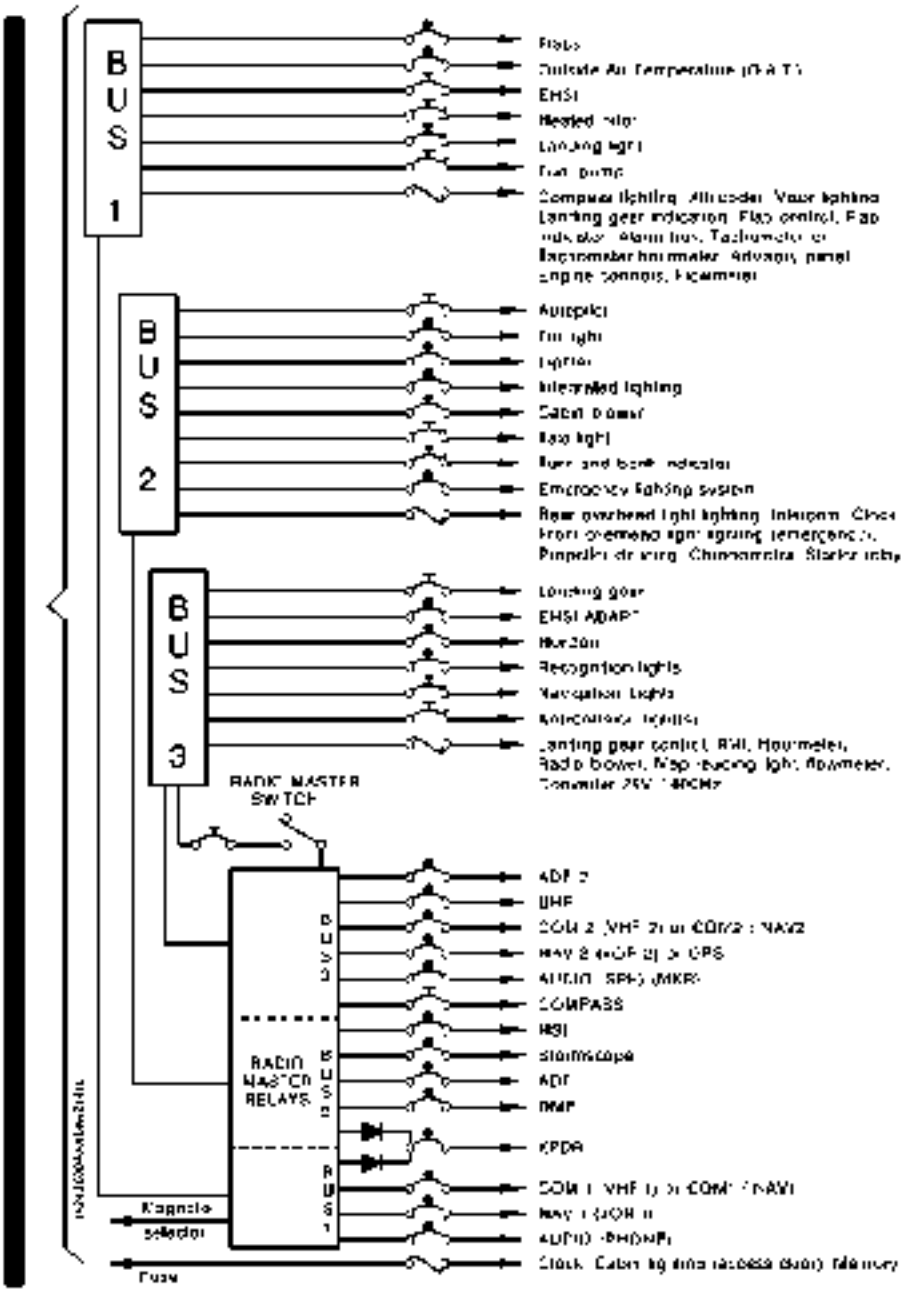

Figure 9.1.2 - POWER DISTRIBUTION IN IFR

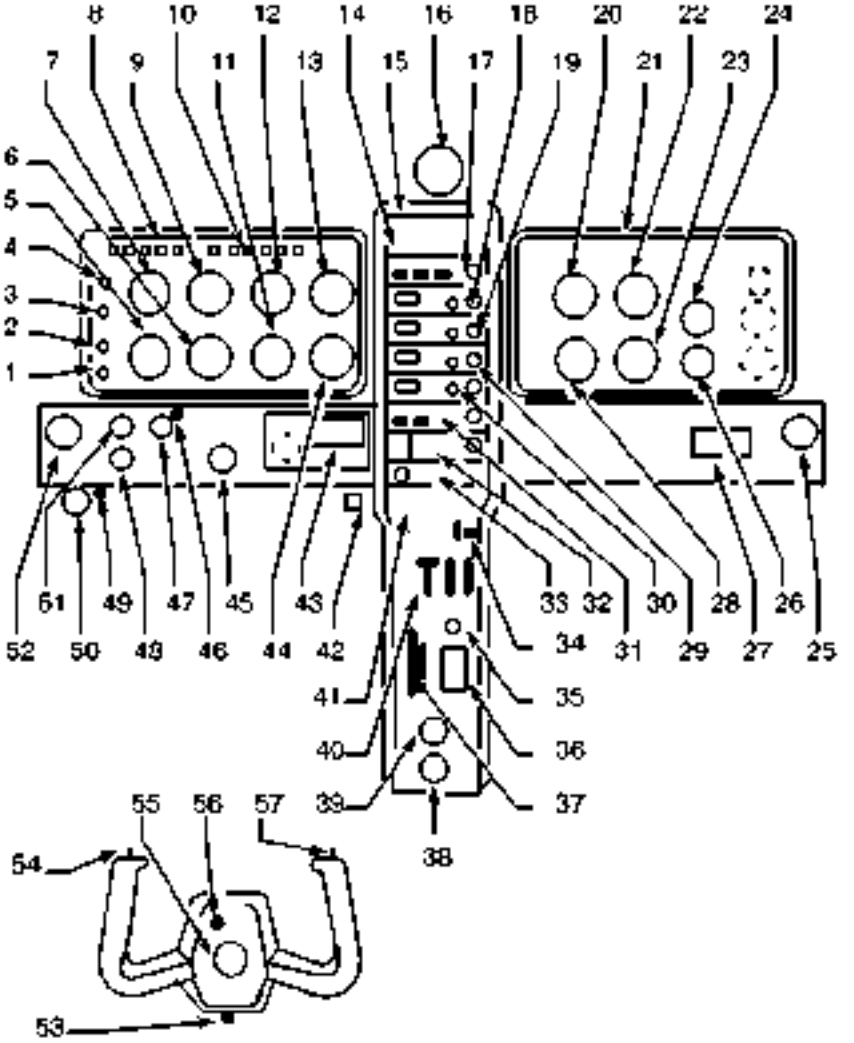

Figure 9.1.3 - EXAMPLE OF INSTRUMENT PANEL " IFR "

INSTRUMENT PANEL EXAMPLE

1 – Normal lighting control (Std)
2 – Emergency lighting control (Std)
3 – Instruments and radio lighting control (Std)
4 – Emergency locator transmitter switch (if installed)
5 – Illuminated turn and bank indicator
6 – Illuminated heading indicator
7 – Illuminated true airspeed indicator (Std)
8 – L H instrument panel visor lighting
9 – Illuminated attitude gyro indicator
10 – Pitot heat indicator light
11 – Illuminated vertical speed indicator (Std)
12 – Illuminated altimeter (Std)
13 – VOR / ILS indicator
14 – Engine monitoring cluster (Std)
15 – Radio support visor lighting
16 – Illuminated compass (Std)
17 – Audio control pane
18 – VHF 1
19 – VHF 2
20 – VOR / LOC Indicator
21 – R H. instrument panel visor lighting
22 – Illuminated tachometer (Std) or, Post-MOD 151, illuminated tachometer-hourmeter (Std)
23 – Illuminated manifold pressure – fuel flow / pressure dual indicator
24 – Illuminated CHT / EGT combination
25 – R H. air outlet (Std)
26 – Illuminated OAT indicator
27 – Cabin air selector (Std)
28 – Illuminated altimeter Nr 2
29 – VOR / ILS receiver
30 – VOR / LOC receiver
31 – ADF receiver
32 – Transponder
33 – DME indicator
34 – Wing flaps control and illuminated indicator (Std)
35 – Lighter (Std)
36 – Ash-tray (Std)
37 – Pitch trim control wheel and illuminated indicator (Std)

INSTRUMENT PANEL EXAMPLE (Cont.)

38 - Fuel selector (Std)
39 - Rudder trim control wheel (Std)
40 - Engine controls (Std)
41 - Switch-breakers for turn and bank indicator, anti-collision light(s), navigation lights, heated pitot and landing lights.
42 - "Alternate air" control (Std)
43 - Landing gears configuration and controls panel (Std)
44 - ADF indicator
45 - Parking brake knob (Std)
46 - L.H. subpanel post light (Std)
47 - Vacuum gage
48 - Alternate static source valve
49 - Emergency landing gear and circuit breakers panel post light
50 - Emergency landing gear control (Std)
51 - Magneto / start selector (Std)
52 - L.H. air outlet (Std)
53 - Maps reading light
54 - Push-to-talk switch
55 - Clock / stop watch
56 - Clock / stop watch post light
57 - Maps reading light switch

LIGHTING DEVICES

INSTRUMENT PANELS LIGHTING

- See Figure 9.1.3.
- Controlled and regulated by "Normal" and "Radio" controls.

EMERGENCY LIGHTING

Pre-MOD.151

- Front overhead lights controlled by turning post lights and regulated by the "Emergency" control. See Figure 9.1.3.

Post-MOD.151

- Front overhead lights controlled and regulated by the "Emergency" control. See Figure 9.1.3.

CABIN LIGHTING

Pre-MOD.151

- Front overhead lights controlled by turning post lights and regulated by the "Emergency" control. See Figure AUCUN LIEN

Post-MOD.151

Front overhead lights controlled and regulated by the "Emergency" control. See Figure AUCUN LIEN .

All

- Rear overhead light (manual).

INSTRUMENT PANEL ADDITIONAL EQUIPMENT

ADDITIONAL SENSITIVE ALTIMETER (if installed)

The second sensitive altimeter is connected to the airplane static pressure. It may be switched over to cabin static pressure by means of the alternate static source valve.

When the alternate static source valve is pulled, altitude compensation should be performed as per Section 5 "Performance".

CLOCK / STOP WATCH

The clock / stop watch and its post light are installed in the center of the pilot's control wheel.

OAT INDICATOR

The indicator is connected to the transmitter which is installed under L.H. wing. The instrument is provided with integral lighting.

A red warning light is provided on the dial. This warning light, permanently lit, becomes visible by the pointer rotation when the outside atmosphere is close to 32° F.

ALTERNATE STATIC SOURCE

A two position selector allows the normal static source system of the airplane to be isolated in case of clogging or icing of static ports.

The ON position ("PULL") of the alternate static source valve admits cabin static pressure to the static system.

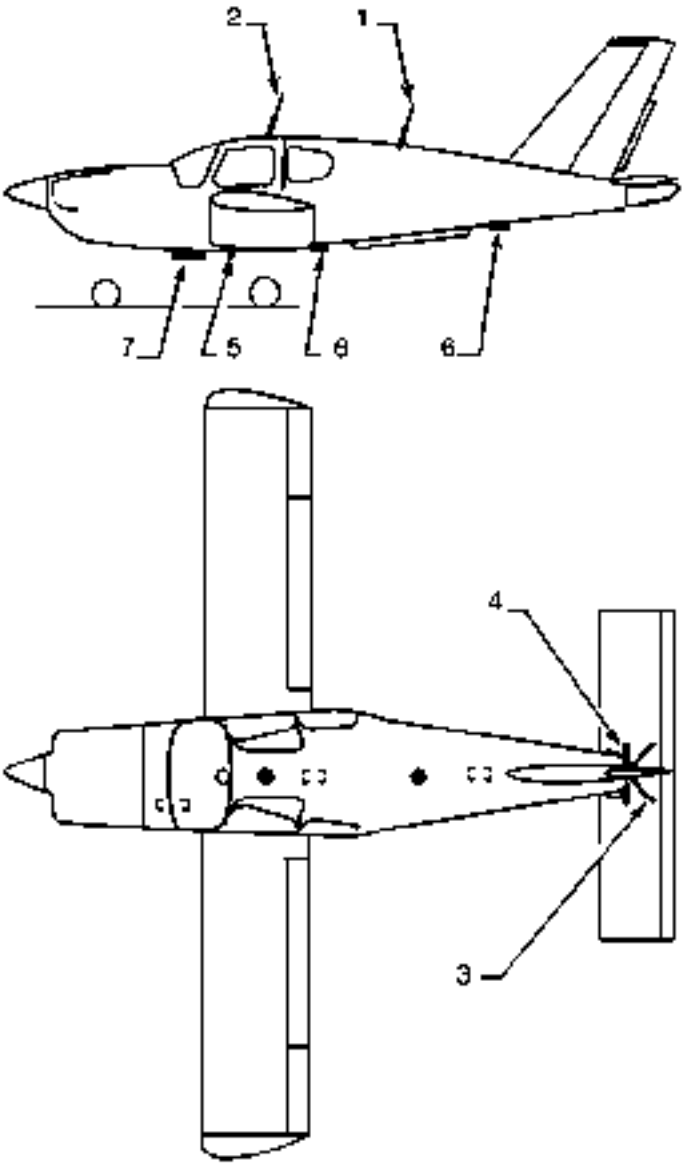

Figure 9.1.4 - ANTENNAS

ANTENNAS

1 - VHF 1 antenna
2 - VHF 2 antenna
3 - VOR antenna
4 - Glide ILS antenna
5 - ATC transponder antenna
6 - Radio compass - loop and sense antenna
7 - Marker antenna
8 - DME antenna

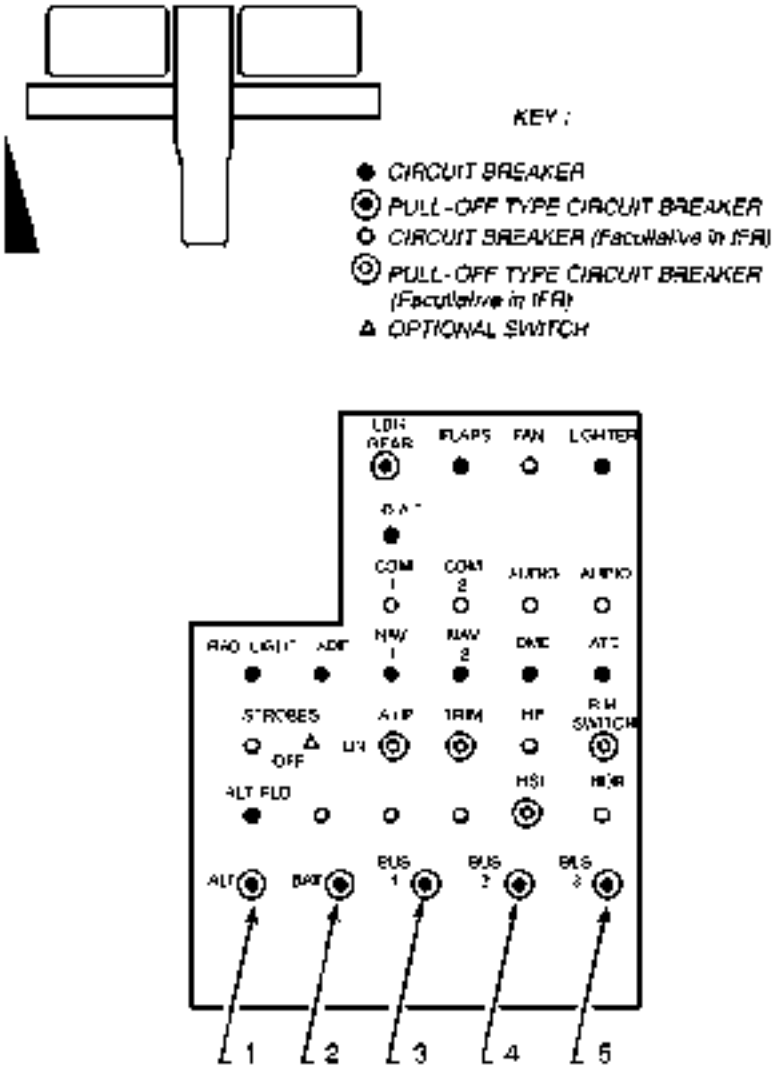

Figure 9.1.5 – CIRCUIT BREAKERS ASSEMBLY
(Typical arrangement)

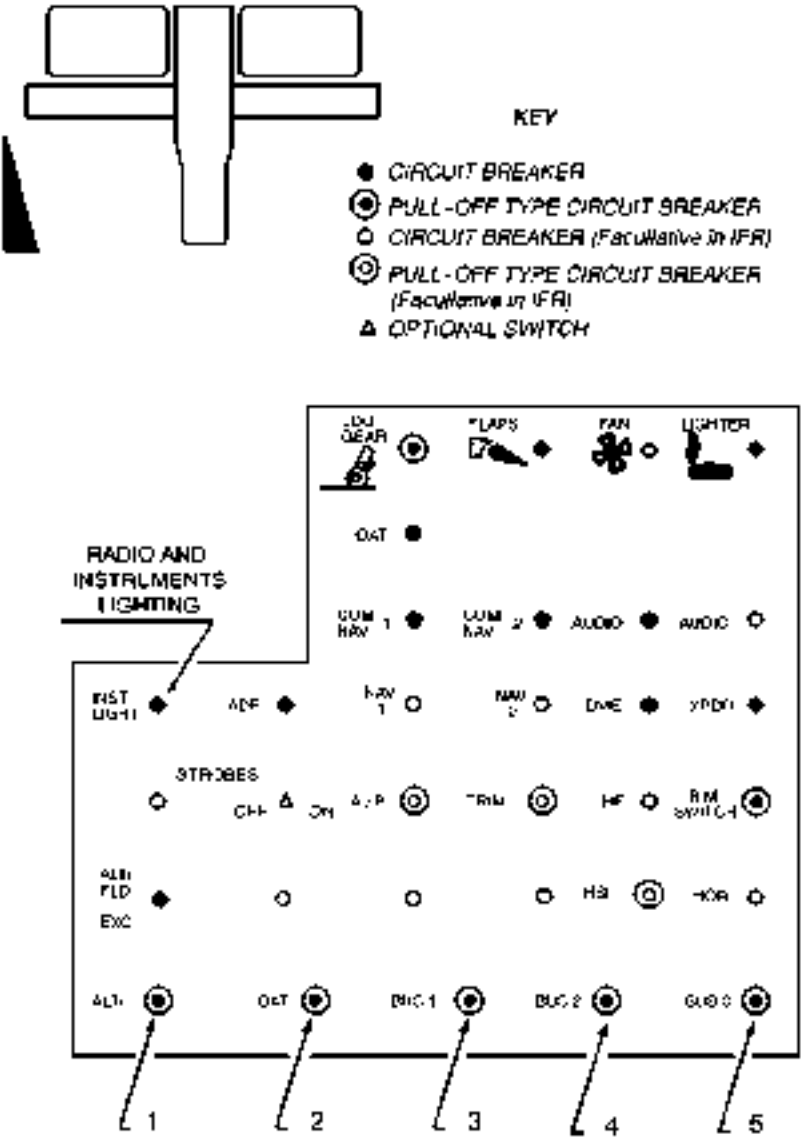

Figure 9.1.5A – CIRCUIT BREAKERS ASSEMBLY
(Typical arrangement)

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CIRCUIT BREAKERS ASSEMBLY

1 - Alternator "pull-off" type circuit breaker (60 A)

2 - Battery "pull-off" type circuit breaker (70 A)

3 - BUS bar 1 "pull-off" type circuit breaker (30 A)

4 - BUS bar 2 "pull-off" type circuit breaker (30 A)

5 - BUS bar 3 "pull-off" type circuit breaker (30 A)

SECTION 2
LIMITATIONS

The installation and the operation of the day and night IFR equipment do not change the basic limitations of the airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

PLACARDS

This placard is located near the instruction plate

FLIGHT CONDITIONS : DAY AND NIGHT IFR AND VFR ICING CONDITIONS NOT ALLOWED

SECTION 3
EMERGENCY PROCEDURES

These procedures supplement those of the standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

AIRSPEED INDICATING SYSTEM FAILURE

- Check the operation of the heated pitot, green indicator light: "ON". If the switch-breaker is "ON" and the indicator light "OFF", check that BUS 1 "pull-off" type circuit breaker is "ON"
- Erroneous indications of true airspeed indicator and altimeters :

Alternate static source	PULL

Open air outlets and / or actuate cabin air regulation flow lever to open position. Then, airspeed indicator and altimeter errors are slight.

If the failure persists, perform a precautionary approach, maintaining an adequate airspeed margin above the stall warning activation speed using the pre-setting (see Figure 9.1.6).

NORMAL LIGHTING FAILURE

- Switch on emergency lighting system (front overhead lights)
- Check that radio and instrument lighting circuit breaker is "ON"

LANDING LIGHT FAILURE

The left light has a wide beam and is considered as a taxi light and the right one has a narrow beam and is considered as a landing light, but either or both can be used as desired.

When landing without lights, it is suggested to use the same pitch attitude as that required to maintain the ILS Glide Slope.

FIRE OR SMOKE OF ELECTRIC ORIGIN

- Disengage "pull-off" type circuit breakers of BUS bars 1, 2, 3.
- After a few moments reset "pull-off" type circuit breakers in the numerical order with a delay between each operation for observation. Disengage the faulty BUS bar and disconnect all the equipment supplied by the latter. See Figure 9.1.2.
- Reset "pull-off" type circuit breaker and reconnect one after the other all the disconnected equipment to isolate the failed item. Let the "pull-off" type circuit breaker tripped for this item

VACUUM SYSTEM FAILURE

The vacuum gage is below green arc or shows zero :

- the pneumatically operated attitude gyro indicator and / or heading indicator / HSI are inoperative.
- electric turn and bank indicator and magnetic compass continue to function normally.

Leave IMC conditions, fly airplane carefully in partial panel mode, and proceed with landing as soon as possible

SECTION 4
NORMAL PROCEDURES

These procedures supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

4.1 - PROCEDURES FOR IFR FLIGHT OR NIGHT FLIGHT

PRELIMINARY STEPS

Study the meteorology in order to avoid flying in hazardous conditions (minima, icing ...).

Check that fuel level is sufficient to comply with regulations.

BEFORE FLIGHT (may be undertaken or continued at night)

Check the operation :

. of anti-collision light(s)
. of navigation lights
. of cabin and instrument panel lighting
. of landing lights
. of day / night selector switch.

A flashlight must be provided on board the airplane

TAXING

Check the operation of gyroscopic instruments by performing alternate turns :

- Attitude gyro indicator - set miniature airplane as required
- Heading indicator - correct rotation
- Turn and bank indicator - proper direction.

At night, preferably use only the taxi light (left landing light)

BEFORE TAKE-OFF

- Heated pitot
- Check vacuum gage in green arc
- Check installed radio-navigation equipment
- Set transponder to "stand-by"
- At night or in damp weather, set the cabin air selector to maximum demisting.

LINED UP ON RUNWAY

Check heading indicator and attitude gyro indicator bar

At night, turn on landing lights as required.

TAKE-OFF

See Section 4 "Normal procedures" of the basic Pilot's Operating Handbook

Always maintain a positive rate of climb.

At night, switch off the landing lights when safely airborne

CLIMB, CRUISE AND DESCENT

See Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

ILS APPROACH (pre-setting)

These values are given for a maximum weight.

Descent: (Δ vz) : 1 in.Hg per 100 ft
Speed variation (Δ IAS) : 1 in.Hg per 10 KIAS (12 MPH IAS)

	LDG	Flaps	KIAS	MPH IAS	RPM	MP in.Hg	FUEL FLOW	
							U.S Gal / hr	Litres / hr
Level flight holding	Up	0°	120	137	2500	19	11.7	44
	Down	0°	120	137	2500	25.3	16.5	62
	Up	0°	100	112	2500	16	9	34
	Down	0°	100	112	2500	22	13	49
Approach Descent 500 ft / min	Up	0°	100	112	2500	17	9	34
	Down	10°	90	106	2500	16	9	34
	Down	40°	75	87	As required full low pitch and MP			

Figure 9.1.6 - PRE-SETTINGS, ILS APPROACH

LANDING

At night, preferably use the R.H. landing light (long range) or both lights simultaneously.

4.2 - USE OF AVIONICS

AUDIO CONTROL PANEL

These knobs permit the selection of transmission and reception of VHF 1 or VHF 2, double VHF reception, reception of VOR 1, VOR 2, ADF, Marker and DME.

TRANSMISSION

Transmission may be made either through the hand microphone, or through the headset boom microphone with its push-to-talk-switches located on the control wheels. Headsets that will not be used should be unplugged.

RECEPTION

Select the loud-speaker or headset reception by means of the corresponding button on audio control panel (SPKR or PHONE).

In I.M.C. or at night, it is recommended to use the headset.

VOR, ADF, MKR AND DME (if installed)

They operate independently of VHF comm transceivers, but at least one VHF comm transceiver must be turned on to provide an audio amplifier for loud-speaker operation, unless the audio control panel contains an integral amplifier. Headphone operation is normal regardless of VHF operation on loud-speakers.

LIGHTING

Three controls are located on the left side of the L.H. instrument panel. See Figure 9.1.3 :

- Lower control (normal)

  Controls and regulates lighting of L.H. and R.H. instrument panels' visors.

- Central control (emergency) Pre-MOD.151

  Regulates lighting of both forward overhead lights. Rotating the overhead lights turns them on and off.

- Central control (emergency) Post-MOD.151

  Controls and regulates lighting of both forward overhead lights.

- Upper control (radio-equipment) operates and regulates :
  - Radio equipment lighting
  - Instruments and indicators lighting on instrument panel
  - circuit breakers panel lighting

NOTE :
Both "normal" and "radio equipment" controls and, Post MOD 151, the "emergency" position control operate and regulate lighting ; from high position "OFF" turn clockwise for "FULL INTENSITY OPERATION", then, still clockwise, rotate towards "MINIMUM INTENSITY" ; turn back to "OFF" turning counterclockwise
The "emergency" position control, Pre-MOD.151, regulates lighting ; from high position "FULL INTENSITY" turn clockwise to regulate to "MINIMUM INTENSITY" ; turn back to high position "FULL INTENSITY" turning counterclockwise.

LANDING LIGHTS

The lights are controlled by two switch breakers. See Figure 7-5B of the basic Pilot's Operating Handbook.

The L.H. light has a wide beam which facilitates taxiing.

The R.H. light has a long range beam and should be used for take-off and landing.

Simultaneous operation is possible.

DAY / NIGHT DIMMER

A day / night switch allows the indicator lights for the fuel pump, pitot heater and landing lights to be dimmed during night operations.

SECTION 5
PERFORMANCE

The installation and the operation of the day and night IFR equipment do not change the basic performance of the airplane described in Section 5 "Performance" of the basic pilot's Operating Handbook.
However, the installation of the externally mounted antennas will result in a minor reduction in cruise performance. See Section 5 "Performance" of the basic Pilot's Operating Handbook.

SUPPLEMENT

NIGHT VFR EQUIPMENT

TABLE OF CONTENTS

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SECTION I
GENERAL

LIST OF APPROVED AND MANDATORY EQUIPMENT
FOR NIGHT FLIGHT
(in addition to the basic flight instruments)

EQUIPMENT
- RADIO-NAVIGATION
VHF - Category 2 VOR / LOC - Category 2 (NAV) or Radio compass - Category 2 (ADF)
- NAVIGATION EQUIPMENT
Attitude gyro indicator Turn and bank indicator Heading indicator Gyro "ON" indicator Vertical speed indicator Anti-collision light Navigation lights Landing and taxi lights Interior panel lighting Flashlight (Personal equipment) Night VFR placard

NOTE :
Refer to the prevailing regulation, which can change anytime.

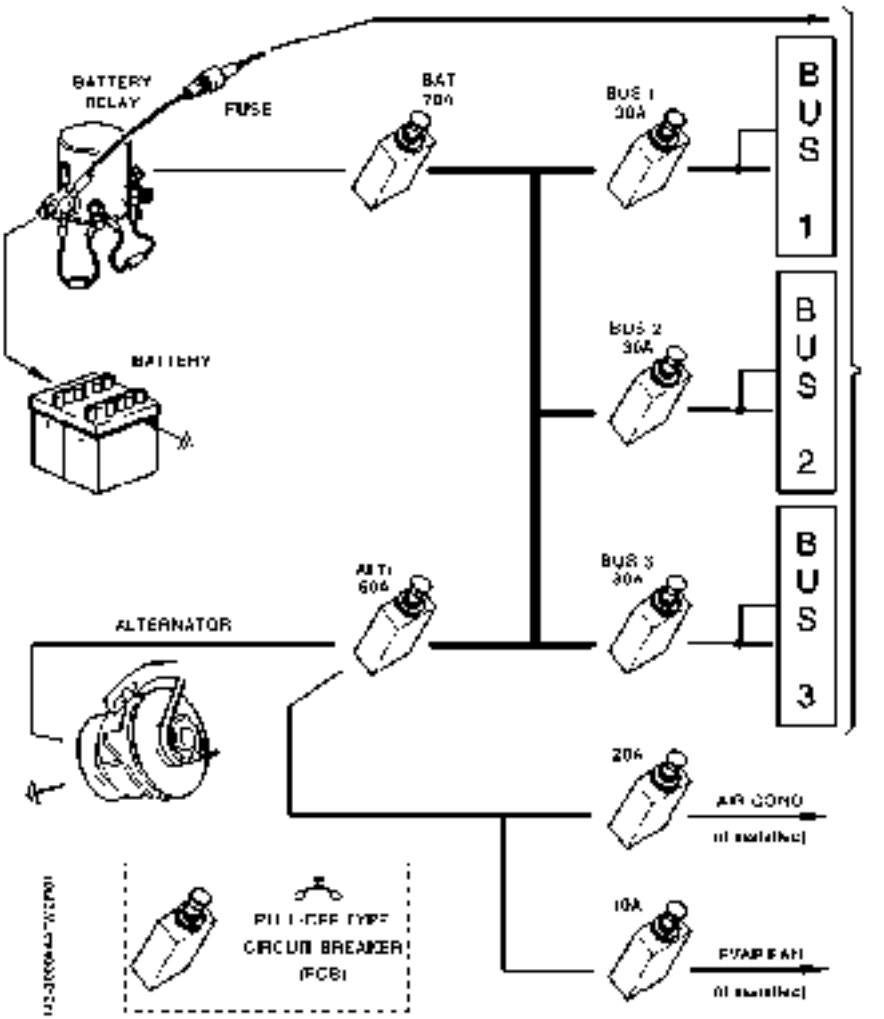

Figure 9.2.1 - BUS BAR POWER SUPPLY

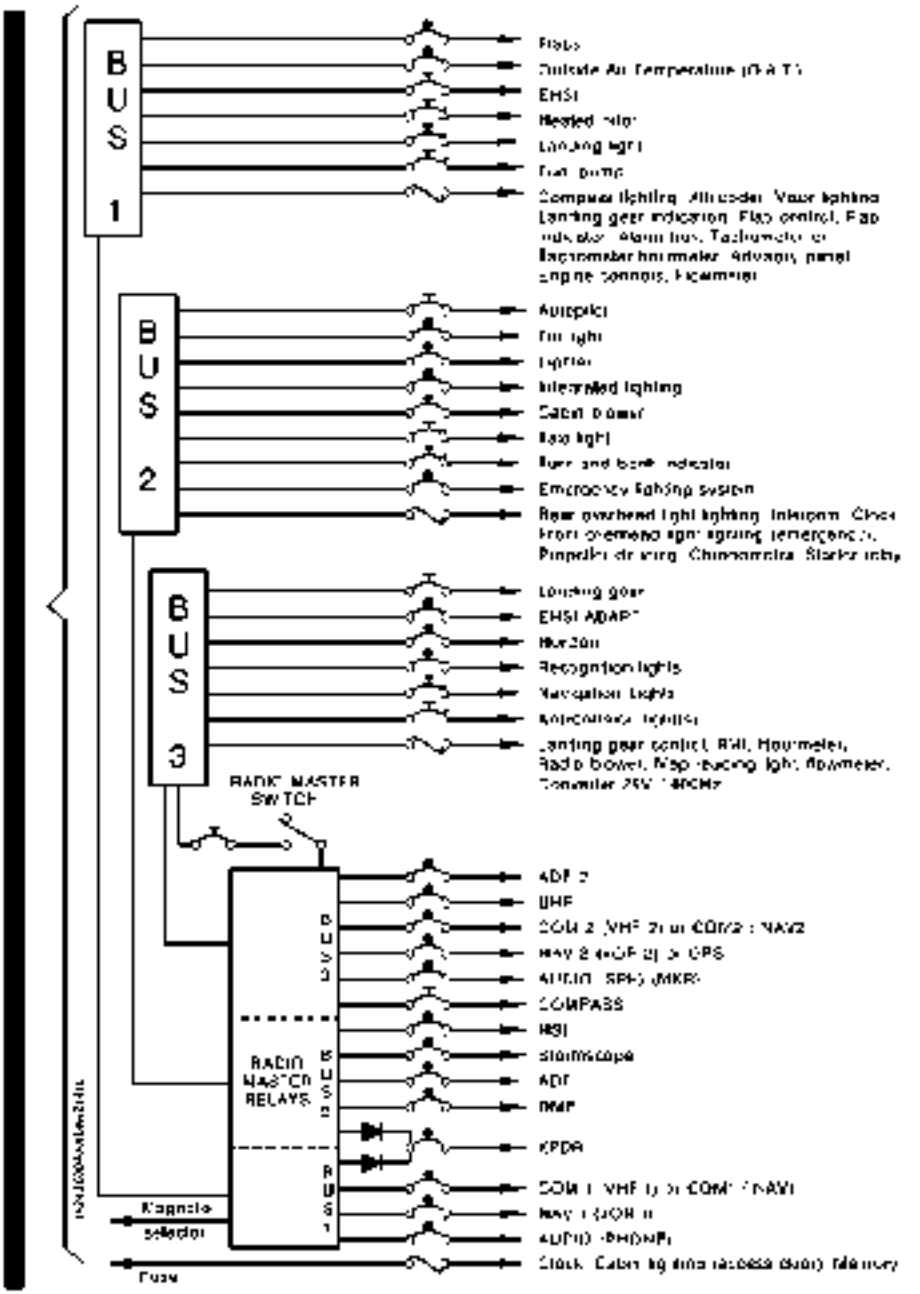

Figure 9.2.2 - POWER DISTRIBUTION IN VFR

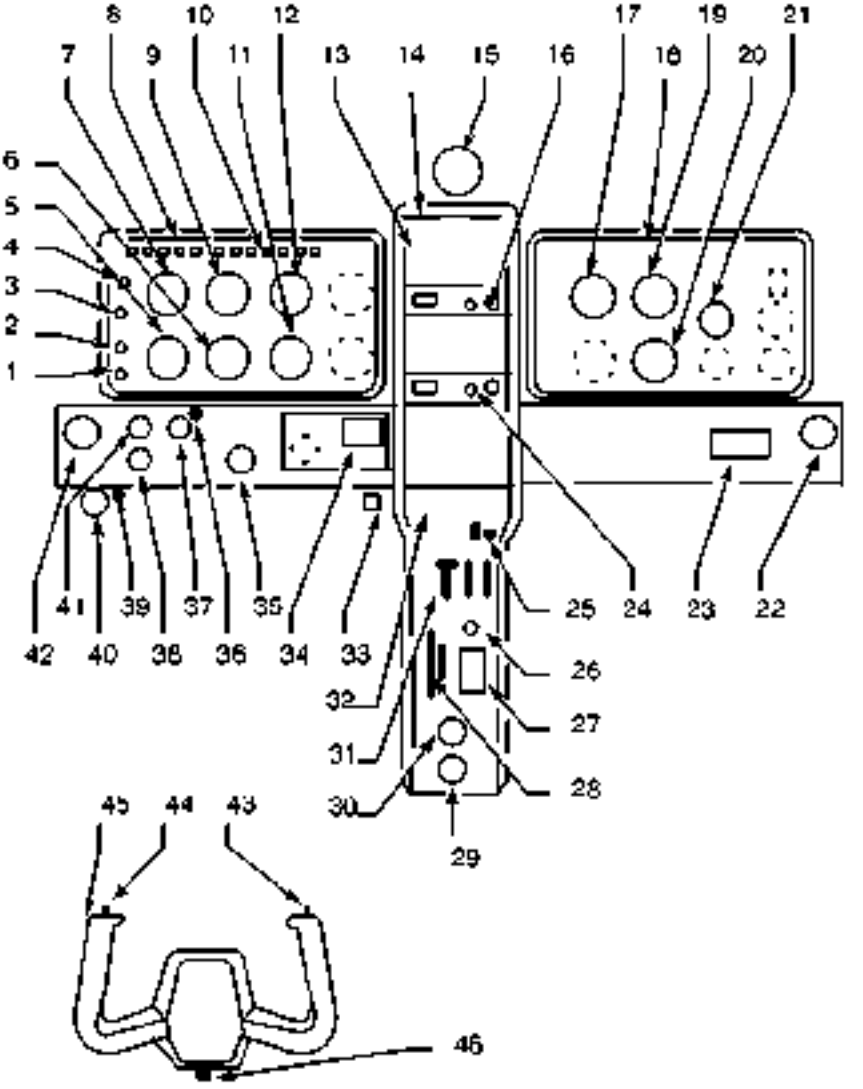

Figure 9.2.3 - EXAMPLE OF INSTRUMENT PANEL " VFR "

INSTRUMENT PANEL EXAMPLE

1 - Normal lighting control (Std)
2 - Emergency lighting control (Std)
3 - Instruments and radio lighting control (Std)
4 - Emergency locator transmitter switch (if installed)
5 - Illuminated turn and bank indicator
6 - Illuminated heading indicator
7 - Illuminated true airspeed indicator (Std)
8 - L.H. instrument panel visor lighting
9 - Illuminated attitude gyro indicator
10 - Pitot heat indicator light
11 - Illuminated vertical speed indicator (Std)
12 - Illuminated altimeter (Std)
13 - Engine monitoring cluster (Std)
14 - Radio support visor lighting
15 - Illuminated compass (Std)
16 - VHF 1
17 - VOR / LOC Indicator
18 - R.H. instrument panel visor lighting
19 - Illuminated tachometer (Std) or, Post-MOD 151. illuminated tachometer-hourmeter (Std)
20 - Illuminated manifold pressure - fuel flow / pressure dual indicator
21 - Illuminated CHT / EGT combination
22 - R.H. air outlet (Std)
23 - Cabin air selector (Std)
24 - VOR / LOC receiver
25 - Wing flaps control and indicator (Std)
26 - Lighter (Std)
27 - Ash-tray (Std)
28 - Pitch trim illuminated control wheel and indicator (Std)
29 - Fuel selector (Std)
30 - Rudder trim control wheel (Std)
31 - Engine controls (Std)
32 - Switch-breakers for turn and bank indicator, anti-collision light(s), navigation lights, heated pitot and landing lights
33 - 'Alternate air' control (Std)
34 - Landing gears configuration and controls and panel (Std)
35 - Parking brake knob (Std)
36 - L.H. subpanel post light

INSTRUMENT PANEL EXAMPLE (Cont.)

37 - Vacuum gage
38 - Alternate static source valve
39 - Emergency landing gear and circuit breakers panel post light
40 - Emergency landing gear control (Std)
41 - Magneto / start selector (Std)
42 - L.H. air outlet (Std)
43 - Maps reading light switch
44 - Push-to-talk switch
45 - Control wheel
46 - Maps reading light

LIGHTING DEVICES

INSTRUMENT PANELS LIGHTING

- See Figure 9.2.3.
- Controlled and regulated by "Normal" and "Radio" controls

EMERGENCY LIGHTING

Pre-MOD 151

- Front overhead lights controlled by turning post lights and regulated by the "Emergency" control. See Figure 9.2.3.

Post-MOD.151

- Front overhead lights controlled and regulated by the "Emergency" control. See Figure 9.2.3.

CABIN LIGHTING

Pre-MOD 151

- Front overhead lights controlled by turning post lights and regulated by the "Emergency" control. See Figure 9.2.3.

Post-MOD.151

- Front overhead lights controlled and regulated by the "Emergency" control. See Figure 9.2.3.

All

- Rear overhead light (Manual or automatic when pilot's door opens).

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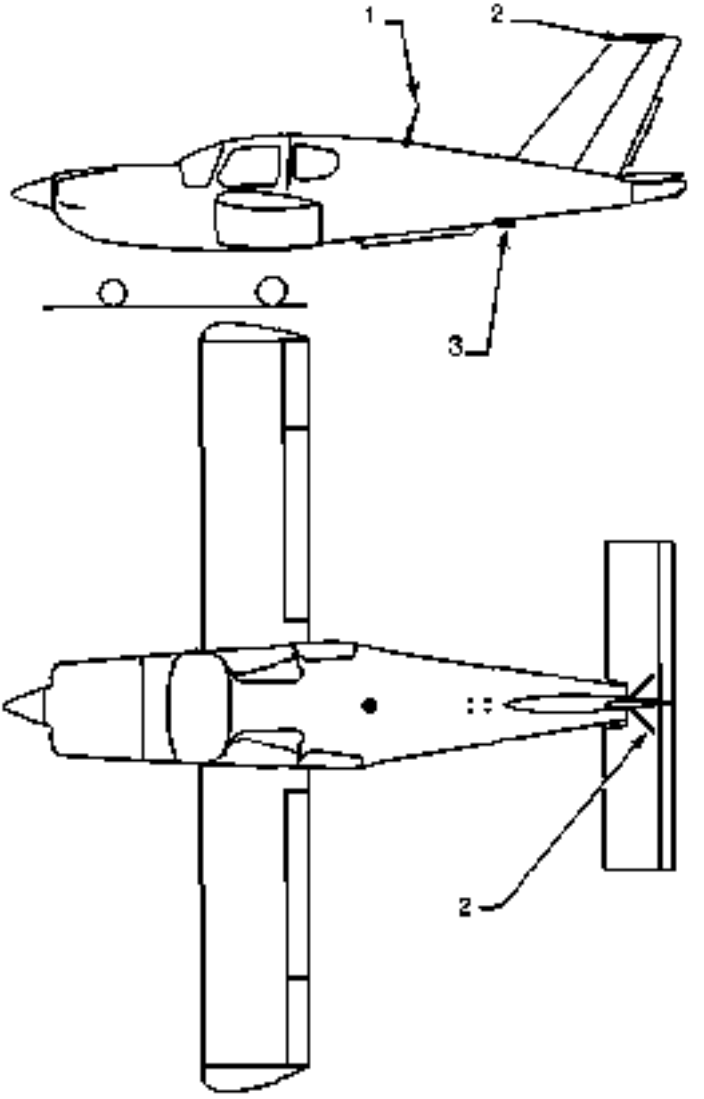

Figure 9.2.4 – ANTENNAS

ANTENNAS

1 - VHF antenna

2 - VOR antenna

3 - Radio compass - loop and sense antenna.

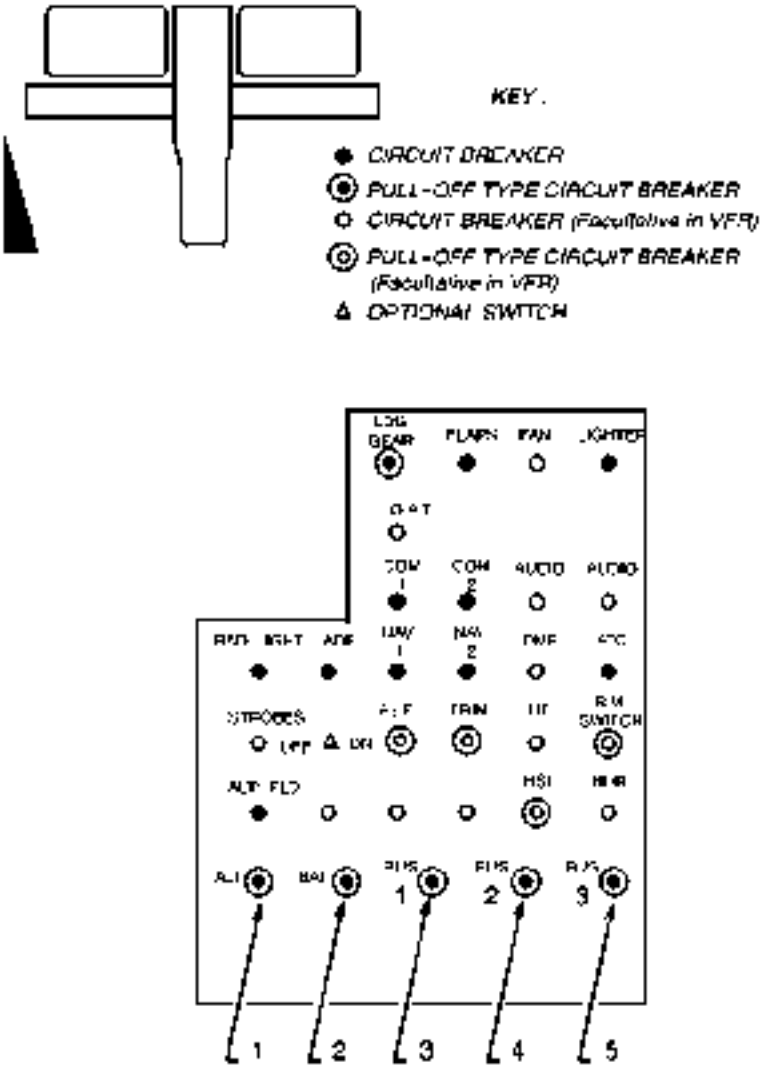

Figure 9.2.5 – CIRCUIT BREAKERS ASSEMBLY
(Typical arrangement)

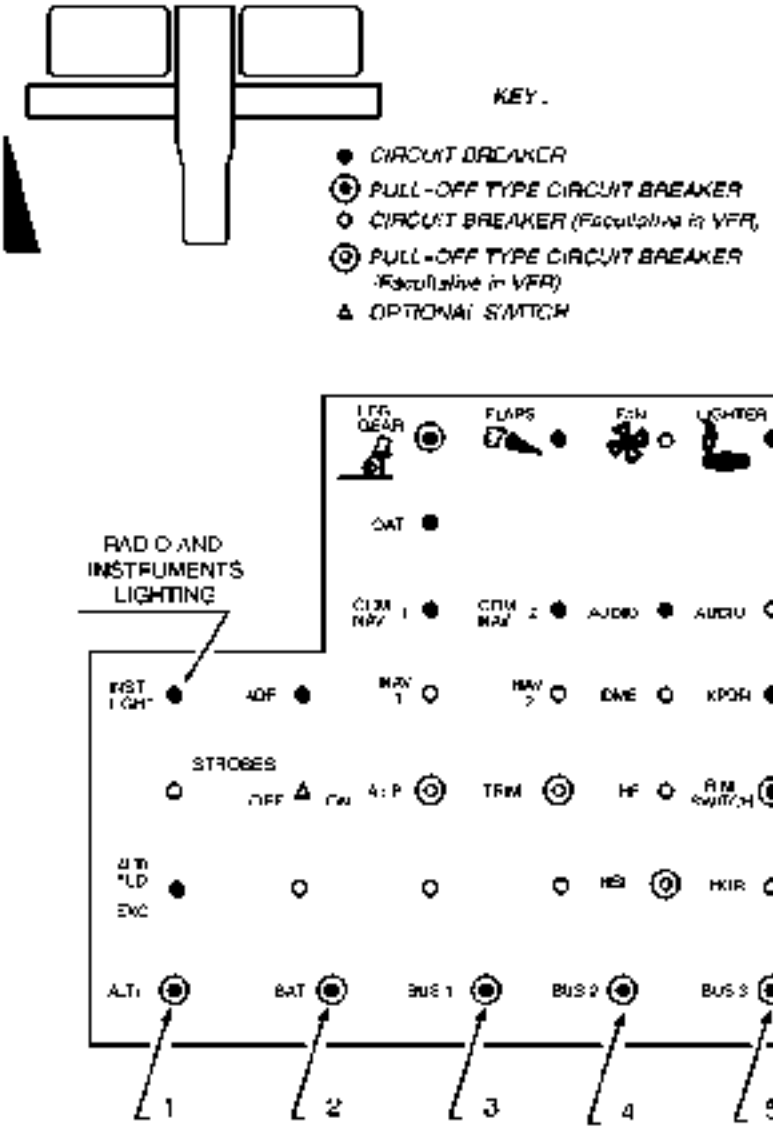

Figure 9.2.5A – CIRCUIT BREAKERS ASSEMBLY
(Typical arrangement)

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CIRCUIT BREAKERS ASSEMBLY

1 - Alternator "Pull-off" type circuit breaker (60 A)
2 - Battery "Pull-off" type circuit breaker (70 A)
3 - BUS bar 1 "Pull-off" type circuit breaker (30 A)
4 - BUS bar 2 "Pull-off" type circuit breaker (30 A)
5 - BUS bar 3 "Pull-off" type circuit breaker (30 A)

SECTION 2
LIMITATIONS

The installation and the operation of the night VFR equipment do not change the basic limitations of the airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

PLACARDS

This placard is located near the instruction plate

FLIGHT CONDITIONS : DAY AND NIGHT VFR
ICING CONDITIONS NOT ALLOWED

SECTION 3
EMERGENCY PROCEDURES

These procedures supplement those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

NORMAL LIGHTING FAILURE

- Switch on emergency lighting system
- Check that radio and instrument lighting circuit breaker is "ON"

LANDING LIGHT FAILURE

The left light has a wide beam and is considered as a taxi light, and the right one has a narrow beam and is considered as a landing light, but either or both can be used as desired

When landing without lights, it is suggested to use the same pitch attitude as that required to maintain the ILS Glide Slope

FIRE OR SMOKE OF ELECTRIC ORIGIN

- Disengage "pull-off" type circuit breaker of BUS bars 1, 2, 3.
- After a few moments reset "pull-off" type circuit breakers in the numerical order with a delay between each operation for observation. Disengage the faulty BUS bar and disconnect all the equipment supplied by the latter. See Figure 9.2.2.
- Reset "pull-off" type circuit breaker and reconnect one after the other all the disconnected equipment until the faulty equipment is found and isolated. Let the "pull-off" type circuit breaker tripped for this item.

VACUUM SYSTEM FAILURE

If the vacuum gage is below green arc or shows zero :

- the pneumatically operated attitude gyro indicator and / or heading indicator / HSI are inoperative.
- electric turn and bank indicator and magnetic compass continue to function normally

Fly the airplane carefully in partial panel mode, and proceed with landing as soon as possible

SECTION 4
NORMAL PROCEDURES

These procedures supplement those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

4.1 - PROCEDURES FOR VFR NIGHT FLIGHT

FIRST STEPS

Study the meteorology in order to avoid flying in hazardous conditions (minima, icing ...).

Check that fuel level is sufficient to comply with regulations.

BEFORE FLIGHT (may be undertaken or continued at night)

Check the operation :

. of anti-collision light(s)
. of navigation lights
. of cabin and instrument panel lighting
. of landing lights
. of day / night selector switch.

A flashlight must be provided on board the airplane

TAXIING

Check the operation of gyroscopic instruments by performing alternate turns :

- Attitude gyro indicator - set miniature airplane as required
- Heading indicator - correct rotation
- Turn and bank indicator - proper direction.

At night, preferably use only the taxi light (left landing light)

BEFORE TAKE-OFF

- Check vacuum gage in green arc
- Check VHF

  VOR or radiocompass

- At night or in damp weather, set the cabin air selector to maximum demisting

LINED UP ON RUNWAY

Check heading indicator and attitude gyro indicator bar

At night, turn on landing lights as required

TAKE-OFF

See Section 4 "Normal procedures" of the basic Pilot's Operating Handbook

Always maintain a positive rate of climb

At night, switch off the landing lights when safely airborne.

CLIMB, CRUISE AND DESCENT

See Section 4 "Normal procedures" of the basic Pilot's Operating Handbook

ILS APPROACH (pre-setting)

These values are given for a maximum weight.

Descent: (Δ vz) : 1 in.Hg per 100 ft
Speed variation (Δ IAS) : 1 in.Hg per 10 KIAS (12 MPH IAS)

	LDG	Flaps	KIAS	MPH IAS	RPM	MP in.Hg	FUEL FLOW	
							U.S Gal / hr	Litres / hr
Level flight holding	Up	0°	120	137	2500	19	11.7	44
	Down	0°	120	137	2500	25.3	16.5	62
	Up	0°	100	112	2500	16	9	34
	Down	0°	100	112	2500	22	13	49
Approach Descent 500 ft / min	Up	0°	100	112	2500	17	9	34
	Down	10°	90	106	2500	16	9	34
	Down	40°	75	87	As required full low pitch and MP			

Figure 9.2.6 - PRE-SETTINGS, ILS APPROACH

LANDING

At night, preferably use the R.H. landing light (long range) or both lights simultaneously.

4.2 - USE OF AVIONICS

TRANSMISSION

Transmission may be made either through the hand microphone, or through the headset boom microphone with its push-to-talk-switches located on the control wheels. Headsets that will not be used should be unplugged.

RECEPTION

The loud-speaker is the main equipment, the headset being considered as stand-by equipment

A selector switch selects reception on the loud-speaker or headset.

On headset operation, all receptions are simultaneous.

LIGHTING

Three controls are located on the left side of the L.H. instrument panel. See Figure 9.2.3 :

- Lower control (normal)

  Controls and regulates lighting of L.H. and R.H. instrument panels'visors.

- Central control (emergency) Pre-MOD.151

  Regulates lighting of both forward overhead lights. Rotating the overhead lights turns them on and off.

- Central control (emergency) Post-MOD.151

  Controls and regulates lighting of both forward overhead lights.

- Upper control (radio-equipment) operates and regulates :
  - Radio equipment lighting
  - Instruments and indicators lighting on instrument panel
  - Emergency landing gears and circuit breakers panel lighting

NOTE :
Both "normal" and "radio-equipment" controls and, Post-MOD.151, the emergency control operate and regulate lighting : from high position "OFF" turn clockwise for "FULL INTENSITY OPERATION", then, still clockwise, rotate towards "MINIMUM INTENSITY" : turn back to "OFF" turning counterclockwise.
The "emergency" position control, Pre-MOD.151, regulates lighting , from high position "FULL INTENSITY" turn clockwise to regulate to "MINIMUM INTENSITY" ; turn back to high position "FULL INTENSITY" turning counterclockwise

LANDING LIGHTS

The lights are controlled by two switch-breakers. See Figure 7.5B of the basic Pilot's Operating Handbook.

The L.H. light has a wide beam which facilitates taxiing.

The R.H. light has a long range beam and should be used for take-off and landing.

Simultaneous operation is possible.

DAY / NIGHT DIMMER

A day / night switch allows the indicator lights for the fuel pump, pitot heater and landing lights to be dimmed during night operations.

SECTION 5

PERFORMANCE

The installation and the operation of the night VFR equipment do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.
However, the installation of the externally mounted antennas will result in a minor reduction in cruise performance. See Section 5 "Performance" of the basic Pilot's Operating Handbook.

SUPPLEMENT

PROPELLER DE-ICING "T.K.S."

"OPTIONAL EQUIPMENT N° 522"

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SECTION 1

GENERAL

The propeller de-icing system "T.K.S." is a means of protection for the propeller blades in case of unforeseen icing conditions.

The de-icing system is based on ejection of "glycol" on each propeller blade leading edge.

The glycol tank (0.53 U.S Gal - 2 l) is attached on the inside of engine cowling, on upper L.H. side.

An inspection door allows filling.

The system control box is located on R.H. side of the lower panel strip on pilot's side.

It consists of :

- a three-position switch :

  . LO : low flow (maximum endurance = 2 hr 10)

  . OFF : stop

  . HI high flow (maximum endurance = 1 hr 35)

- a yellow warning light, on R.H. side of the switch blinks when the system is operating.

- a fuse.

SECTION 2

LIMITATIONS

The installation and the operation of the propeller de-icing system "T.K.S." do not change the basic limitations of the airplane described in Section 2 "Limitations" of the basic Flight Manuel.

CAUTION

FLIGHT UNDER ICING CONDITIONS
IS PROHIBITED IN SPITE OF
INSTALLATION OF ANTI-ICING EQUIPMENT

SECTION 3

EMERGENCY PROCEDURES

These procedures complete those of standard airplane described in Section 3 "Emergency procedures" of the basic Flight Manual.

CAUTION

FLIGHT UNDER ICING CONDITIONS IS PROHIBITED IN SPITE OF INSTALLATION OF ANTI-ICING EQUIPMENT

In case of unforeseen icing conditions and in case of engine vibration due to propeller icing, follow the "ICING " instructions given in Section 3 "Emergency procedures" as well as the procedure given hereafter :

- Position the "PROP DE-ICING ' switch on LO or HI (in case of severe icing)
- Check the operation : yellow warning light flashing
- Leave icing area as soon as possible
- After leaving icing area : switch set to OFF.

SECTION 4

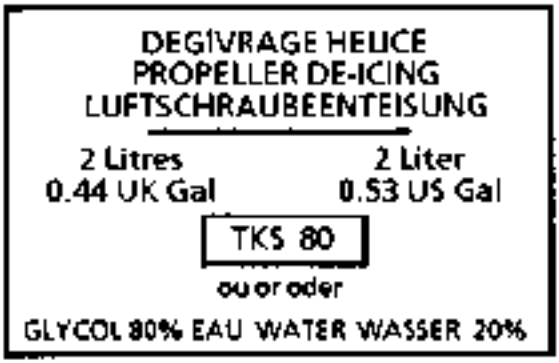
NORMAL PROCEDURES

These procedures complete those of standard airplane described in Section 4 "Normal procedures" of the basic Flight Manual.

Preflight check :

Full glycol tank	CHECKED

There is no other modification of the airplane normal procedures when the propeller de-icing system is installed



SECTION 5

PERFORMANCE

The installation and the operation of the propeller de-icing system "T.K.S." do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Flight Manual.

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SUPPLEMENT

"KING" AUTOPILOT TYPE KAP 100

"OPTIONAL EQUIPMENT N° 668"

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Figure 9.7.1 - KC 190 AUTOPILOT COMPUTER

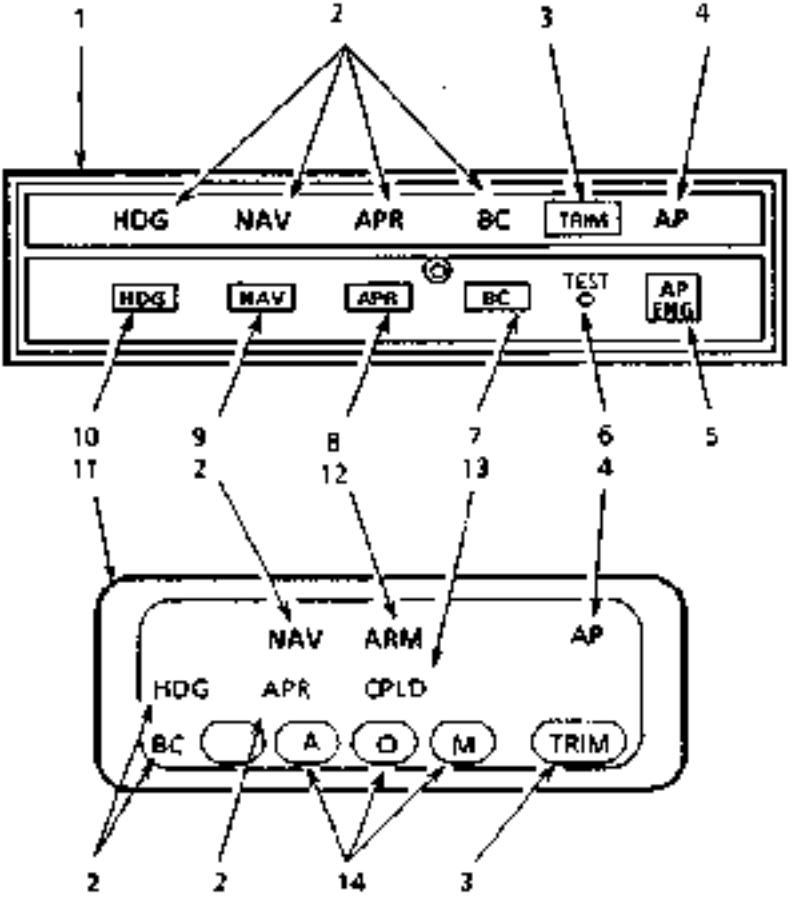

Figure 9.7.2 - KA 185 REMOTE MODE ANNUNCIATOR (Option)

SECTION 1

GENERAL

This supplement is provided to acquaint the pilot with the limitations as well as normal and emergency operating procedures of the King KAP 100 Automatic Flight Control System. The limitations presented are pertinent to the operation of the KAP 100 System as installed in the SOCATA Models TB 10, TB 200, TB 20 and TB 21 airplanes ; the Flight Control System must be operated within the limitations herein specified.

The KAP 100 Autopilot is certified in this airplane with roll axis control. The various instruments and the controls for the operation of the KAP 100 Autopilot are described in the figures of this supplement.

The KAP 100 Autopilot has an optional electric pitch trim system. The trim system is designed to withstand any single inflight malfunction. A trim fault is visually and aurally annunciated.

A lockout device prevents autopilot engagement until the system has been successfully preflight tested.

The following conditions will cause the Autopilot to automatically disengage :

A - Power failure

B - Internal Flight Control System failure

C - With the KCS 55A Compass System, a loss of compass valid (displaying HDG flag) disengages the Autopilot when a mode using heading information is engaged.
With the HDG flag present only the autopilot wings level mode can be selected.

D - (TB 21 only) Roll rates in excess of 14° per second will cause the Autopilot to disengage except when the CWS switch is held depressed.

Item 1 - KAP 100 KC 190 AUTOPILOT COMPUTER - Complete Autopilot Computer. Includes system mode annunciators and system controls.

Item 2 - MODE ANNUNCIATORS - Illuminate when a mode is selected by the corresponding mode selector button (PUSH ON - PUSH OFF).

Item 3 - TRIM WARNING LIGHT (TRIM) - Illuminates continuously whenever trim power is not on or the system has not been preflight tested. The TRIM warning light will illuminate and be accompanied by an audible warning whenever a manual pitch trim malfunction occurs (trim running without being commanded to run).

Item 4 - AUTOPILOT (AP) ANNUNCIATOR - Illuminates continuously whenever the autopilot is engaged. Flashes approximately 12 times whenever the autopilot is disengaged (an aural alert will also sound for 2 seconds).

Item 5 - AUTOPILOT ENGAGE (AP ENG) BUTTON - When pushed, engages autopilot if all logic conditions are met. When pushed again, disengages autopilot.

Item 6 - PREFLIGHT TEST (TEST) BUTTON - When momentarily pushed, initiates preflight test sequence which automatically turns on all annunciator lights, tests the roll rate monitor, checks the manual trim drive voltage, checks the manual electric trim monitor and tests all autopilot valid and dump logic. If the preflight is successfully passed, the AP annunciator light will flash for approximately 6 seconds (an aural tone will also sound simultaneously with the annunciator flashes).The autopilot can not be engaged until the autopilot preflight tests are successfully passed. When the autopilot is engaged, the test button should not be operated in flight

Item 7 - BACK COURSE APPROACH (BC) MODE SELECTOR BUTTON - When pushed will select the Back Course Approach Mode. This mode functions indentically to the approach mode except that response to LOC signals is reversed.

Item 8 - APPROACH (APR) MODE SELECTOR BUTTON - When pushed, will select the Approach mode. This mode provides all angle intercept (with HSI) or a fixed angle intercept of 45° (with DG), automatic beam capture and tracking of VOR, RNAV or LOC signals. The tracking gain of the APR mode is greater than the gain in the NAV mode. The APR annunciator will flash until the automatic capture sequence is initiated. On the KA 185 remote mode annunciator, APR ARM will annunciate until the automatic capture sequence is initiated. At beam capture, APR CPLD will annunciate.

Item 9 - NAVIGATION (NAV) MODE SELECTOR BUTTON - When pushed will select the Navigation mode. The mode provides all angle intercept (with HSI) or a fixed angle intercept of 45° (with DG), automatic beam capture and tracking of VOR, RNAV or LOC signals.
The NAV annunciator will flash until the automatic capture sequence is initiated. On the KA 185 remote mode annunciator, NAV ARM will annunciate until the automatic capture sequence is initiated. At beam capture, NAV CPLD will annunciate.

Item 10 - HEADING (HDG) MODE SELECTOR BUTTON - When pushed will select the Heading mode, which commands the airplane to turn to and maintain the heading selected by the heading bug on the DG or HSI.
A new heading may be selected at any time and will result in the airplane turning to the new heading with a maximum bank angle of about 18°. Selecting HDG mode will cancel NAV, APR or BC track modes.

Item 11 - KA 185 REMOTE MODE ANNUNCIATOR (OPTIONAL) - Provides mode annunciation in the pilot's primary scan area as well as three Marker Beacon lights.

Item 12 - ARMED (ARM) ANNUNCIATOR - Illuminates continuously along with NAV or APR when either the NAV or APR mode selector button is depressed. The ARM annunciator will continue to illuminate until the automatic capture sequence is initiated at which time ARM will extinguish and CPLD will annunciate.

Item 13 - COUPLED (CPLD) ANNUNCIATOR - Illuminates continuously along with NAV or APR at the initiation of automatic beam capture sequence in either the NAV or APR modes. Normally the CPLD condition follows an ARM condition but may be entered into directly if the beam capture criteria is met when NAV or APR is selected.

Item 14 - REMOTE MARKER BEACON LIGHTS - Remote Airway, Outer and Middle Marker Beacon lights driven by the Marker Beacon receiver.

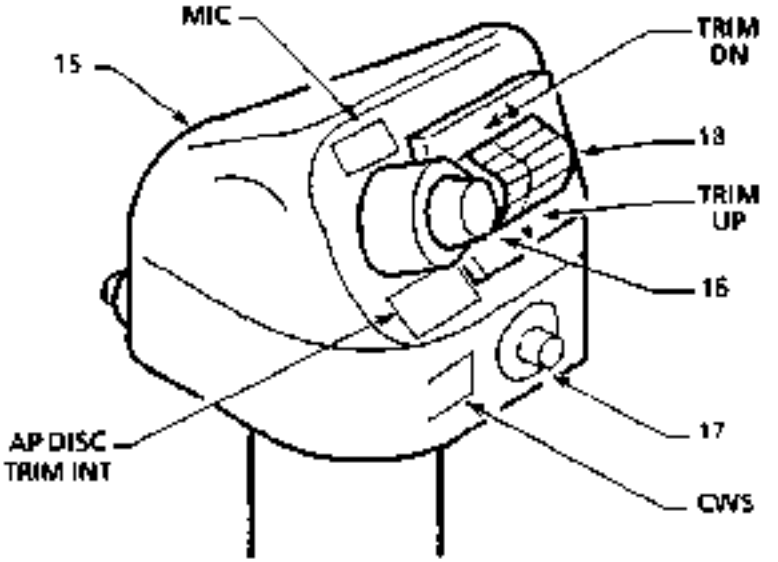

Figure 9.7.3 - AUTOPILOT CONTROL WHEEL SWITCH CAP

Item 15 - AUTOPILOT CONTROL WHEEL SWITCH CAP (installed with optional manual electric trim) (TB 20 - TB 21)
(installed on TB 10 and TB 200 airplanes without optional manual electric trim)
Molded plastic unit mounted on the left horn of the pilot's control wheel which provides mounting for the switch units associated with the autopilot and manual electric trim systems.

Item 16 - AUTOPILOT DISCONNECT / TRIM INTERRUPT (AP DISC TRM INT) SWITCH (installed with optional manual electric trim) (TB 20 - TB 21)
(installed on TB 10 and TB 200 airplanes without optional manual electric trim)
When depressed and released will disengage the autopilot and cancel all operating autopilot modes. When depressed and held will interrupt all electric trim power (stop trim motion), disengage the autopilot, and cancel all operating autopilot modes.

Item 17 - CONTROL WHEEL STEERING (CWS) BUTTON (installed with optional manual electric trim) - When depressed, allows pilot to manually control the airplane (disengages the servo) without cancellation of any of the selected modes.

Item 18 - MANUAL ELECTRIC TRIM CONTROL SWITCHES (installed with optional manual electric trim) - A split switch unit in which the left half provides power to engage the trim servo clutch and the right half to control the direction of motion of the trim servo motor. Both halves of the split trim switch must be actuated in order for the manual trim to operate in the desired direction.

Item 19 - KG 258 VERTICAL GYRO - Displays airplane attitude as a conventional attitude gyro. The gyro is air driven

Item 20 - ROLL ATTITUDE INDEX - Displays airplane roll attitude with respect to the roll attitude scale.

Item 21 - ROLL ATTITUDE SCALE - Scale marked at 0, ± 10, 20, 30, 60 and 90 degrees

Item 22 - PITCH ATTITUDE SCALE - Moves with respect to the symbolic airplane to present pitch attitude.
Scale graduated at 0, ± 5, 10, 15, 20 and 25 degrees.

Item 23 - SYMBOLIC AIRPLANE - Serves as a stationary symbol of the airplane. Airplane pitch and roll attitudes are displayed by the relationship between the fixed symbolic airplane and the movable background.

Item 24 - SYMBOLIC AIRPLANE ALIGNMENT KNOB - Provides manual positioning of the symbolic airplane for level flight under various load conditions.

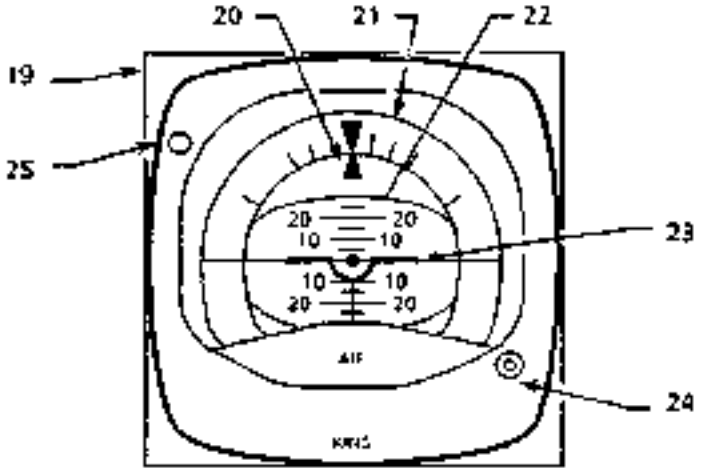

Figure 9.7.4 - KG 258 VERTICAL GYRO

Item 25 - DECISION HEIGHT (DH) ANNUNCIATOR LIGHT - Optional light for use with the airplane optional radar altimeter.

Item 26 - KI 525 A HORIZONTAL SITUATION INDICATOR (HSI) - Provides a pictorial presentation of airplane deviation relative to VOR radials or localizer beams. It also displays Glide Slope deviations and gives heading reference with respect to magnetic north.

Item 27 - NAV FLAG - Flag is in view when the NAV receiver signal is inadequate. When a NAV flag is present in the navigation indicator (CDI or KI 525 A) the autopilot operation is not affected. The pilot must monitor the navigation indicators for NAV flags to insure that the Autopilot is tracking valid navigation information.

Item 28 - LUBBER LINE - Indicates airplane magnetic heading on compass card (item 35)

Item 29 - HEADING WARNING FLAG (HDG) - When flag is in view the heading display is invalid. If a HDG flag appears and a lateral mode (HDG, NAV, APR or APR BC) is selected, the Autopilot will be disengaged. The Autopilot may be re-engaged in the basic wings level mode. The CWS switch would be used to manually maneuver the airplane laterally.

Item 30 - COURSE BEARING POINTER - Indicates selected VOR course or localizer course on compass card (Item 35). The selected VOR radial or localizer heading remains set on the compass card when the compass card (Item 35) rotates.

Item 31 - TO / FROM INDICATOR FLAG - Indicates direction of VOR station relative to selected course.

Item 32 - DUAL GLIDE SLOPE POINTERS - Indicate on Glide Slope scale (Item 33) airplane displacement from Glide Slope beam center. Glide Slope pointers in view indicate a usable Glide Slope signal is being received.

Item 33 - GLIDE SLOPE SCALES - Indicate displacement from Glide Slope beam center. A Glide Slope deviation bar displacement of 2 dots, represents full scale (0.7°) deviation above or below Glide Slope beam centerline.

Item 34 - HEADING SELECTOR KNOB (⮌) - Positions heading Bug (Item 39) on compass card (Item 35) by rotating the heading selector knob. The Bug rotates with the compass card.

Item 35 - COMPASS CARD - Rotates to display heading of airplane with reference to lubber line (Item 28) on HSI or DG.

Item 36 - COURSE SELECTOR KNOB - Positions course bearing pointer (Item 30) on the compass card (Item 35) by rotating the course selector knob.

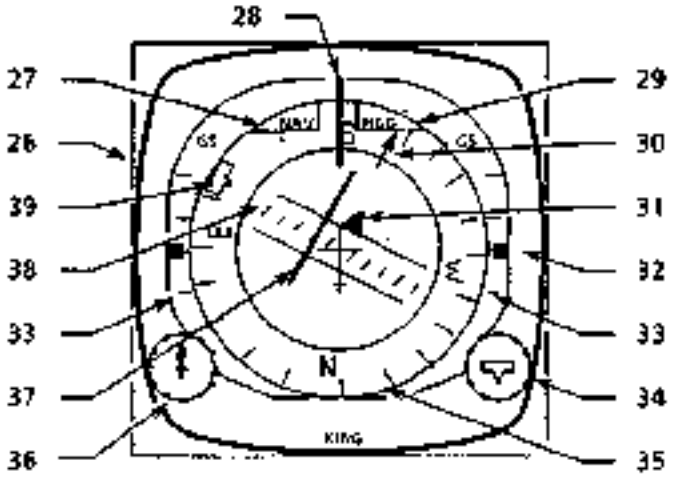

Figure 9 7.5 - KI 525 HSI

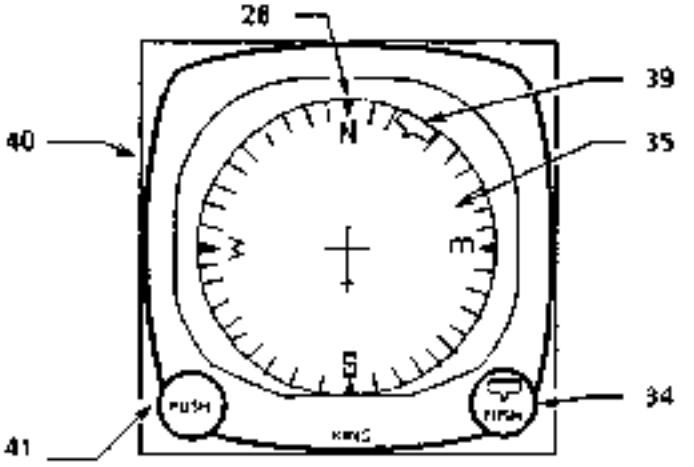

Figure 9 7.6 - KG 107 DG

Item 37 - COURSE DEVIATION BAR (D-BAR) - The center portion of omni bearing pointer moves laterally to pictorially indicate the relationship of airplane to selected course. It indicates in degrees of angular displacement from VOR radials and localizer beams or displacement in nautical miles from RNAV courses.

Item 38 - COURSE DEVIATION SCALE - A course deviation bar displacement of 5 dots represents full scale (VOR = ± 10° ; LOC = ± 2.5° ; RNAV = 5 NM ; RNAV APR = 1.25 NM) deviation from beam centerline

Item 39 - HEADING BUG - Moved by knob (Item 34) to select desired heading.

Item 40 - KG 107 NON-SLAVED DIRECTIONAL GYRO (DG) - Provides a stable visual indication of airplane heading to the pilot. The gyro is air driven.

Item 41 - GYRO ADJUSTMENT KNOB (PUSH) - When pushed in, allows the pilot to manually rotate the gyro compass card (Item 35) to correspond with the magnetic heading indicated by the magnetic compass.
The unslaved compass card must be manually reset periodically to compensate for precessional errors in the gyro.

Item 42 - VOR / LOC / GLIDE SLOPE INDICATOR - Provides rectilinear display of VOR / LOC and Glide Slope deviation.

Item 43 - COURSE INDEX - Indicates selected VOR course

Item 44 - COURSE CARD - Indicates selected VOR course under course index.

Item 45 - GLIDE SLOPE DEVIATION NEEDLE - Indicates deviation from ILS Glide Slope.

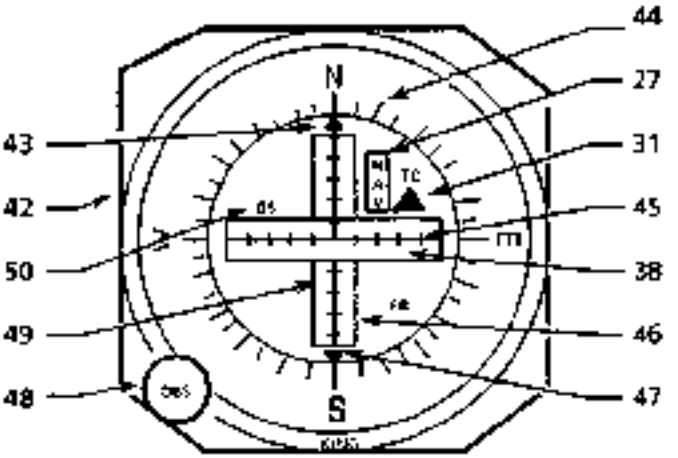

Figure 9.7.7 - KI 204 / 206 VOR / LOC / GS INDICATOR

Item 46 - GLIDE SLOPE SCALE - Indicates displacement from Glide Slope beam center. A Glide Slope deviation needle displacement of 5 dots represents full scale (0.7°) deviation above or below Glide Slope beam centerline.

Item 47 - RECIPROCAL COURSE INDEX - Indicates reciprocal of selected VOR course

Item 48 - OMNI BEARING SELECTOR (OBS) KNOB - Rotates course card to selected course.

Item 49 - COURSE DEVIATION NEEDLE - Indicates course deviation from selected omni course or localizer centerline

Item 50 - GLIDE SLOPE (GS) FLAG - Flag is in view when the GS receiver signal is inadequate.

The airplane MAIN SWITCH function is unchanged and can be used in an emergency to shut off electrical power to all flight control systems while the problem is isolated.

The AUTOPILOT MASTER switch supplies power to the AUTOPILOT (A/P) circuit-breaker.

The following circuit-breakers are used to protect the following elements of the KING KAP 100 Autopilot :

LABEL	FUNCTION
A/P	Supplies power to the KC 190, the autopilot roll servo, and the TRIM circuit-breaker.
TRIM	Supplies power to the optional manual electric pitch trim system.
HSI	Supplies power to the optional KCS 55A Compass System.

SECTION 2
LIMITATIONS

These limitations complete those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook

A - The autopilot must be OFF during take-off and landing and during approach under 200 ft height.

A' - Engagement height in climb and cruise 1000 ft.

B - It is forbidden to operate TEST button in flight

C - Maximum fuel imbalance :

20 U.S Gal (TB 20 - TB 21)	6 U.S Gal (TB 10 - TB 200)
75 litres	23 litres

D - Autopilot maximum airspeed limitation :

175 KIAS (TB 20 - TB 21)	150 KIAS (TB 10 - TB 200)
322 km/h	278 km/h

Placards :

CAUTION . DURING ILS APPROACH
AVOID ENGINE RPM HIGHER THAN 2600

SECTION 3
EMERGENCY PROCEDURES

These procedures complete those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook

A - System with Autopilot only

- In case of Autopilot malfunction : (accomplish the two following items simultaneously)
  - Airplane control wheel - GRASP FIRMLY and regain airplane control.
  - AP ENG button (AP DISC button on TB 10 and TB 200 airplanes) - PRESS to disengage autopilot.

B - Systems with Autopilot and optional manual electric trim

- In case of Autopilot malfunction : (accomplish the two following items simultaneously)
  - Airplane control wheel - GRASP FIRMLY and regain airplane control.
  - AP DISC TRM INT Switch - PRESS.
- In case of manual electric trim malfunction :

  AP DISC TRM INT switch - PRESS and HOLD

  TRIM circuit-breaker - PULL.
  - Airplane - RETRIM manually.

CAUTION

MAXIMUM BANKS DUE TO AUTOPILOT MALFUNCTION :

Configuration	Maximum banks
Cruise, climb, descent	60°
Maneuvers	45° (TB 20 - TB 21) 40° (TB 10 - TB 200)
Approach	30° (TB 20 - TB 21) 20° (TB 10 - TB 200)

SECTION 4
NORMAL PROCEDURES

These procedures complete those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

A - Preflight (Perform prior to each flight)

- GYROS - Allow 3-4 minutes for gyros to come up to speed.

- AUTOPILOT MASTER Switch - ON.

- PREFLIGHT TEST BUTTON - PRESS momentarily and NOTE :

a) All annunciator lights on (TRIM annunciator flashing).

b) After approximately 5 seconds, all annunciator lights off except AP which will flash approximately 12 times and then remain off.

NOTE :

If trim warning light stays on then the manual electric trim did not pass preflight test. The trim circuit-breaker should be pulled. The autopilot can still be used.

- MANUAL ELECTRIC TRIM (if installed) - TEST as follows

a) Actuate the left side of the split switch to the fore and aft positions. The trim wheel should not move on its own. Rotate the trim wheel manually against the engaged clutch to check the pilot's overpower capability.

b) Actuate right side of split switch unit to the fore and aft positions. The trim wheel should not move on its own and normal trim wheel force is required to move it manually.

c) Press the AP DISC TRM INT switch down and hold. Manual Electric Trim should not operate either nose up or nose down.

- AP ENG button - Press to engage autopilot.

- Control wheel - MOVE left or right to verify that the autopilot can be overpowered.

- Autopilot - DISENGAGE by pressing AP ENG button or optional AP DISC TRM INT switch. Verify that the autopilot disconnects and all modes are cancelled.

- TRIM - SET to take-off position

B - AUTOPILOT OPERATION

NOTE (Valid only for TB 10 and TB 200 airplanes) :

The minimum recommended airspeed for autopilot operation is 80 KIAS.

- Before take-off

Autopilot - DISENGAGE by pressing AP ENG button or optional AP DISC TRM INT switch.

Inflight autopilot engagement

AP ENG button - PRESS. Note AP annunciator on. If no other modes are selected the autopilot will operate in the wings level mode.

- Heading changes

a) Manual heading changes (with optional CWS button only)

CWS Button - PRESS and MANEUVER airplane to the desired heading.

. CWS Button - RELEASE. Autopilot will maintain airplane in wings level attitude.

NOTE :

Airplane heading may change in the wings level mode due to an airplane out of trim condition.

b) Heading hold

. Heading selector Knob - SET BUG to desired heading.

. HDG mode selector Button - PRESS. Note HDG mode annunciator ON. Autopilot will automatically turn the airplane to the selected heading.

c) Command Turns (Heading Hold mode ON)

. HEADING Selector Knob - MOVE BUG to the desired heading. Autopilot will automatically turn the airplane to the new selected heading.

- NAV Coupling

a) When equipped with HSI

. Course Bearing Pointer - SET to desired course.

NOTE :

When equipped with NAV 1 / NAV 2 switching and NAV 2 is selected, set OBS 2 to the desired course.

. HEADING SELECTOR KNOB - SET BUG to provide desired intercept angle.

. NAV Mode Selector Button - PRESS

If the Course Deviation Bar is greater than 2 to 3 dots : the airplane will continue in HDG mode (or wings level if HDG not selected) with the NAV annunciator flashing ; when the computed capture point is reached the HDG will disengage, the NAV annunciator will illuminate steady and the selected course will be automatically captured and tracked.

If the D-BAR is less than 2 to 3 dots . the HDG mode will disengage upon selecting NAV mode ; the NAV annunciator will illuminate steady and the capture / track sequence will automatically begin

b) When equipped with DG

. OBS Knob - SELECT desired course.

NAV Mode Selector Button - PRESS

Heading Selector Knob - ROTATE BUG to agree with OBS course.

NOTE :

When NAV is selected, the lateral operating mode will change from HDG (if selected) to wings level for 5 seconds. A 45° intercept angle will then be automatically established based on the position of the bug.

If the D-BAR is greater than 2 to 3 dots : the autopilot will annunciate HDG mode (unless HDG not selected) and NAV flashing ; when the computed capture point is reached the HDG annunciator will go out, the NAV annunciator will illuminate steady and the selected course will be automatically captured and tracked.

If the D-BAR is less than 2 to 3 dots : the HDG mode will disengage upon selecting NAV mode ; the NAV annunciator will illuminate steady and the capture / track sequence will automatically begin.

- Approach (APR) Coupling

"Erratic deviations have been observed with airplane flown down an ILS path with KING RADIO-NAV installations. Analysis of the phenomenon indicates that the fluctuations are due to an interference between propeller rotation frequency and one of LOC frequencies. The more sensitive conditions are met when the localizer beacon is right ahead and the engine speed is adjusted toward 2650 RPM.

The localizer use is not significantly impaired by the phenomenon when :

- engine speed is reduced to lower than 2600 RPM
- localizer beacon lies right or left by more than 30 degrees from airplane heading.

Autopilot APR mode operation should be discontinued whenever high engine power settings are anticipated. This can be done by switching to HDG mode or CWS mode or by switching off the autopilot.

a) When equipped with HSI

. Course Bearing Pointer - SET to desired course.

NOTE :

When equipped with NAV 1 / NAV 2 switching and NAV 2 is selected, set OBS 2 to the desired course.

. HEADING Selector Knob - SET BUG to provide desired intercept angle.

. APR Mode Selector Button - PRESS.

If the Course Deviation Bar is greater than 2 to 3 dots the airplane will continue in HDG mode (or wings level if HDG not selected) with the APR annunciator flashing ; when the computed capture point is reached, the HDG will disengage, the APR annunciator will illuminate steady and the selected course will be automatically captured and tracked.

If the D-BAR is less than 2 to 3 dots : the HDG mode will disengage upon selecting APR mode ; the APR annunciator will illuminate steady and the capture / track sequence will automatically begin.

b) When equipped with DG

. OBS Knob - SELECT desired approach course.

. APR Mode Selector Button - PRESS.

. Heading Selector Knob - ROTATE Bug to agree with OBS course.

NOTE :

When APR is selected, the lateral operating mode will change from HDG (if selected) to wings level for 5 seconds. A 45° intercept angle will then be automatically established based on the position of the bug.

If the D-BAR is greater than 2 to 3 dots : the autopilot will annunciate HDG mode (unless HDG not selected) and APR flashing ; when the computed capture point is reached the HDG annunciator will go out, the APR annunciator will illuminate steady and the selected course will be automatically captured and tracked.

If the D-BAR is less than 2 to 3 dots : the HDG mode will disengage upon selecting APR mode ; the APR annunciator will illuminate steady and the capture / track sequence will automatically begin.

- BC Approach Coupling

a) When equipped with HSI

Course Bearing Pointer - SET to the ILS front course inbound heading.

NOTE :

When equipped with NAV 1 / NAV 2 switching and NAV 2 is selected, set OBS to the ILS front course inbound heading.

. HEADING Selector Knob - SET BUG to provide desired intercept angle.

. BC Mode Selector Button - PRESS

If the Course Deviation Bar is greater than 2 to 3 dots : the airplane will continue in HDG mode (or wings level if HDG not selected) with BC annunciator steady and APR annunciator flashing ; when the computed capture point is reached the HDG will disengage, the BC and APR annunciators will illuminate steady and the selected course will be automatically captured and tracked.

If the D-BAR is less than 2 to 3 dots : the HDG mode will disengage upon selecting BC mode ; the APR BC annunciator will illuminate steady and the capture / track sequence will automatically begin.

b) When equipped with DG

. OBS Knob - SELECT the ILS front course inbound heading.

. BC Mode Selector Button - PRESS

. Heading Selector Knob - ROTATE Bug to the ILS front course inbound heading.

NOTE :

When BC is selected, the lateral operating mode will change from HDG (if selected) to wings level for 5 seconds. A 45° intercept angle will then be automatically established based on the position of the bug

If the D-BAR is greater than 2 to 3 dots the autopilot will annunciate HDG (unless HDG not selected) and BC modes with APR flashing ; when the computed capture point is reached the HDG annunciator will go out, the BC and APR annunciators will illuminate steady and the selected course will be automatically captured and tracked.

If the D-BAR is less than 2 to 3 dots the HDG mode will disengage upon selecting BC mode ; the BC and APR annunciators will illuminate steady and the capture / track sequence will automatically begin.

- Missed Approach

a) Autopilot - DISENGAGE by pressing AP ENG switch (AP DISC TRM INT switch on TB 10 and TB 200 airplanes), or optional AP DISC TRM INT switch.

b) MISSED APPROACH - EXECUTE.

c) AP ENG Button - PRESS (if AP operation is desired)
Note AP annunciator ON.

- Before landing

a) Autopilot - DISENGAGE by pressing AP ENG switch (AP DISC TRM INT switch on TB 10 and TB 200 airplanes), or optional AP DISC TRM INT switch.

SECTION 5

PERFORMANCE

The installation and the operation of the autopilot do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

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SUPPLEMENT

"KING" AUTOPILOT TYPE KFC 150 AND KAP 150

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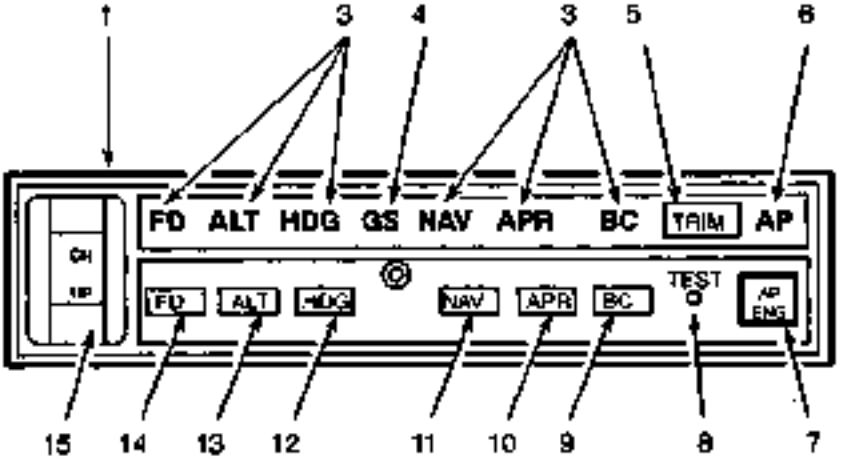

Figure 9.8.1 - KC 192 AUTOPILOT & FLIGHT DIRECTOR COMPUTER FOR KFC 150

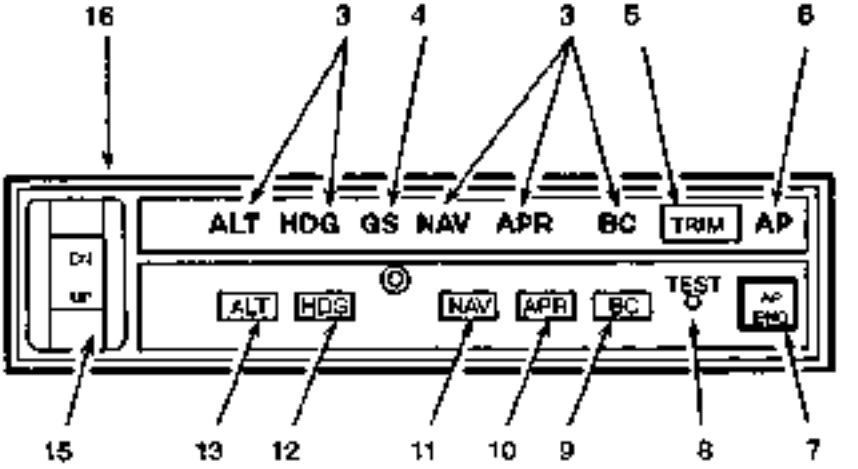

Figure 9.8.2 - KC 91 AUTOPILOT COMPUTER FOR KAP 150

SECTION 1
GENERAL

This supplement is provided to acquaint the pilot with the limitations as well as normal and emergency operating procedures of the King 150 AFCS (Automatic Flight Control Systems) Type KFC 150 and Type KAP 150. The limitations presented are pertinent to the operation of the King 150 System as installed in the SOCATA Models TB 10, TB 200, TB 20 and TB 21 airplanes ; the Flight Control Systems must be operated within the limitations herein specified.

The King 150 Series AFCS is certified in this airplane with 2 axis autopilot control, pitch and roll. The various instruments and the controls for the operation are described in the figures of this supplement.

The King 150 Series AFCS has an electric pitch trim system which provides autotrim during autopilot operation and manual electric trim for the pilot. The trim system is designed to withstand any single inflight malfunction.
Trim faults are visually and aurally annunciated.

A lockout device prevents autopilot engagement until the system has been successfully preflight tested.

The following conditions will cause the Autopilot to automatically disengage :

A - Power failure

B - Internal Flight Control System failure

C - With the KCS 55A Compass System, a loss of compass valid (displaying HDG flag) disengages the Autopilot when a mode using heading information is engaged.
With the HDG flag present, the Autopilot may be re-engeged in the basic wings level mode along with any vertical mode.

D - Pitch rates in excess of 5° (TB 20) 6° (TB 21) per second, and roll rates in excess of 14° per second (TB 21), will cause the autopilot to disengage except when the CWS switch is held depressed.

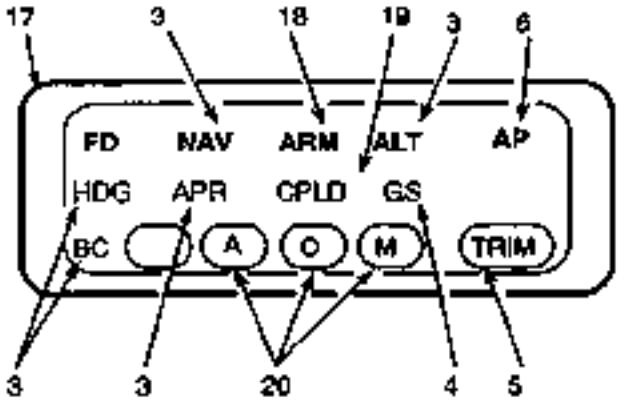

Figure 9.8.3 - KA 185 REMOTE MODE ANNUNCIATOR (OPTIONAL)

Item 1 – KFC 150 System KC 192 AUTOPILOT COMPUTER – Complete Flight Director and Autopilot computer, including system mode annunciators and system controls.

Item 2 – Not used.

Item 3 – MODE ANNUNCIATORS – Illuminate when a mode is selected by the corresponding mode selector button (PUSH ON – PUSH OFF).

Item 4 – GLIDE SLOPE (GS) ANNUNCIATOR – Illuminates continuously whenever the autopilot is coupled to the Glide Slope signal. The GS annunciator will flash if the Glide Slope signal is lost (GS flag in CDI or absence of Glide Slope pointers in KI 525A). The autopilot reverts to pitch attitude hold operation. If a valid Glide Slope signal returns within six seconds, the autopilot will automatically recouple in the GS mode. If the valid signal does not return within six seconds, the autopilot will remain in pitch attitude hold mode until such time that a valid Glide Slope returns and the airplane passes thru the Glide Slope. At that point GS couple will re-occur

Item 5 - TRIM WARNING LIGHT (TRIM) - Illuminates continuously whenever trim power is not on or the system has not been preflight tested. The TRIM warning light illuminates and is accompanied by an audible warning whenever a manual trim fault is detected. The Manual Trim System is monitored for the trim servo running without a command. The TRIM warning light will illuminate and be accompanied by an audible warning whenever an autotrim failure occurs. The autotrim system is monitored for the following failures : trim servo running without a command ; trim servo not running when commanded to run ; trim servo running in the wrong direction.

Item 6 - AUTOPILOT (AP) ANNUNCIATOR - Illuminates continuously whenever the autopilot is engaged. Flashes approximately 12 times whenever the autopilot is disengaged (an aural alert will also sound for 2 seconds).

Item 7 - AUTOPILOT ENGAGE (AP ENG) BUTTON - When pushed, engages autopilot if all logic conditions are met. When pushed again, disengages autopilot.

Item 8 - PREFLIGHT TEST (TEST) BUTTON - When momentarily pushed, initiates preflight test sequence which automatically turns on all annunciator lights, tests the roll and pitch rate monitors, tests the autotrim fault monitor, checks the manual trim drive voltage and tests all autopilot valid and dump logic. If the preflight is successfully passed, the AP annunciator light will flash for approximately six seconds (an aural tone will also sound simultaneously with the annunciator flashes).
The autopilot can't be engaged until the autopilot preflight tests are successfully passed.
When the autopilot is engaged, the test button should not be operated in flight.

Item 9 – BACK COURSE APPROACH (BC) MODE SELECTOR BUTTON When pushed will select the Back Course Approach mode. This mode functions identically to the approach mode except that response to LOC signals is reversed. Glide Slope coupling is inhibited in the Back Course Approach mode.

Item 10 - APPROACH (APR) MODE SELECTOR BUTTON – When pushed, will select the Approach mode. This mode provides all angle intercept (with HSI) or a fixed angle intercept of 45° (with DG), automatic beam capture and tracking of VOR, RNAV or LOC signals plus Glide Slope coupling in the case of an ILS. The tracking gain of the APR mode is greater than the gain in the NAV mode. The APR annunciator on the Autopilot Computer will flash until the automatic capture sequence is initiated. On the KA 185 Remote Mode annunciator, APR ARM will annunciate until the automatic capture sequence is initiated. At beam capture, APR CPLD will annunciate.

Item 11 - NAVIGATION (NAV) MODE SELECTOR BUTTON – When pushed will select the Navigation mode. The mode provides all angle intercept (with HSI) or a fixed angle intercept of 45° (with DG), automatic beam capture and tracking of VOR, RNAV or LOC signals.
The NAV annunciator on the Autopilot Computer will flash until the automatic capture sequence is initiated.
On the KA 185 Remote Mode Annunciator, NAV ARM will annunciate until the automatic capture sequence is initiated. At beam capture, NAV CPLD will annunciate.

Item 12 - HEADING (HDG) MODE SELECTOR BUTTON – When pushed will select the Heading mode, which commands the airplane to turn to and maintain the heading selected by the heading bug on the DG or HSI. A new heading may be selected at any time and will result in the airplane turning to the new heading with a maximum bank angle of about 18°.
Selecting HDG mode will cancel NAV, APR or BC track modes.

Item 13 - ALTITUDE HOLD (ALT) MODE SELECTOR BUTTON - When pushed will select the Altitude Hold mode, which commands the airplane to maintain the pressure altitude existing at the moment of selection
Engagement may be accomplished in climb, descent, or level flight. In the APR mode, altitude hold will automatically disengage when the Glide Slope is captured.

Item 14 - FLIGHT DIRECTOR (FD) MODE SELECTOR BUTTON - When pushed will select the Flight Director mode (with KC 192 Autopilot Computer only), bringing the Command Bar in view on the KI 256 and will command wings level and pitch attitude hold. The FD mode must be selected prior to Autopilot engagement.

Item 15 - VERTICAL TRIM CONTROL - A rocker switch (fitted with a return to neutral position through a spring) allows nose-down and nose-up maneuvers :

- adjusts, in ALT, altitude at a rate of about 500 ft / min.
- adjusts, when not in ALT, pitch attitude at a rate of 0.7 deg / sec
- cancels GS couple.
- the airplane must pass thru the Glide Slope again to allow GS recouple

Item 16 - KAP 150 SYSTEM KC 191 AUTOPILOT COMPUTER - Complete Autopilot computer, including system mode annunciators and system controls.

Item 17 - KA 185 REMOTE MODE ANNUNCIATOR (OPTIONAL) - Provides mode annunciation in the pilot's primary scan area as well as three Marker Beacon lights.

Item 18 - ARMED (ARM) ANNUNCIATOR - Illuminates continuously along with NAV or APR when either the NAV or APR mode selector button is depressed.
The ARM annunciator will continue to illuminate until the automatic capture sequence is initiated at which time ARM will extinguish and CPLD will annunciate.

Item 19 – COUPLED (CPLD) ANNUNCIATOR - Illuminates continuously along with NAV or APR at the initiation of automatic beam capture sequence in either the NAV or APR modes. Normally the CPLD condition follows an ARM condition but may be entered into directly if the beam capture criteria is met when NAV or APR is selected

Item 20 - REMOTE MARKER BEACON LIGHTS – Remote Airway, Outer and Middle Marker Beacon lights driven by the Marker Beacon receiver.

Item 21 – Not used.

Item 22 - AUTOPILOT CONTROL WHEEL SWITCH ASSEMBLY – Switch assembly mounted on the pilot's control wheel associated with the autopilot and manual electric trim systems.

Item 23 - AUTOPILOT DISCONNECT / TRIM INTERRUPT (AP DISC TRIM INT) Switch – When depressed will disengage the autopilot and cancel all operating Flight Director modes. When depressed and held will interrupt all electric trim power (stop trim motion), disengage the autopilot and cancel all operating Flight Director modes.

Item 24 – CONTROL WHEEL STEERING (CWS) BUTTON - When depressed, allows pilot to manually control the airplane (disengages the pitch and roll servos) without cancellation of any of the selected modes.

Will engage the Flight Director mode if not previously engaged. Automatically synchronizes the Flight Director / Autopilot to the pitch attitude present when the CWS switch is released, or to the present pressure altitude when operating in the ALT hold mode. Will cancel GS couple.

The airplane must pass through the Glide Slope again to allow GS recouple.

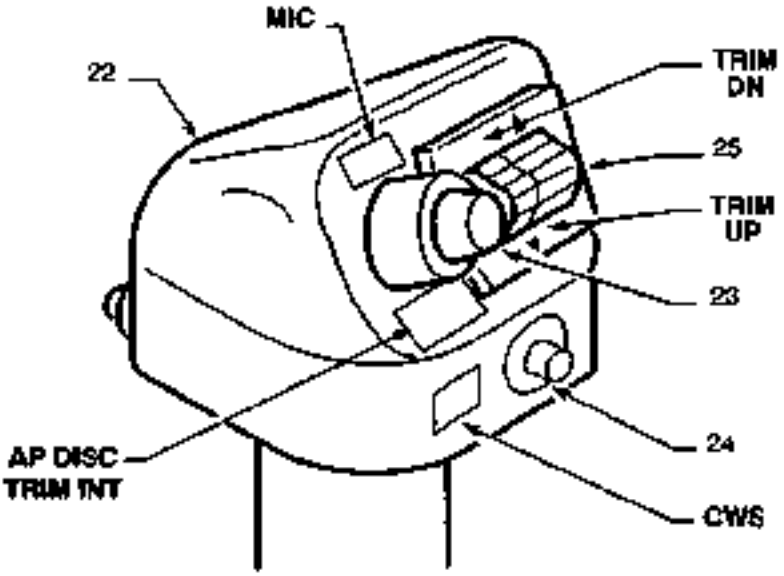

Figure 9.6.4 - AUTOPILOT CONTROL WHEEL SWITCH CAP

Item 25 - MANUAL ELECTRIC TRIM CONTROL SWITCHES - A split switch unit in which the left half provides power to engage the trim servo clutch and the right half to control the direction of motion of the trim servo motor. Both halves of the split trim switch must be actuated in order for the manual trim to operate in the desired direction. When the autopilot is engaged, operation of the manual electric trim will automatically disconnect the autopilot.

Item 26 - KI 256 FLIGHT COMMAND INDICATOR (FCI) - Displays airplane attitude as a conventional attitude gyro and displays commands for flight director operation. The gyro is air driven

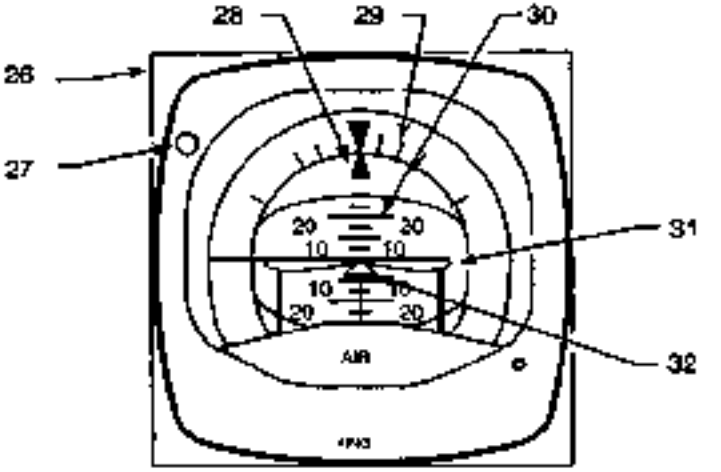

Figure 9.8.5 - KI 256 FLIGHT COMMAND INDICATOR FOR KFC 150

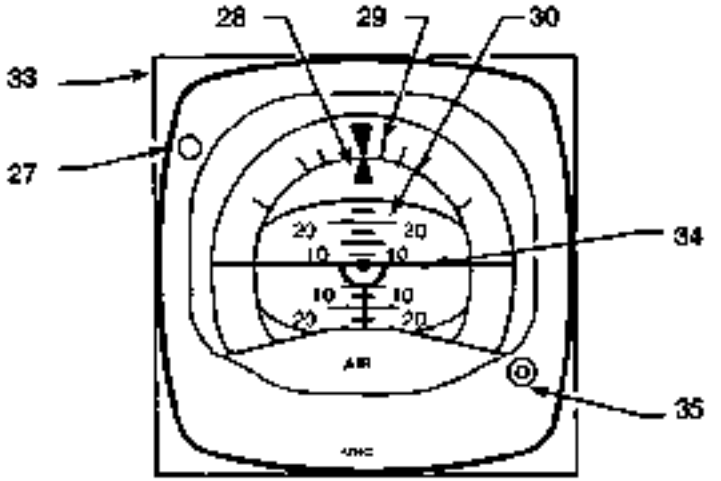

Figure 9.8.6 - KG 258 VERTICAL GYRO FOR KAP 150

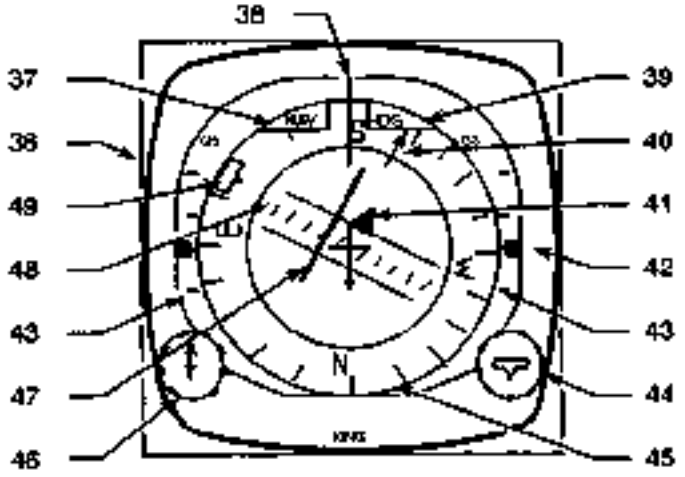

Figure 9.8.7 - KI 525A HSI FOR KFC 150

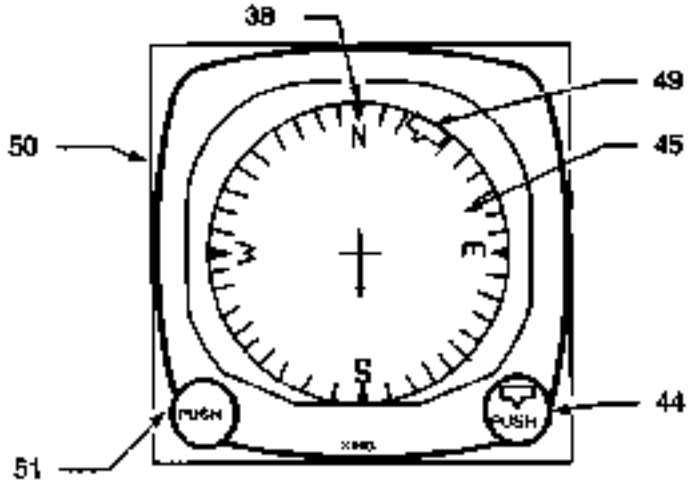

Figure 9.8.8 - KG 107 DG FOR KAP 150

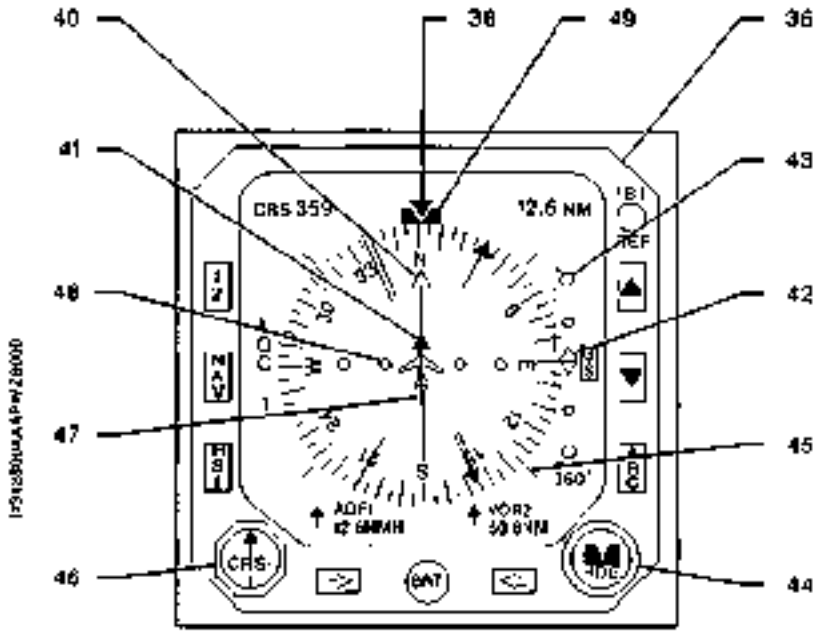

Figure 9.8.8A – EHSI

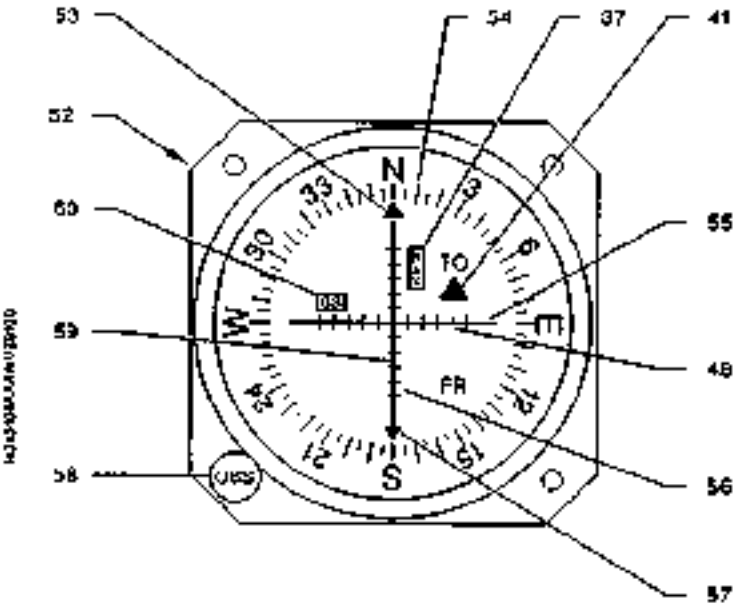

Figure 9.8.9 – KI 204 / 206 VOR / LOC / GS INDICATOR

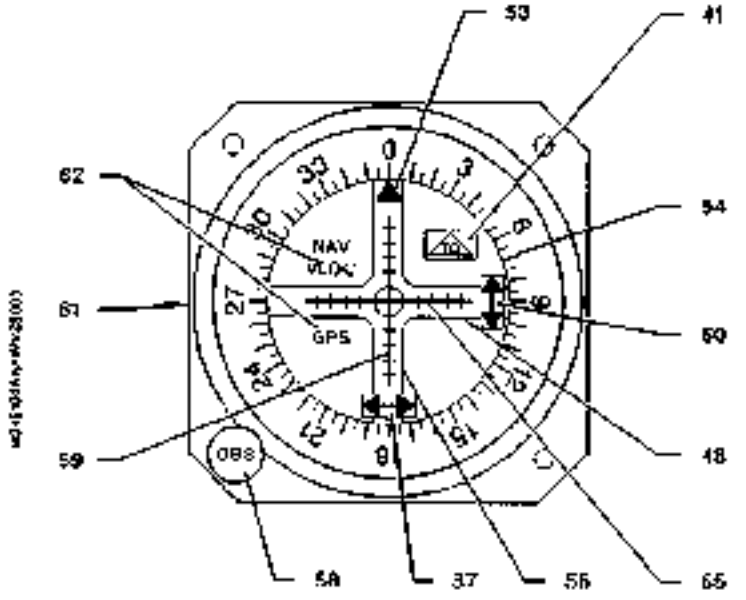

Figure 9.8.9A - GI 106A CDI

Item 27 - DECISION HEIGHT (DH) ANNUNCIATOR LIGHT - Optional light for use with the airplane optional radar altimeter.

Item 28 - ROLL ATTITUDE INDEX - Displays airplane roll attitude with respect to the roll attitude scale.

Item 29 - ROLL ATTITUDE SCALE - Scale marked at 0, ± 10, 20, 30, 60 and 90 degrees.

Item 30 - PITCH ATTITUDE SCALE - Moves with respect to the symbolic airplane to present pitch attitude.
Scale graduated at 0, ± 5, 10, 15, 20 and 25 degrees.

Item 31 - COMMAND BAR - Displays computed steering commands referenced to the symbolic airplane. The command bar is visible only when FD mode is selected. The command bar will be biased out of view whenever the system is invalid or a Flight Director mode is not engaged.

Item 32 - FCI SYMBOLIC AIRPLANE - Airplane pitch and roll attitude is displayed by the relationship between the fixed symbolic airplane and the movable background.
During flight director operation, the symbolic airplane is flown to align it with the command bar to satisfy the flight director commands.

Item 33 - KG 258 VERTICAL GYRO - Displays airplane attitude as a conventional attitude gyro. The gyro is air driven.

Item 34 - SYMBOLIC AIRPLANE - Serves as a stationary symbol of the airplane. Airplane pitch and roll attitudes are displayed by the relationship between the fixed symbolic airplane and the movable background.

Item 35 - SYMBOLIC AIRPLANE ALIGNMENT KNOB - Provides manual positioning of the symbolic airplane for level flight under various load conditions.

Item 36 - KI 525A HORIZONTAL SITUATION INDICATOR (HSI or EHSI) - Provides a pictorial presentation of airplane deviation relative to VOR radials or localizer beams.
It also displays Glide Slope deviations and gives heading reference with respect to magnetic north.

Item 37 - NAV FLAG – Flag is in view when the NAV receiver signal is inadequate. When a NAV flag is present in the navigation indicator (CDI or KI 525A or EHSI or KI 204/206) the autopilot operation is not affected.
The pilot must monitor the navigation indicators for NAV flags to insure that the Autopilot and / or Flight Director are tracking valid navigation information.

Item 38 - LUBBER LINE - Indicates airplane magnetic heading on compass card (Item 45).

Item 39 – HEADING WARNING FLAG (HDG) - When flag is in view, the heading display is invalid.
If a HGD flag appears and a lateral mode (HDG, NAV, APR or APR BC) is selected, the Autopilot will be disengaged.
The autopilot may be re–engaged in the basic wings level mode along with any vertical mode.
The CWS switch would be used to manually maneuver the airplane laterally.

Item 40 – COURSE BEARING POINTER - Indicates selected VOR course or localizer course on compass card (Item 45).
The selected VOR radial or localizer heading remains set on the compass card when the compass card (Item 45) rotates.

Item 41 - TO / FROM INDICATOR FLAG – Indicates direction of VOR station relative to selected course.

Item 42 - DUAL GLIDE SLOPE POINTERS - Indicate on Glide Slope scale (Item 43) airplane displacement from Glide Slope beam center. Glide Slope pointers in view indicate a useable Glide Slope signal is being received.

Item 43 – GLIDE SLOPE SCALES - Indicate displacement from Glide Slope beam center. A Glide Slope deviation bar displacement of 2 dots, represents full scale (0.7°) deviation above or below Glide Slope beam centerline.

Item 44 - HEADING SELECTOR KNOB (⇨ or ▮▮) – Positions heading bug (Item 49) on compass card (Item 45) by rotating the heading selector knob. The bug rotates with the compass card.

Item 45 - COMPASS CARD - Rotates to display heading of airplane with reference to lubber line (Item 38) on HSI or DG.

Item 46 - COURSE SELECTOR KNOB - Positions course bearing pointer (Item 40) on the compass card (Item 45) by rotating the course selector knob.

Item 47 - COURSE DEVIATION BAR (D-BAR) - The center portion of omni bearing pointer moves laterally to pictorially indicate the relationship of airplane to the selected course. It indicates degrees of angular displacement from VOR radials and localizer beams, or displacement in nautical miles from RNAV courses.

Item 48 - COURSE DEVIATION SCALE - A course deviation bar dis-placement of 5 dots represents full scale (VOR = ± 10°, LOC = ± 2.5°, RNAV = 5 NM, RNAV APR = 1.25 NM) deviation from beam centerline.

Item 49 - HEADING BUG - Moved by ⇦ or ⇨ knob (Item 44) to select desired heading.

Item 50 - KG 107 NON-SLAVED DIRECTIONAL GYRO (DG) - Provides a stable visual indication of airplane heading to the pilot. The gyro is air driven.

Item 51 - GYRO ADJUSTMENT KNOB (PUSH) - When pushed in, allows the pilot to manually rotate the gyro compass card (Item 45) to correspond with the magnetic heading indicated by the magnetic compass. The unslaved compass card must be manually reset periodically to compensate for precessional errors in the gyro.

Item 52 - KI 204 / 206 VOR / LOC / GLIDE SLOPE INDICATOR - Provides rectilinear display of VOR / LOC and Glide Slope deviation

Item 53 - COURSE INDEX - Indicates selected VOR course.

Item 54 - COURSE CARD - Indicates selected VOR course under course index.

Item 55 - GLIDE SLOPE DEVIATION NEEDLE - Indicates deviation from ILS Glide Slope.

Item 56 - GLIDE SLOPE SCALE - Indicates displacement from Glide Slope beam center. A Glide Slope deviation needle displacement of 5 dots, represents full scale (0.7°) deviation above or below Glide Slope beam centerline.

Item 57 - RECIPROCAL COURSE INDEX – Indicates reciprocal of selected VOR course.

Item 58 - OMNI BEARING SELECTOR (OBS) KNOB - Rotates course card to selected course.

Item 59 - COURSE DEVIATION NEEDLE - Indicates course deviation from selected omni course or localizer centerline.

Item 60 - GLIDE SLOPE (GS) FLAG - Flag is in view when the GS receiver signal is inadequate.

Item 61 - GI 106A CDI - Provides rectilinear display of VOR / LOC, Glide Slope and GPS deviation.

Item 62 - NAVIGATION SOURCE - Indicates if the CDI navigation source is the GPS (green GPS) or a VOR/LOC (white VLOC).

The airplane MAIN SWITCH function is unchanged and can be used in an emergency to shut off electrical power to all flight control systems while the problem is isolated.

The AUTOPILOT MASTER switch supplies power to the AUTOPILOT or A/P circuit breaker.

The following circuit breakers are used to protect the following elements of the King 150 Series Autopilot :

LABEL	FUNCTION
A/P	Supplies power to the KC 192 or the KC 191 computer, the autopilot pitch and roll servos, the optional KA 185 Annunciator and the Trim Circuit breaker
TRIM	Supplies power to the autotrim and manual electric pitch trim systems.
HSI	Supplies power to the optional KCS 55A Compass System.

SECTION 2
LIMITATIONS

These limitations complete those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

A - During autopilot operation, a pilot with seat belt fastened must be seated at the left pilot position.

B - The autopilot must be OFF during take-off and landing and during approach under 200 ft height.

C - Engagement height in climb and cruise 1000 ft.

D - The system is approved for Category I operation only (Approach mode selected).

E - It is forbidden to operate TEST button in flight.

F - Autopilot maximum airspeed limitation :

175 KIAS (TB 20 - TB 21)	150 KIAS (TB 10 - TB 200)
322 km/h	278 km/h

G - Maximum fuel imbalance :

20 U.S Gal (TB 20 - TB 21)	6 U.S Gal (TB 10 - TB 200)
75 litres	23 litres

NOTE :
In accordance with FAA recommendation, use of "ALTITUDE HOLD" mode is not recommended during operation in severe turbulence.

Placards (TB10 - TB200) :

CAUTION : DURING ILS APPROACH
AVOID ENGINE RPM HIGHER THAN 2600

SECTION 3

EMERGENCY PROCEDURES

These procedures complete those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

A - In case of Autopilot malfunction : (accomplish the two first following operations simultaneously).

- Airplane control wheel – GRASP FIRMLY and regain airplane control.
- AP DISC TRIM INT switch – PRESS and HOLD.
- AP DISC TRIM INT switch - RELEASE while observing pitch trim wheel. If pitch trim wheel is in motion, follow the B - procedure given hereafter.

B - In case of manual electric trim malfunction :

- AP DISC TRIM INT switch – PRESS and HOLD throughout recovery.
- TRIM circuit-breaker – OFF.
- Airplane - RETRIM manually.

CAUTION

WHEN DISCONNECTING THE AUTOPILOT AFTER A TRIM MALFUNCTION, HOLD THE CONTROL WHEEL FIRMLY ; UP TO 45 POUNDS OF FORCE ON THE CONTROL WHEEL MAY BE NECESSARY TO HOLD THE AIRPLANE LEVEL.

Maximum altitude losses and maximum banks due to autopilot malfunction :

Configuration	Alt Loss	Bank
Cruise, climb, Descent	500' * 450' **	60°
Maneuvering	300' * 50' **	40° * 45° **
Approach	100' * 50' **	20° * 30° **

* TB 10 – TB 200 – ** TB 20 – TB 21

SECTION 4
NORMAL PROCEDURES

These procedures complete those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

A - PREFLIGHT (Perform prior to each flight)

- GYROS - Allow 3–4 minutes for gyros to come up to speed.
- AUTOPILOT MASTER switch - ON.
- PREFLIGHT TEST BUTTON - PRESS momentarily and NOTE :
  (a) All annunciator lights ON (TRIM annunciator flashing)
  (b) After approximately 5 seconds, all annunciator lights off except AP which will flash approximately 12 times and then remain off

NOTE :
If trim warning light stays on then the autotrim did not pass preflight test. The autopilot circuit-breaker should be pulled (Manual electric trim and autopilot will be inoperative).

- MANUAL ELECTRIC TRIM - TEST as follows :
  (a) Actuate left side of split switch unit to the fore and aft positions. The trim wheel should not move on its own. Rotate the trim wheel manually against the engaged clutch to check the pilot's trim overpower capability.
  (b) Actuate right side of split switch unit to the fore and aft positions. Trim wheel should not move on its own and normal trim wheel force is required to move it manually.
  (c) Press the AP DISC TRIM INT switch down and hold. Manual electric trim should not operate either nose up or nose down.

- FLIGHT DIRECTOR (KFC 150 ONLY) - ENGAGE by pressing FD or CWS button.
- AP ENG button - Press to engage autopilot.
- FLIGHT CONTROLS - MOVE fore, aft, left and right to verify that the autopilot can be overpowered
- AP DISC TRIM INT Switch - PRESS. Verify that the autopilot disconnects and all flight director modes are canceled.
- TRIM - SET to take-off position.

B - AUTOPILOT OPERATION

NOTE (Valid only for TB 10 and TB 200 airplanes) :
The minimum recommended airspeed for autopilot operation is 80 KIAS.

- Before take-off

AP DISC TRIM INT Switch - PRESS.

- Inflight Autopilot engagement.

(a) FD Mode Selector Button (KFC 150 Only) - PRESS.

(b) AP ENG Button - PRESS. Note AP annunciator on. If no other modes are selected the autopilot will operate in wings level and pitch attitude hold.

CAUTION

DO NOT HELP THE AUTOPILOT AS THE AUTOPILOT WILL RUN THE PITCH TRIM TO OPPOSE YOUR HELP.

- Climb or descent

(a) Using CWS

. CWS Button - PRESS and MOVE airplane nose to the desired attitude.

. CWS Button - RELEASE. Autopilot will maintain airplane pitch attitude up to the pitch limits of + 15° or - 10°.

b) Using vertical Trim

. VERTICAL TRIM Control - PRESS either up or down to modify airplane attitude at a rate of 0.7 deg / sec. up to the pitch limits of + 15° or - 10°.

. VERTICAL TRIM Control - RELEASE when desired airplane attitude is reached. The autopilot will maintain the desired pitch attitude.

- Altitude Hold

(a) ALT Mode Selector Button - PRESS Note ALT mode annunciator ON Autopilot will maintain the selected pressure altitude.

(b) Change selected altitude

. Using CWS (recommended for altitude changes greater than 100 ft).

CWS Button - PRESS and reach desired pressure altitude.

CWS Button - RELEASE when desired pressure altitude is reached. The autopilot will maintain the desired pressure altitude.

. Using Vertical Trim (Recommended for altitude changes less than 100 ft).

VERTICAL TRIM Control - PRESS either up or down.

Vertical Trim will seek an altitude rate of change of about 500 ft / min.

VERTICAL TRIM Control - RELEASE when desired pressure altitude is reached. The autopilot will maintain the desired pressure altitude.

- Heading changes

(a) Manual Heading Changes

. CWS Button - PRESS and MANEUVER airplane to the desired heading.

. CWS Button - RELEASE. Autopilot will maintain airplane in wings level attitude.

NOTE :
Airplane heading may change in the wings level mode due to an airplane out of trim condition.

(b) Heading Hold

. Heading Selector Knob - SET BUG to desired heading.

HDG Mode Selector Button - PRESS. Note HDG mode annunciator ON. Autopilot will autometically turn the airplane to the selected heading.

(c) Command Turns (Heading Hold mode ON)

. HEADING Selector Knob - MOVE BUG to the desired heading. Autopilot will automatically turn the airplane to the new heading selected.

- NAV Coupling

(a) When equipped with HSI or EHSI

. Course Bearing Pointer - SET to desired course.

NOTE :
When equipped with NAV 1 / NAV 2 switching and NAV 2 is selected, set OBS 2 to the desired course.

. HEADING Selector Knob - SET BUG to provide desired intercept angle.

. NAV Mode Selector Button - PRESS.

If the Course Deviation Bar is greater than 2 to 3 dots : the airplane will continue in HDG mode (or wings level if HDG not selected) with the NAV annunciator flashing ; when the computed capture point is reached the HDG will disengage, the NAV annunciator will illuminate steady and the selected course will be automatically captured and tracked.

If the D-Bar is less than 2 to 3 dots : the HDG mode will disengage upon selecting NAV mode ; the NAV annunciator will illuminate steady and the capture / track sequence will automatically begin.

(b) When equipped with DG

. OBS Knob - SELECT desired course.

. NAV Mode Selector Button - PRESS

. Heading Selector Knob - ROTATE BUG to agree with OBS course.

NOTE :
When NAV is selected, the lateral operating mode will change from HDG (if selected) to wings level for 5 seconds. A 45 ° intercept angle will then be automatically established based on the position of the bug.

If the D-Bar is greater than 2 to 3 dots : the autopilot will annunciate HDG mode (unless HDG not selected) and NAV flashing; when the computed capture point is reached, the HDG annunciator will go out, the NAV annunciator will illuminate steady and the selected course will be automatically captured and tracked.

If the D-Bar is less than 2 to 3 dots, the HDG mode will disengage upon selecting NAV mode ; the NAV annunciator will illuminate steady and the capture / track sequence will automatically begin.

- Approach (APR) Coupling (TB10 - TB200)

"Erratic deviations have been observed with airplane flown down an ILS path with KING RADIO–NAV installations. Analysis of the phenomenon indicates that the fluctuations are due to an interference between propeller rotation frequency and one of LOC frequencies. The more sensitive conditions are met when the localizer beacon is right ahead and the engine speed is adjusted toward 2650 RPM.

The localizer use is not significantly impaired by the phenomenon when :

- engine speed is reduced to lower than 2600 RPM
- localizer beacon lies right or left by more than 30 degrees from airplane heading.

Autopilot APR mode operation should be discontinued whenever high engine power settings are anticipated. This can be done by switching to HDG mode or CWS mode or by switching off the autopilot.

(a) When equipped with HSI or EHSI

. Course Bearing Pointer - SET to desired course.

NOTE :
When equipped with NAV 1 / NAV 2 switching and NAV 2 is selected, set OBS 2 to the desired course.

. HEADING Selector Knob - SET BUG to provide desired intercept angle.

. APR Mode Selector Button – PRESS.

If the Course Deviation Bar is greater than 2 to 3 dots : the airplane will continue in HDG mode (or wings level if HDG not selected) with the APR annunciator flashing ; when the computed capture point is reached the HDG mode will disengage, the APR annunciator will illuminate steady and the selected course will be automatically captured and tracked.

If the D-Bar is less than 2 to 3 dots : the HDG mode will disengage upon selecting APR mode ; the APR annunciator will illuminate steady and the capture / track sequence will automatically begin.

(b) When equipped with DG

- OBS Knob - SELECT desired approach course
- APR Mode Selector Button - PRESS.
- Heading Selector Knob - ROTATE Bug to agree with OBS course.

NOTE :
When APR is selected, the lateral operating mode will change from HDG (if selected) to wings level for 5 seconds. A 45 ° intercept angle will then be automatically established based on the position of the bug.

If the D-Bar is greater than 2 to 3 dots : the autopilot will annunciate HDG mode (unless HDG not selected) and APR flashing ; when the computed capture point is reached the HDG annunciator will go out, the APR annunciator will illuminate steady and the selected course will be automatically captured and tracked.

If the D-Bar is less than 2 to 3 dots : the HDG mode will disengage upon selecting APR mode, the APR annunciator will illuminate steady and the capture / track sequence will automatically begin.

- BC Approach Coupling

(a) When equipped with HSI or EHSI

- Course Bearing Pointer - SET to the ILS front course inbound heading.

NOTE :
When equipped with NAV 1 / NAV 2 switching and NAV 2 is selected, set OBS to the ILS front course inbound heading.

- HEADING Selector Knob - SET BUG to provide desired intercept angle.
- BC Mode Selector Button - PRESS.

  If the Course Deviation Bar is greater than 2 to 3 dots : the airplane will continue in HDG mode (or wings level if HDG not selected) with BC annunciated steady and APR annunciator flashing ; when the computed capture point is reached the HDG will disengage, and the BC and APR annunciators will illuminate steady and the selected course will be automatically captured and tracked.

  If the D-Bar is less than 2 to 3 dots : the HDG mode will disengage upon selecting BC mode ; the APR BC annunciator will illuminate steady and the capture / track sequence will automatically begin.

(b) When equipped with DG

- OBS Knob -SELECT the ILS front course inbound heading.
- BC mode Selector Button – PRESS.
- Heading Selector Knob - ROTATE Bug to the ILS front course inbound heading.

NOTE :
When BC is selected, the lateral operating mode will change from HDG (if selected) to wings level for 5 seconds. A 45° intercept angle will then be automatically established based on the position of the bug.

If the D-Bar is greater than 2 to 3 dots : the autopilot will annunciate HDG (unless HDG not selected) and BC modes with APR flashing ; when the computed capture point is reached the HDG annunciator will go out, the BC and APR annunciators will illuminate steady and the selected course will be automatically captured and tracked

If the D-Bar is less than 2 to 3 dots : the HDG mode will disengage upon selecting BC mode ; the BC and APR annunciators will illuminate steady and the capture / track sequence will automatically begin.

- Glide Slope coupling

NOTE :
Glide Slope coupling is inhibited when operating in NAV or APR BC modes. Glide Slope coupling occurs automatically in the APR mode

(a) APR Mode - ENGAGED.

(b) At Glide Slope centering - NOTE GS annunciator ON.

NOTE :
Autopilot can capture Glide Slope from above or below the beam while operating in either pitch attitude hold or alt hold modes.

- Missed Approach

(a) AP DISC TRIM INT Switch - PRESS to disengage A / P.

(b) MISSED APPROACH - EXECUTE

(c) CWS Button - PRESS (KFC 150 only) as desired to activate FD mode during go-around maneuver.

(d) AP ENG BUTTON - PRESS (If A / P operation is desired). Note AP annunciator ON.

NOTE :
If it is desired to track the ILS course outbound as part of the missed approach procedure, use the NAV mode to prevent inadvertent GS coupling.

- Before Landing

AP DISC TRIM INT Switch - PRESS to disengage A / P.

C - FLIGHT DIRECTOR OPERATION (KFC 150 System Only)

NOTE :
The flight director modes of operation are the same as those used for autopilot operations except the autopilot is not engaged and the pilot must maneuver the airplane to satisfy the flight director commands.

SECTION 5
PERFORMANCE

The installation and the operation of the autopilot do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SUPPLEMENT

OXYGEN EQUIPMENT "PURITAN-BENNETT"

(FRONT SEATS PRESSURE-DEMAND TYPE MASKS)

"OPTIONAL EQUIPMENT N° 621-622-623"

TABLE OF CONTENTS

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SECTION 1
GENERAL

This equipment provides the necessary oxygen for 4 persons for flights at high altitude.

A storage oxygen cylinder, located on the rear bulkhead of the baggage hold, supplies the system with a pressure expanded to 75 psi (5 bars) by means of a pressure-reducing valve. The filling connector (AND 10089-3 type) and a pressure indicator are located on the cylinder.

On the upper duct, at level of pilot's head, are located a stop valve and a pressure indicator giving the pressure in the cylinder.

Four quick-disconnect connectors allow to connect four masks.

Two masks are equipped with a pressure-demand type regulator and with a microphone. The regulator possesses a two-position selector "Normal" and "100 %".
Pressure-demand type masks have a pressure indicator. The latter shows in case of normal pressure a green zone and in case of low pressure a red zone.

The two other masks are of constant-flow type.
Masks with constant flow have a flow indicator incorporated in the supply tube. A green zone appears when the mask is supplied.

SECTION 2
LIMITATIONS

These limitations supplement those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

a) In case of oxygen equipment use, the occupants number is limited to 4.

b) The pilot must mandatorily use a mask fitted with a mike.

c) When the oxygen cylinder is installed, the maximum weight of baggage admitted in the baggage compartment is limited to 110 lbs (50 kg).

d) Endurance

OXYGEN DURATION IN HOURS				
	ALTITUDE			
	10 000 ft (NORMAL)	15 000 ft (NORMAL)	20 000 ft (100%)	TB 21 25 000 ft (100%)
pilot	4 hr 05 min	5 hr 35 min	3 hr 45 min	4 hr 50 min
pilot & 1 passenger	2 hr 05 min	2 hr 45 min	1 hr 50 min	2 hr 25 min
pilot & 2 passengers	1 hr 35 min	2 hr 00 min	1 hr 30 min	1 hr 55 min
pilot & 3 passengers	1 hr 20 min	1 hr 35 min	1 hr 20 min	1 hr 35 min

NOTE :
These values are average values which can vary according to persons. They correspond to a cylinder completely filled with a pressure of 126 bars (approximately 1850 psi). When pressure is different, the endurance is proportional to the pressure in the cylinder.

For use limitations of oxygen equipment, comply with operational rules in force.

SECTION 3

EMERGENCY PROCEDURES

These procedures supplement those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

If the oxygen flow is interrupted, as indicated either by flow or pressure indicators or by symptoms of hypoxia:

- Install another mask, if available on an unused connector.
- If the flow cannot be restored, descend immediately under 12 500 ft

In case of smoke in the cockpit :

- Set oxygen regulation selector on "100 %".

SECTION 4
NORMAL PROCEDURES

These procedures supplement those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

BEFORE FLIGHT

- Check the oxygen endurance and note the pressure indicated by the pressure indicator.
- Connect the masks which are stored in head-rests of the seats. The pilot must mandatorily use a mask fitted with a mike.
- Turn on oxygen system - valve on "ON".
- The flow must be established in constant-flow masks ; at each inhaling in the mask, the flow indicator is green.
- Test the pressure-demand type masks ; the pressure indicator is green.
- Turn off the oxygen system.

IN FLIGHT

- Connect only the masks that will be worn by crew or passengers.
- Turn on the oxygen system : valve on "ON".
- Adjust the masks.
- Adjust the flow :

  . Up to 20 000 ft :

  Pressure-demand type mask : selector on "NORMAL".

  . Above 20 000 ft (Valid for TB 21 airplane) :

  Mask as required : selector on "100 %".

NOTE :
The position "100 %" can be used in case of smoke in the cockpit or in case of indisposition. The mask supplies only pure oxygen.

NOTE :
The use of "100 %" position of the pressure-demand type masks under 20 000 ft involves an oxygen consumption more important than foreseen and the endurance can feel itself very reduced.

- Observe the flow and pressure indicators and the oxygen reserve.

WARNING

SMOKING IS STRICTLY PROHIBITED ANY TIME OXYGEN IS IN USE.

OIL, FATTY OR GREASY SUBSTANCES, INCLUDING SOAPS, LIPSTICK, AFTER-SHAVE LOTION AND MAKE UP ARE CAPABLE OF SPONTANEOUS COMBUSTION ON CONTACT WITH OXYGEN.

SECTION 5

PERFORMANCE

The installation and the operation of the oxygen equipment do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SUPPLEMENT

OXYGEN EQUIPMENT "PURITAN-BENNETT"
(FRONT SEATS CONSTANT-FLOW TYPE MASKS)

TABLE OF CONTENTS

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SECTION 1
GENERAL

This equipment provides the necessary oxygen for 4 persons for flights at high altitude.

A storage oxygen cylinder, located on the rear bulkhead of the baggage hold, supplies the system with a pressure expanded to 75 psi (5 bars) by means of a pressure-reducing valve. The filling connector (AND 10089-3 type) and a pressure indicator are located on the cylinder.

On the upper duct, at level of pilot's head, are located a stop valve and a pressure indicator giving the pressure in the cylinder.

Four quick-disconnect connectors allow to connect four masks. Two masks (front) are equipped with a microphone.

The four masks are of constant-flow type.

Masks with constant flow have a flow indicator incorporated in the supply tube. A green zone appears when the mask is supplied.

SECTION 2
LIMITATIONS

These limitations supplement those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

a) In case of oxygen equipment use, the occupants number is limited to 4.

b) The pilot must mandatorily use a mask fitted with a mike.

c) When the oxygen cylinder is installed, the maximum weight of baggage admitted in the baggage compartment is limited to 110 lbs (50 kg)

d) Endurance

OXYGEN DURATION IN HOURS				
	ALTITUDE			
	10 000 ft	15 000 ft	20 000 ft	TB 21 25 000 ft
pilot	8 hr 07 min	8 hr 17 min	8 hr 27 min	8 hr 36 min
pilot & 1 passenger	4 hr 03 min	4 hr 09 min	4 hr 14 min	4 hr 18 min
pilot & 2 passengers	2 hr 42 min	2 hr 46 min	2 hr 49 min	2 hr 52 min
pilot & 3 passengers	2 hr 02 min	2 hr 04 min	2 hr 07 min	2 hr 09 min

NOTE :
These values are average values which can vary according to persons. They correspond to a cylinder completely filled with a pressure of 126 bars (approximately 1850 psi). When pressure is different, the endurance is proportional to the pressure in the cylinder.

For use limitations of oxygen equipment, comply with operational rules in force.

SECTION 3

EMERGENCY PROCEDURES

These procedures supplement those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

If the oxygen flow is interrupted, as indicated by flow indicators or by symptoms of hypoxia:

- Install another mask, if available, on an unused connector.
- If the flow cannot be restored, descend immediately under 12 500 ft.

In case of smoke in the cockpit :

- Descend immediately under 12 500 ft.

SECTION 4

NORMAL PROCEDURES

These procedures supplement those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

BEFORE FLIGHT

- Check the oxygen endurance and note the pressure indicated by the pressure indicator.
- Connect the masks which are stored in head-rests of the seats. The pilot must mandatorily use a mask fitted with a mike
- Turn on oxygen system : valve on "ON".
- The flow must be established in constant-flow masks. At each inhaling in the mask, the flow indicator is green.
- Turn off the oxygen system.

IN FLIGHT

- Connect only the masks that will be worn by crew or passengers.
- Turn on the oxygen system : valve on "ON".
- Adjust the masks.
- Observe the flow indicators and the oxygen reserve.

WARNING

SMOKING IS STRICTLY PROHIBITED ANY TIME OXYGEN IS IN USE.

OIL, FATTY OR GREASY SUBSTANCES, INCLUDING SOAPS, LIPSTICK, AFTER-SHAVE LOTION AND MAKE UP ARE CAPABLE OF SPONTANEOUS COMBUSTION ON CONTACT WITH OXYGEN.

SECTION 5

PERFORMANCE

The installation and the operation of the oxygen equipment do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6

WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in. (m)
	35 - OXYGEN			
A	TB 20 - TB 21 Oxygen system equipment Pre-MOD.151 (OPT10 062115 M)	PURITAN-BENNETT	32.19 (14.60)	115.35 (2.99)
A	Oxygen system equipment Post-MOD.151 (OPT10 062105 M)	PURITAN-BENNETT	32.19 (14.60)	115.35 (2.99)
A	Oxygen constant-flow masks with radio (Qty 2) (OPT10 FB21 00M)	PURITAN-BENNETT	0.71 (0.32)	55.12 (1.40)
A	Oxygen constant-flow masks without radio (Qty 2) (OPT10 062000 M)	PURITAN-BENNETT	0.53 (0.24)	90.55 (2.30)
A	TB 21 Oxygen system equipment Post-MOD.151 and with option OPT10 21002 (Air conditioning) (OPT10 062106 M)	PURITAN-BENNETT	32.19 (14.60)	115.35 (2.93)

SUPPLEMENT

GROUND POWER RECEPTACLE

TABLE OF CONTENTS

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SECTION 1
GENERAL

The ground power receptacle permits the use of an external power source for cold weather starting and during lenghty maintenance work on the electrical and avionics equipment. The receptacle is located under the baggage compartment access door, near the ant -twist edge.

NOTE :
If no avionics equipment is to be used or worked on, the avionics power switches should be turned off or the circuit breakers should be released or, if installed, set "Radio Master" switch to OFF.
If maintenance is required on the avionics equipment, it is advisable to utilize a battery cart external power source to prevent damage to the avionics equipment by transient voltage.

NOTE :
The auxiliary power source relay disconnects battery automatically, when the ground power receptacle is powered. Therefore it is impossible to service battery without having removed it from the airplane.

SECTION 2
LIMITATIONS

The limitations hereafter supplement those of the standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

PLACARDS

The following placards are located above the ground power receptacle access door :

Valid for English speaking countries

Valid for Brazil

SECTION 3

EMERGENCY PROCEDURES

The installation and the operation of the ground power receptacle do not change the basic emergency procedures of the airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

SECTION 4

NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

Engine starting using auxiliary power does not change the basic procedures, however

WARNING

IF THE BATTERY HAS BEEN REMOVED, BEFORE CONNECTING THE AUXILIARY POWER SOURCE, ISOLATE ELECTRICAL HARNESS TERMINAL LUGS USING RUBBER OR PLASTIC OR CHECK THEIR ISOLATION

CAUTION

IT IS RECOMMENDED TO LET THE ENGINE RUN WITH THE AUXILIARY POWER ONLY IF THE "RADIO MASTER" IS OFF.

Airplanes not equipped with the 'Radio Master' switch

The avionics power switches should be turned off.

Airplanes equipped with the "Radio Master" switch

Electrical power supply of radio communication and radio navigation systems is automatically cut off during engine starting sequence.

All

WARNING

WHEN TURNING ON THE MAIN SWITCH, USING AN EXTERNAL POWER SOURCE, OR PULLING THE PROPELLER THROUGH BY HAND, TREAT THE PROPELLER AS IF THE MAGNETO SWITCHES WERE ON :

DO NOT STAND, NOR ALLOW ANYONE ELSE TO STAND, WITHIN THE ARC OF THE PROPELLER, SINCE A LOOSE OR BROKEN WIRE, OR A COMPONENT MALFUNCTION, COULD CAUSE THE ENGINE TO START

The ground power receptacle circuit incorporates a polarity reversal protection. Power from the external power source will flow only if the ground power receptacle is correctly connected to the airplane. If the plug is accidentally connected backwards, no power will flow to the electrical system, thereby preventing any damage to electrical equipment.

The following check should be made after starting engine and removing the external power source, if there is any question as to the condition of the battery.

(1) Main switch - OFF.

(2) Taxi and landing lights switch-breakers - ON

(3) Engine RPM - REDUCE to idle.

(4) Main switch - ON (with taxi and landing lights ON).

(5) Alt Fld switch-breaker - ON

(6) Engine RPM - INCREASE to approximately 1500 RPM.

(7) Voltmeter - CHECK.
If the voltmeter is in red sector or, Post-MOD 182, if V < 24 Volts (VOLT lamp illuminated) : remove the battery for servicing

(8) Lights switch-breakers - OFF.

SECTION 5
PERFORMANCE

The installation and the operation of the ground power receptacle do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SUPPLEMENT

AUXILIARY DRY AIR PUMP

"OPTIONAL EQUIPMENT Nr 632"

TABLE OF CONTENTS

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SECTION 1
GENERAL

The auxiliary dry air pump system, electrically driven, provides an independent backup source of pneumatic power to operate the gyro flight instruments in the event the engine driven air pump fails. This "Pump-Electric motor" assembly is located on the L.H. side under cabin floor.

The auxiliary pump operates through the switch on L.H. instrument panel strip.

The auxiliary system electrical protection is provided by 2 circuit-breakers labeled "AUX SUCT" and located on L.H. side instrument panel, on the pilot's left hand :

- a 2 amp. circuit-breaker for the control circuit
- a 10 amp. circuit-breaker for the power circuit

At the head of the L.H. instrument panel, 2 lights incorporating a press-to-test feature, located on the alarms panel, enable to check for condition the vacuum system. Two vacuum switches illuminate these lights :

- the L.H. red light labeled "GYRO SUCT", when illuminated, indicates the drop of "normal" or "auxiliary" suction,
- the R.H. green light labeled "AUX SUCT", when illuminated, indicates that "auxiliary" pump is activated and operates correctly.

CAUTION

THE AUXILIARY PUMP USE, WHEN SUCTION IS NORMAL (main pump operating correctly), AFFECTS NEITHER THE GENERAL OPERATION OF VACUUM SYSTEM, NOR THE GYRO FLIGHTS INSTRUMENTS.

THE AUXILIARY PUMP OPERATION MAY LEAD TO AN ELECTRICAL OVERLOAD AND, THEREFORE, IS NOT RECOMMENDED DURING NORMAL OPERATION.

SECTION 2
LIMITATIONS

These limitations complete those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook. These limits must be on a placard located at level with control switch of the auxiliary pump, on L.H. instrument panel strip :

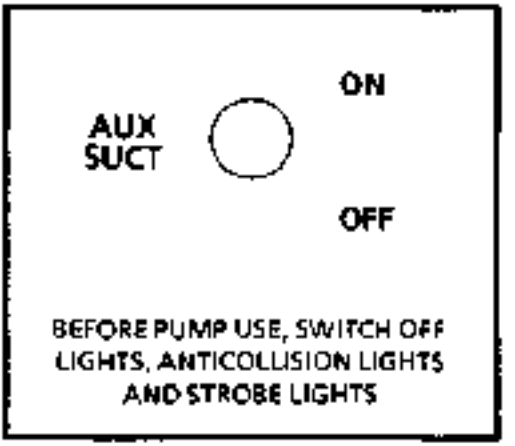

Figure 9.14.1 - AUXILIARY DRY AIR PUMP SWITCH PLACARD

SECTION 3
EMERGENCY PROCEDURES

These procedures complete those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

MAIN VACUUM PUMP FAILURE

"GYRO SUCT" red light	ILLUMINATED
Suction gage	OUT OF GREEN SECTOR
Landing and taxiing lights	OFF
Anticollision light (if installed)	OFF
Strobe lights (if installed)	OFF
"AUX SUCT" switch	ON
"AUX SUCT" green light	ILLUMINATED
"GYRO SUCT" red light	OFF
Suction gage	GREEN SECTOR

SECTION 4
NORMAL PROCEDURES

These procedures complete those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

BEFORE STARTING ENGINE

Main switch	ON
"AUX SUCT" switch	ON
"AUX SUCT" green light	ILLUMINATED
"GYRO SUCT" red light	OFF
Suction gage	GREEN SECTOR
Gyro flight instruments	ON
"AUX SUCT" switch	OFF
"GYRO SUCT" red light	ILLUMINATED
"AUX SUCT" green light	OFF
Main switch	OFF

DURING FLIGHT

The auxiliary pump operation may lead to an electrical overload and therefore must only be used in the event main vacuum pump fails. See Section 3 "Emergency procedures" of this supplement.

SECTION 5
PERFORMANCE

The installation and the operation of the AUXILIARY DRY AIR PUMP do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SUPPLEMENT

"TKS" ICE PROTECTION SYSTEMS

TABLE OF CONTENTS

SECTION 1
GENERAL

This supplement must be included in the Pilot's Operating Handbook. when "TKS" Ice Protection Systems are installed in accordance with the SOCATA option No. 687 or C687 00M or C687 05M or C687 25M - refer to Section 6 of tho present Supplement.

The information contained herein supplements or supersedes basic placards, instrument markings and instructions of the basic Pilot's Operating Handbook.

SECTION 2
LIMITATIONS

These limitations supplement those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

Flight into known icing conditions is approved provided that the following equipment is installed in accordance with "TKS" and SOCATA drawings and is serviceable .

- All equipment required for night IFR
- "TKS" wing, empennage, propeller and windshield ice protection systems
- Wing inspection light
- Non-icing cabin heat air inlet
- Fuel tank vent shields
- On TB 20, SOCATA modification No. 47 (manually operated "ALTERNATE AIR" system) must be applied.
- On TB 21, SOCATA modification No. 79 (manually operated "ALTERNATE AIR" system) is applied from S/N 1280.

DE-ICING FLUID

CAUTION

UNDER NO CIRCUMSTANCES ARE FLUIDS OTHER THAN THOSE LISTED BELOW TO BE USED IN THE "TKS" SYSTEM.

SOME FLUIDS CURRENTLY USED FOR GROUND DE-ICING PURPOSES CONTAIN THICKENING AGENTS WHICH MAY BLOCK THE POROUS PANELS. IF IT IS KNOWN OR SUSPECTED THAT SUCH A FLUID HAS BEEN PLACED IN THE TANK, DO NOT OPERATE THE SYSTEM, CONTACT "TKS" FOR INSTRUCTIONS

De-icing fluids must meet one of the following specifications : TKS R328 , TKS 80 : AL-5 (DTD 406B)
In this case, they may be mixed in the airplane tank in any proportions.
Fluids to DTD 406B are available under a number of proprietary names (e g Aeroshell Compound 07).

NOTE :
The system is intended to be operated continuously in icing conditions at the "Anti-icing" flow rate. With 'De-ice' selected, the rate of fluid consumption is doubled.

With two-blade propeller

Maximum system endurance :

- With ANTI-ICE selected ..... 3 hours 20 minutes
- With DE-ICE selected ..... 1 hour 40 minutes

Endurance for a typical mission :

- With DE-ICE selected ..... 2 minutes hr every 30 minutes
- With WINDSHIELD selected .... 5 seconds hr every 10 minutes
- ENDURANCE ..... 2 hours 50 minutes

With three-blade propeller (OPT10 61-001 version B)

Maximum system endurance :

- With ANTI-ICE selected ..... 2 hours 50 minutes
- With DE-ICE selected ..... 1 hour 25 minutes

Endurance for a typical mission :

- With DE-ICE selected ..... 2 minutes hr every 30 minutes
- With WINDSHIELD selected .... 5 seconds hr every 10 minutes
- ENDURANCE ..... 2 hours 27 minutes

All

The following placards are to be fitted :

(1) On the outside of the tank filler door

TKS ICE PROTECTION TANK
USE ONLY THE FOLLOWING FLUIDS :
TKS 80 ; AL-5 (DTD 406B) . TKS R328

(2) On the upper skin surface at the root end of each wing and stabilator (total 4 places)

"TKS" ICE PROTECTION

CAUTION
POROUS DE-ICING PANELS MAY BE DAMAGED BY CERTAIN SOLVENTS
REFER TO SECTION 8 OF "T.K.S." SUPPLEMENT TO PILOT'S OPERATING HANDBOOK

(3) Near the drain

TKS SYSTEM

Purge - Drain - Entleerung

The following placard may be fitted

(4) Near the instruction plate

FLIGHT CONDITIONS : DAY AND NIGHT IFR AND VFR
FLIGHT IN ICING CONDITIONS PERMITTED
REFER TO FLIGHT MANUAL SUPPLEMENT

(5) On the instruction plate, delete the following paragraph :

"ICING CONDITIONS ..... PROHIBITED"

SECTION 3

EMERGENCY PROCEDURES

These procedures supplement those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

NOTE :
During examination of this supplement, the pilot is advised to identify the ice protection panel and controls.

ICE PROTECTION SYSTEM FAILURE

- In the event of loss of flow to the airframe/propeller ice protection system (indicated by a low pressure warning in the form of two flashing red lights on the control panel and/or by failure of the porous panels to control or prevent ice formation) take **immediate** action to exit icing conditions in the most expedient manner.

- Switch off "TKS" system and check fluid contents

  NOTE :
  With the airplane in the climbing attitude the contents indicator will under read significantly and the quantity of unusable fluid will be increased (see Sections 6 and 7 of this supplement).
  If the tank contents are known to be low, reduce the angle of climb if possible, then re-prime the system as detailed below.

- If adequate fluid remains and ANTI-ICE was previously selected :

  Select DE-ICE and check operation. If the low pressure warning is cancelled and ice protection restored, flight in icing conditions may be continued, **BUT THE REMAINING ICE PROTECTION SYSTEM ENDURANCE WILL BE HALVED.**

If this is not effective, or if the failure occured with DE-ICE selected :

Prime the system by selecting windscreen de-ice for a series of 5 second operations until clear fluid, free from air, is discharged onto the windscreen (Note that this may take up to twenty operations of the windscreen pump). Re-select the airframe system and check operation. If the low pressure warning is not cancelled within 30 seconds, switch off and repeat priming secuence.

CAUTION

THE WINDSCREEN PUMP IS INTERMITTENTLY RATED.

DO NOT OPERATE FOR PERIODS OF MORE THAN 5 SECONDS. ALLOW AT LEAST 5 SECONDS BETWEEN EACH OPERATION

- Increase approach and landing speeds of 10 kts if ice is present on the (normally) protected regions of the airframe. Do not use "Landing" flap if ice is present on the stabilator.

ALTERNATOR FAILURE

Wing ice protection light . . . . . Check OFF

SECTION 4
NORMAL PROCEDURES

These procedures supplement those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

NOTE :
*Checks marked * may be omitted if the flight will not be into known icing conditions.*

PREFLIGHT INSPECTIONS

COCKPIT

1 - Switches

Prime and/or inspect prior to flight :	
Airframe/propeller pump switch 'ANTI-ICE' / 'DE-ICE'	* On ANTI-ICE or DE-ICE
Wing inspection light	ON

AIRFRAME INSPECTION

2 - Fluid tank

Quantity	* Checked (Mini. indicated : 1.7 U.S Gallons - 6.4 l)
Filler cap	SECURE
Filler door	CLOSED
Drain	Check closed and not leaking

3 - Porous panels

Condition and security	Checked
Evidence of fluid flow	* From all panels checked
Wing inspection light	ON checked

SWITCHES

All	OFF

BEFORE STARTING THE ENGINE

Fluid quantity indicator CHECK QUANTITY SUFFICIENT FOR INTENDED FLIGHT AND PREVAILING CONDITIONS
(Mini. indicated : 1.7 U.S Gallons = 6.4 l if system is to be considered operational)
(See Sections 6 and 7 for weight and balance limitations and calibration of contents indicator)

System operation and indicator lights * Select ANTI-ICE
CHECK THAT BOTH INDICATOR LIGHTS FLASH RED INITIALLY, THEN CANCEL AS PRESSURE RISES, WITH GREEN "ANTI-ICE ON" REMAINING ILLUMINATED
* Select DE-ICE
CHECK THAT GREEN "DE-ICE ON" IS ILLUMINATED

NOTE :
If a delay occurs between the selection of ANTI-ICE and DE-ICE the indicator lamps may flash red for a short period until normal operating pressure is restored. This is acceptable provided that the flashing red indication is replaced by a steady green light within 30 seconds.

Pump switches OFF

IN FLIGHT - GENERAL

Check that "ALTERNATE AIR" (if installed) is fully pulled whenever ice protection is on.

NOTE :
Pulling the "ALTERNATE AIR" control may cause the power rating to drop.

BEFORE TAKE-OFF – CLIMB

Airframe/propeller pump switch
"ANTI ICE" / "DE ICE" ANTI ICE
If icing conditions prevailing or anticipated
Wing inspection light ON as required
"ALTERNATE AIR" (If installed) FULLY PULLED
if IOAT below + 39.3°F (+ 4°C) and
visible moisture present
Otherwise PUSHED

DURING FLIGHT

AIRFRAME AND PROPELLER

Airframe/propeller pump switch
"ANTI-ICE" / "DE-ICE" ANTI-ICE
When icing conditions encountered
or anticipated

Airframe/propeller pump switch
"ANTI-ICE" / "DE-ICE" If ice accreted before
ice protection switched on,
DE-ICE until ice cleared,
then ANTI-ICE

NOTE :
The time taken to remove established ice is variable and can be prolonged under certain circumstances, especially if the "TKS" system has not been operated within the preceding few hours. It is recommended that the "TKS" system is operated for two minutes at DE ICE prior to entering icing conditions or immediately on entering icing conditions. In light icing conditions it is recommended that the "TKS" system is operated at DE-ICE as soon as icing is encountered until the leading edges are cleared. The system may then be switched off until changing conditions demand its use.

WINDSHIELD

To de-ice windshield use windshield pump as required to maintain/restore vision. Apply fluid to windshield in short bursts of 3 to 5 seconds duration allowing sufficient time for airflow to spread fluid between applications

"ALTERNATE AIR"
(if installed) FULLY PULLED
If ICAT below – 39.3°F (+ 4°C) and visible moisture present
Otherwise PUSHED

Wing inspection light ON as required

HOLDING IN ICING CONDITIONS

CAUTION

RETRACTION OF SEVERELY ICED LANDING GEAR MAY CAUSE DAMAGE

The objective for holding in icing conditions is to use power and configuration settings which will present the least projected frontal area to the airstream, whilst maintaining adequate temperature of cabin heat and demist airflow. Forward flight planning will to some extent help towards avoiding rapid flight level changes, etc... where undesirable configurations may become necessary.

The following is recommended :

- Minimum power setting : 65 %
- Do not extend flaps
- Avoid unnecessary landing gear extension.

DESCENT - LANDING

CAUTION

IF IT IS KNOWN OR SUSPECTED THAT ICE IS PRESENT ON THE HORIZONTAL STABILISER, DO NOT EXTEND THE FLAPS BEYOND THE TAKE-OFF POSITION

- Select ANTI-ICE / DE-ICE as required
- Minimise the period during which flaps are extended beyond the take-off position
- If the windscreen is obscured by ice, de-ice in advance of final approach and landing in order to allow sufficient time for ice removal and fluid dispersion
- "ALTERNATE AIR"
  (if installed) FULLY PULLED
  if IOAT below + 39.3°F (+ 4°C) and visible moisture present
  Otherwise PUSHED

AFTER LANDING

SWITCHES

Airframe/propeller pump switch "ANTI-ICE" / "DE-ICE"	OFF
Wing inspection light	OFF
"ALTERNATE AIR" (if installed)	PUSHED

SECTION 5
PERFORMANCE

These performance supplement those of standard airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

- On TB 20, from S/N 948 :
  The use of the "Alternate Air" will reduce the rate of climb by 150 feet/minute and alter the takeoff distance by about 10 % , these alterations will be added to those indicated in table - Figure 9 15 1
- On TB 21 :
  A very severe icing of the engine air intake may cause a power drop which may bring about a loss of 5 kt on cruise speeds and 100 feet/minute on rate of climb ; these alterations will be added to those indicated in table – Figure 9.15.1.
  In case of prolonged climb at maximum power and when the "Alternate Air" is used (if installed), carefully observe engine temperatures and, if necessary, adopt a higher climb speed.

Ice accretions will affect the performance of the airplane both with and without the ice protection system operating. Figure 9 15 1 shows typical performance changes

NOTE :
The actual performance changes will vary, dependent on the shape as well as the size of ice formations. For this reason the data shown in Figure 9.15.1 is to be used ***AS A ROUGH GUIDE ONLY.***

PARAMETER	ICE ON ENTIRE AIRFRAME	ICE ON UNPROTECTED REGIONS ONLY
Cruise speed reduction	12 knots per inch of ice thickness	2 knots per inch of ice thickness
Stall speed increase	Up to 20 knots per inch of ice thickness	No significan: change

Figure 9 15 1

CAUTION

ICE ACCRETIONS OF A SIGNIFICANT SIZE CAN ACCUMULATE ON THE UNPROTECTED REGIONS OF THE AIRPLANE AFTER PROLONGED FLIGHT IN ICING CONDITIONS

The airplane has been tested with both natural and artificial representations of such ice accretions and found not to exhibit any unacceptable performance or handling qualities.

It must be remembered, however, that considerable speed reductions can result and these must be taken into account when calculating the endurance and range of the airplane.

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in (m)
	30 - ICE AND RAIN PROTECTION			
A	Ice protection systems (24 VDC) (Not valid for U.S. aircraft) (OPT10 C687 00M)	TKS	+0.665 (+18,40)	74.80 (1,90)
A	Ice protection systems (28 VDC) Pre-MOD 151 (Not valid for U.S. aircraft) (OPT10 C687 00M)	TKS	+0.565 (+18,40)	74.80 (1,90)
A	Ice protection systems (28 VDC) Post-MOD 151 (Not valid for U.S. aircraft) (OPT10 C687 05M)	TKS	+0.565 (+18,40)	74.80 (1,90)
A	Ice protection systems (28 VDC) Post-MOD 151 and OPT10 61-001 version B (Three-blade propeller) (Not valid for U.S. aircraft) (OPT10 C687 25M)	TKS	+0.665 (+18,40)	74.80 (1,90)

The fluid density is 9.2 lbs per U.S Gal. (1.1 kg/l).
There are no changes in weight and balance limits with the system fitted.
The contents indicator will underestimate the quantity of fluid on board except when the tank is full. For the purposes of weight and balance either determine the true weight of fluid from the table below, or add 0.9 U.S Gal. (3.4 litres) to the indicator reading [For system endurance purposes either the uncorrected display value is to be taken, or the correction table (See Figure 9.15.2) may be used. Correction data is also shown, in graphical form in Section 7 of this supplement].

Indicator reading U.S Gal.	True contents U.S Gal (litres)	Weight lb (kg)	Arm in (m)	Moment lb.in/1000 (m.kg)
0	0.7 (2.7) or less	6.4 (2.9)	109 (2.8)	0.70 (8.1)
0.5	1.2 (4.5)	11 (5)	109 (2.8)	1.20 (14)
1	1.7 (6.4)	15.6 (7.1)	109 (2.8)	1.71 (19.9)
2	2.8 (10.6)	25.7 (11.7)	109 (2.8)	2.81 (32.8)
3	3.8 (14.4)	35 (15.9)	109 (2.8)	3.81 (44.5)
4	4.7 (17.8)	43.2 (19.6)	109 (2.8)	4.72 (54.9)
5	5.5 (20.8)	50.6 (23)	109 (2.8)	5.52 (64.4)
6	6.3 (23.8)	58 (26.3)	109 (2.8)	6.32 (73.6)
7	7.0 (26.5)	64.4 (29.2)	109 (2.8)	7.02 (81.8)
7.7	7.5 to 7.9 (28.4 to 29.5)	69 (31.3) 71.8 (32.6)	109 (2.8) 109 (2.8)	7.52 (87.6) 7.83 (91.3)

Figure 9.15.2 Weight and balance table, de icing fluid
Airplane in level attitude on ground

SECTION 7
DESCRIPTION

This airplane is equipped with fluid (liquid) ice protection systems for the aerofoils, propeller and windshield. These systems are supplied with de-icing fluid from a single tank located below the floor of the baggage compartment.

With two-blade propeller

Maximum fluid consumption is :

- ANTI-ICE mode	2.4 U.S Gal. / hr (9.1 l / hr)
- DE-ICE mode	4.8 U.S Gal. / hr (18.2 l / hr)

With three-blade propeller (OPT10 61-001 version B)

Maximum fluid consumption is :

- ANTI-ICE mode	2.6 U.S Gal. / hr (9.8 l / hr)
- DE-ICE mode	5.2 U.S Gal. / hr (19.7 l / hr)

All

The tank is serviced through a filler located on the left hand side of the fuselage, to the rear of the baggage compartment door. The filler orifice is attached to the inside of a door and moves outward with the door as it is opened. Special containers are not required to accomplish filling.
Tank capacity is 7.8 U.S Gal. (29.6 litres). The unusable volume is 0.1 U.S Gal. (0.4 litre) with the airplane in the level attitude, increasing to 1.45 U.S Gal. (5.5 litres) in the climb attitude (measured at 10.5° nose up). Hence the usable quantities are 7.7 and 6.35 U.S Gal. (29.2 and 24.1 litres) respectively.
Fluid quantity is measured by a float operated sensor which transmits an electrical signal to the indicator located on the ice protection control panel. Errors exist over most of the range between the true tank contents and the value indicated. A correction table is provided in Section 6 and the data is shown graphically in Figure 9.15.3.
If the system is to be considered operational, a minimum of 2.5 U.S Gal. (9.4 litres) should be present in the tank before take-off. This is represented by an indicator reading of 1.7 U.S Gal. (6.4 litres).
A drain is provided. This is located beneath the right fuselage slightly aft of the wing leading edge and is used for priming of the feed pipeline in addition to tank drainage.

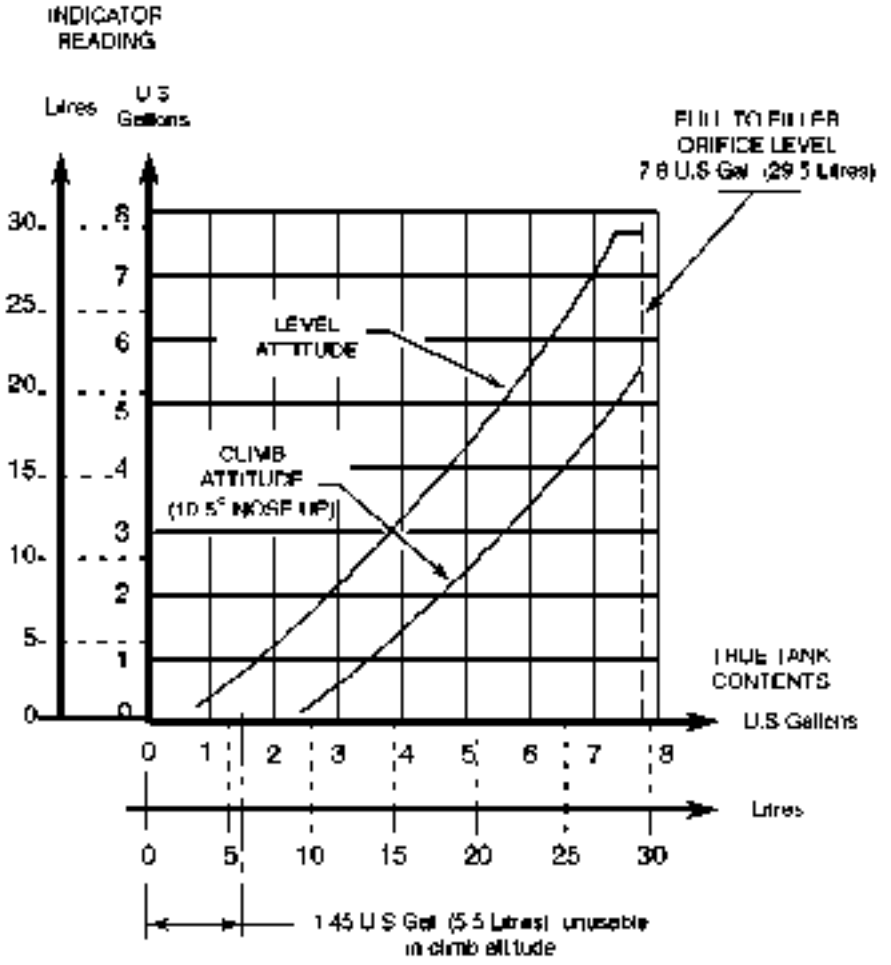

Figure 9.15.3 - FLUID QUANTITY INDICATOR CALIBRATION

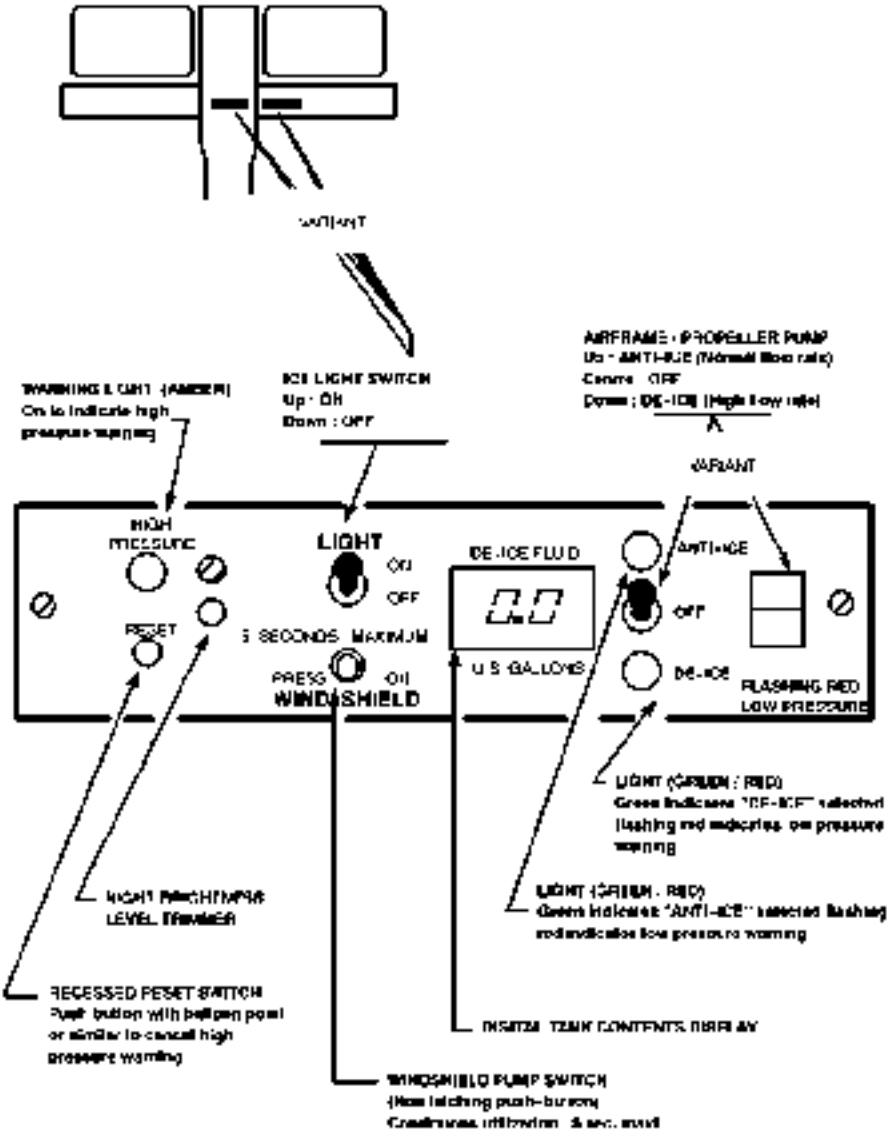

Figure 9.15.4 - CONTROL PANEL

The contents indicator display is shown in Figure 9.15.4 and reads the approximate fluid quantity in the tank in U.S Gallons. True quantity can be obtained by correcting the value shown as described above. This display has automatic dimming for night operations.

Three indicator lights

- Two green/red indicator lights :
  - * illuminate steady green to indicate the selected condition of the airframe/propeller ice protection system : ANTI-ICE or DE-ICE
  - * in the event of low system pressure both lights flash red, with the light appropriate to the current pump selection alternating red/green in colour
- An amber indicator light :

  Illuminates when the pump delivery pressure exceeds normal limits. Illumination of this light indicates the possible need for filter element renewal

  Note that once illuminated this light will remain on until the airplane circuit is switched off, unless it is reset by depressing the recessed "Reset" switch using a probe such as a pencil or ballpen.

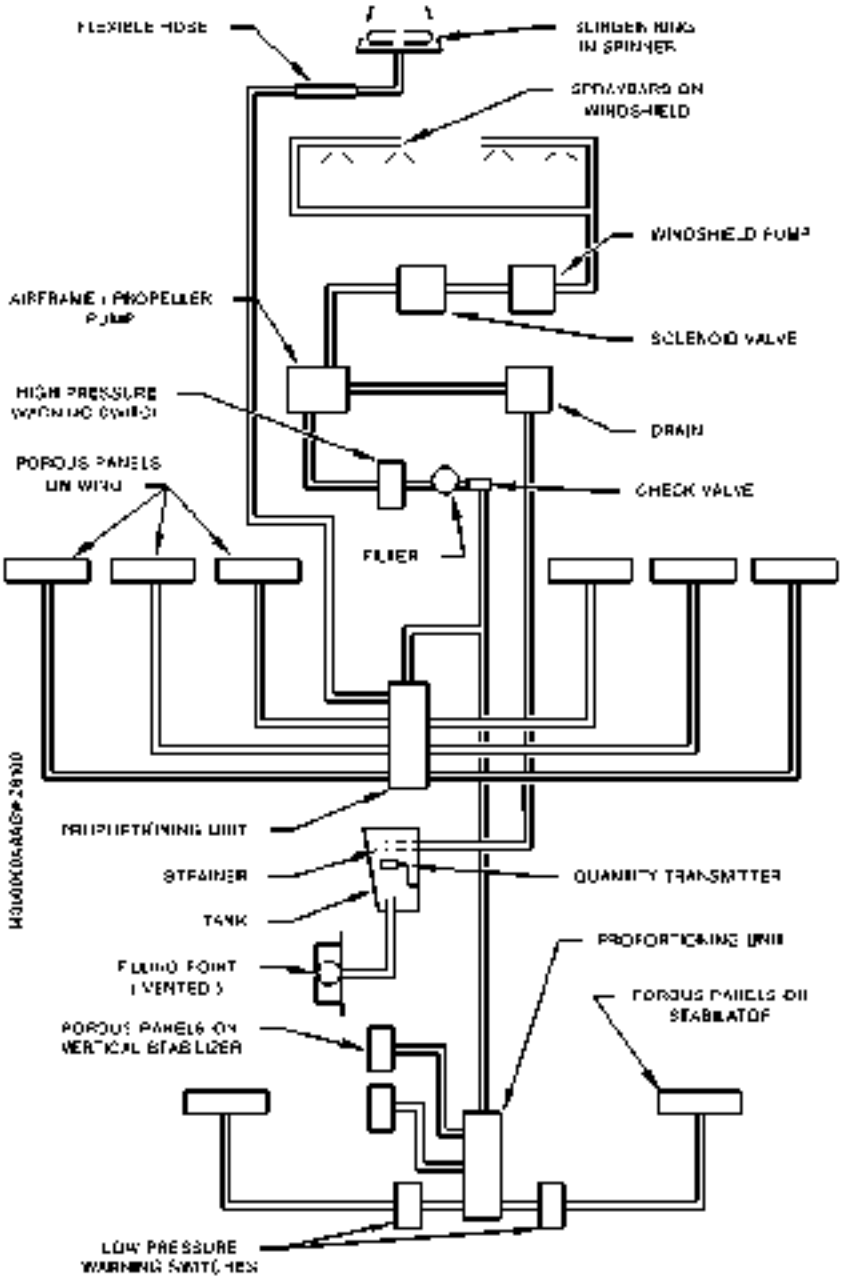

Figure 9.15.5 - SYSTEM SCHEMATIC

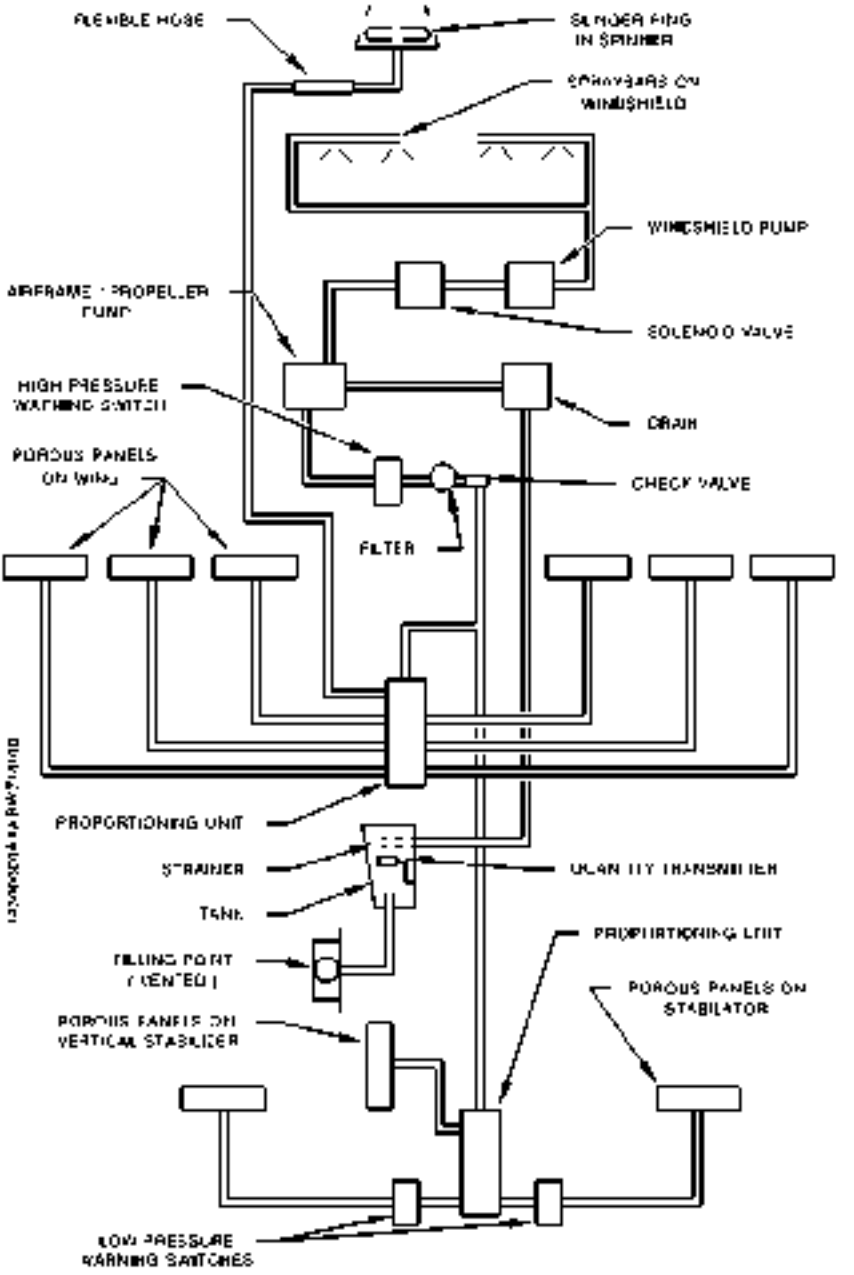

Figure 9.15.5A - SYSTEM SCHEMATIC

The fluid supply to the porous panels and propeller is provided by a two speed electrically driven pump. Propeller and aerofoil protection cannot be operated independently.

The supply for the windshield is provided by a separate intermittently rated pump. Figures 9.15.5 and 9.15.5A show the fluid system schematic. Figure 9.15.6 shows the wiring schematic.

De-icing fluid from the pump passes through a filter and then through a spring loaded check valve which prevents flow when the pump is not operating.

A system of plastic tubing carries the fluid to proportioning units located in rear fuselage. The proportioning units divide the flow into the requirements of the individual regions fed from each proportioning unit outlet.

Porous panels are attached to the aerofoil leading edges. When the system is functioning, these panels exude fluid at a low steady rate. At the same time, a metered quantity of fluid is pumped via a slinger ring to the propeller blades.

The windshield pump has a second function which is to prime the airframe/propeller pump. When the windshield pump is operated the solenoid valve in series with this pump opens and fluid (and air if present) is drawn from the tank through the airframe/propeller pump.

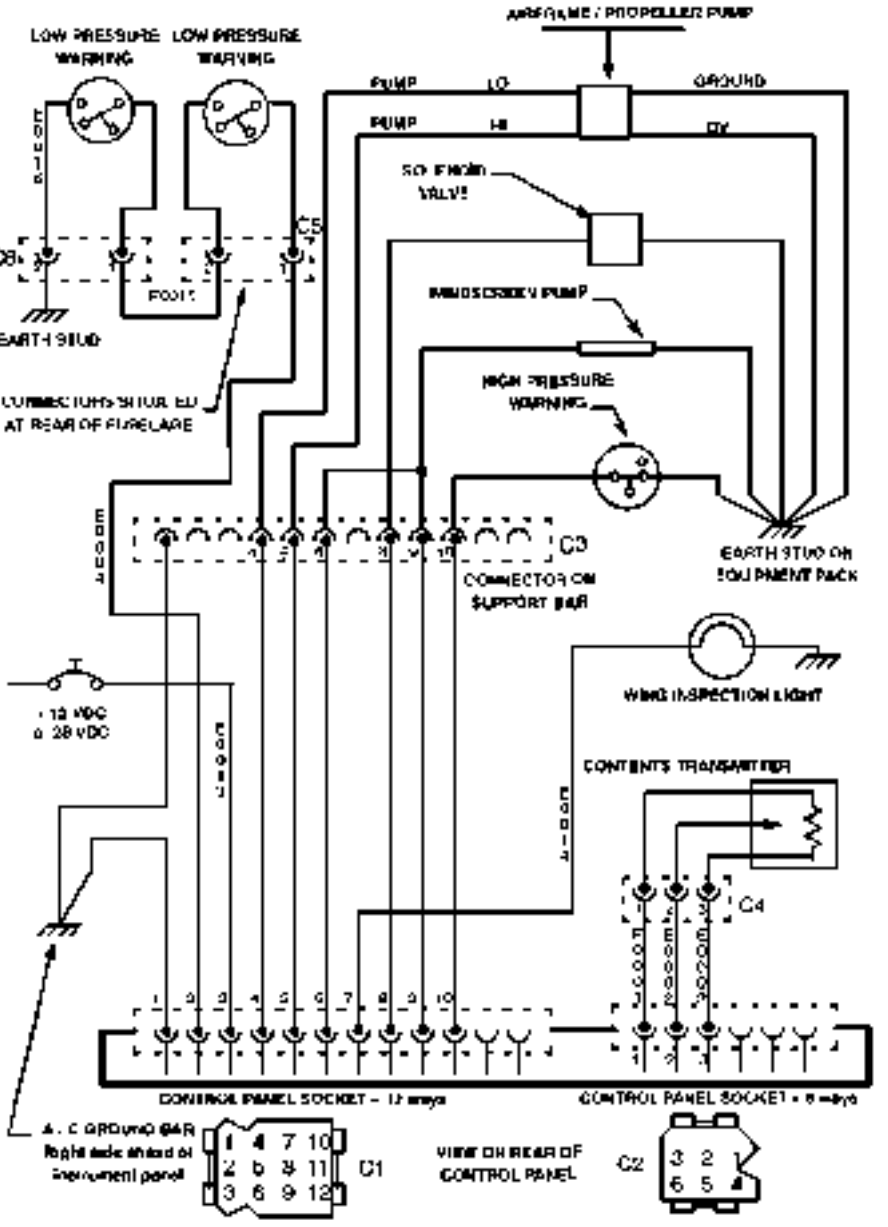

Figure 9.15.6 - WIRING SCHEMATIC

SECTION 6

HANDLING, SERVICING AND MAINTENANCE

PROLONGED OUT OF SERVICE CARE

During flyable storage

Ensure that the de-icing fluid tank contains at least the minimum recommended quantity of fluid (refer to Section 7) and that all system components are filled with fluid.

Operate airframe/propeller pump for at least two minutes at DE-ICE speed. Intervals between operations should not exceed two months, for the first two years from new.

At the same time exercise the windshield pumps for several periods not exceeding 5 seconds each.

The two month interval between operation may be increased to a period not exceeding six months, after the two year period unless any of the system plastic tubing has been renewed (see also § "Pump priming").

Re-check tank contents

NOTE
Complete system priming after prolonged out of service may take as long as 15 to 20 minutes. Priming prior to each flight is recommended to maintain the system ready for immediate use and to facilitate insect removal from the leading edges.

SERVICING AND MAINTENANCE

- De-icing fluid tank

  It is located in the rear fuselage and is accessed through the baggage compartment bottom door

CAUTION

UNDER NO CIRCUMSTANCES ARE FLUIDS OTHER THAN THOSE LISTED TO BE USED IN THE "TKS" SYSTEM. SOME FLUIDS CURRENTLY USED FOR GROUND DE-ICING PURPOSES CONTAIN THICKENING AGENTS WHICH MAY BLOCK THE POROUS PANELS. IF IT IS KNOWN OR SUSPECTED THAT SUCH A FLUID HAS BEEN PLACED IN THE TANK, DO NOT OPERATE THE SYSTEM. CONTACT "TKS" FOR INSTRUCTIONS. SEE SECTION "LIMITATIONS" FOR APPROVED DE-ICING FLUIDS

The de-icing tank filler is located on the left hand side of the fuselage just aft of the baggage compartment door.
To preclude the possibility of contamination, always clean the top of fluid containers before dispensing. If fluid is dispensed from bulk storage it is recommended that a clean vessel is maintained, solely for de-icing fluid.

Secure the filler cap and filler door immediately after filling

- Drain

A drain point is provided beneath the fuselage, on the right side slightly aft of the wing leading edge. This is provided for the purpose of draining the tank and should also be used to remove air from the pipeline between the tank and pump when refilling the system from empty.
In this case, fill or partially fill the tank and open the drain valve until air free fluid is discharged.

- Strainer

  Remove and clean the de-icing fluid strainer in the tank outlet at 12 monthly intervals or sooner if there are indications of foreign materials in the tank.

  The strainer is accessed either through the inspection panel situated on the lower fuselage skin below the forward end of the tank, or by tank removal.

  Flush the tank with clean water if foreign materials are evident in the bottom of the tank.

- Filter

  Illumination of the "High pressure" warning in flight (or during ground testing) indicates the need for filter element renewal, except that warnings arising from system operation in the DE-ICE mode and/or at abnormally low temperatures (below - 22° F (-30°C)) may be ignored.

- Pump priming

  The airframe/propeller pump may not be self priming and is ground primed by first opening the drain valve to remove any air in the supply pipeline from the tank, (reference paragraph 1 of this Section) then by operating windshield de-ice system to remove air from the remainder of the fluid feed pipelines and the body of the airframe/propeller pump. (In flight priming may be accomplished by operation of the windshield pump only - See Section 3).

- Stabilator balancing

  In the event of changes requiring checking and/or rebalancing of the stabilator this is to be carried out in accordance with SOCATA Maintenance Manual Section IV.1 or Chapters 51 and 55, except that due allowance is to be made for the weight of de-icing fluid in the porous panels attached to the stabilator leading edge. The de-icing fluid contained in the stabilator panels represents a moment of - 4.34 lbs.in/1000 (- 50 mm.kg).

The stabilator is to be balanced such that the moment is within the permitted limits with the porous panels both dry and filled with fluid.

In view of the difficulty of determining the quantity of fluid contained within the panels during the balancing operation, it is recommended that the stabilator is balanced within moments reduced by 4.34 lbs in/1000 (50 mm.kg) at each limit.

(i.e. : SOCATA limits are - 13.2 lbs.in/1000 (- 150 mm.kg) to + 6.42 lbs.in/1000 (+ 74 mm.kg). It is recommended that the stabilator with "TKS" panels installed is balanced within the limits - 8.68 lbs in/1000 (- 100 mm kg) to + 2.08 lbs in/1000 (+ 24 mm kg)).

- Stall warning sensor

Maintenance functions relating to the stall warning sensor are to be made as detailed in SOCATA Maintenance Manual Section XI 1 9 or Chapter 27, except that for access to and/or removal of the unit it is first necessary to remove the left outer wing porous panel. This panel is secured with eight screws and may be withdrawn for access to the stall warning sensor following removal of those screws. It is not necessary to disconnect the feed tube to the panel although care is to be taken not to damage or kink the tube during the operation.

CLEANING

CAUTION

POROUS PANELS CONTAIN A PLASTIC MEMBRANE WHICH MAY BE DAMAGED BY CERTAIN SOLVENTS, PARTICULARLY METHYL-ETHYL-KETONE (MEK), ACETONE, LACQUER THINNER AND OTHER TYPES OF THINNERS AND SOLVENTS. MASK PANELS WHEN PAINTING AIRPLANE OR WHEN USING SOLVENTS FOR OTHER PURPOSES IN THE PROXIMITY OF THE POROUS PANELS

The porous panels may be washed with soap (or detergent) and water using a brush or lint free cloth. Only the following solvents are permitted for use on porous panels (refer also to the airplane manufacturers recommendations and instructions for cleaning the airplane exterior surfaces) :

- Water (with soaps or detergents)
- Approved de-icing fluids
- Aviation gasoline
- Aviation turbine fuel
- Isopropyl alcohol
- Ethyl alcohol
- Industrial methylated spirit

Cleaning of the porous panels will be greatly facilitated if the system is primed prior to each flight, especially if flight at low altitudes or in insect infested areas is anticipated.

OVERHAUL OR REPLACEMENT GUIDE

Overhaul or replacement of all components will be carried out depending on their condition.

SECTION 9

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SECTION 10
SAFETY INFORMATION

FLIGHT IN ICING CONDITIONS

The airframe ice protection equipment is not intended to remove ice from airplane on the ground. Do not attempt to take off with frost, ice or snow on flying surfaces.

The ice protection system fitted to this airplane is designed to provide protection for a period limited only by de-ice tank contents in continuous maximum severity icing conditions, such as occur in stratiform clouds. It is also designed for short excursions into the far more severe intermittent maximum conditions associated with cumuliform clouds.
It should be realised, however, that the icing severities for which the system is designed are based upon statistical data and more severe conditions may be encountered in nature.

It must therefore be emphasised that the pilot is "an integral part of the airplane's ice protection equipment".

The prudent pilot must remain aware of and react in a timely manner to prevailing conditions. He must also be aware of the possibility that icing conditions may become so severe that his airplane and equipment cannot cope with them. At the first indication that such conditions may have been encountered, or may be ahead, he should react by deciding the most expeditious and safe course of action. The decision should be based on weather briefing, recent pilot reports and ATC observations. Alternatives could be course changes, altitude changes or even continuance on the same course.

CAUTION

IF IT IS KNOWN OR SUSPECTED THAT THE PROTECTED REGIONS OF THE HORIZONTAL STABILIZER ARE NOT FREE FROM ICE, CAUTION MUST BE EXERCISED WHEN LOWERING THE FLAPS AND THE USE OF FULL FLAP SHOULD BE AVOIDED. AT THE FIRST SIGN OF A REDUCTION OF PITCH CONTROL FLAP DEPLOYMENT SHOULD BE HALTED OR REVERSED

The pilot must remain aware that any ice on the airplane will have some effect on the flight qualities, and be prepared to make the appropriate allowances.

Stall warning indications should not be relied upon during or following icing conditions, as the margin between operation of the wing mounted sensor and the aerodynamic stall may be affected by residual ice.

Depending upon circumstances it may be advisable to increase approach and landing speeds, because even with the protected surfaces clear of ice a performance degradation may occur due to ice on the unprotected regions.

Typical performance penalties due to the presence of ice accretions are illustrated in Figure 9.15.7. These are to be used as a guide only. The actual penalty will depend on the precise shape and size of individual ice accretions which will vary from one encounter to another depending on the prevailing meteorological conditions and airplane operating condition.

NOTE :
The data presented in this illustration are given only as a guide. It does not necessarily represent the worst case.

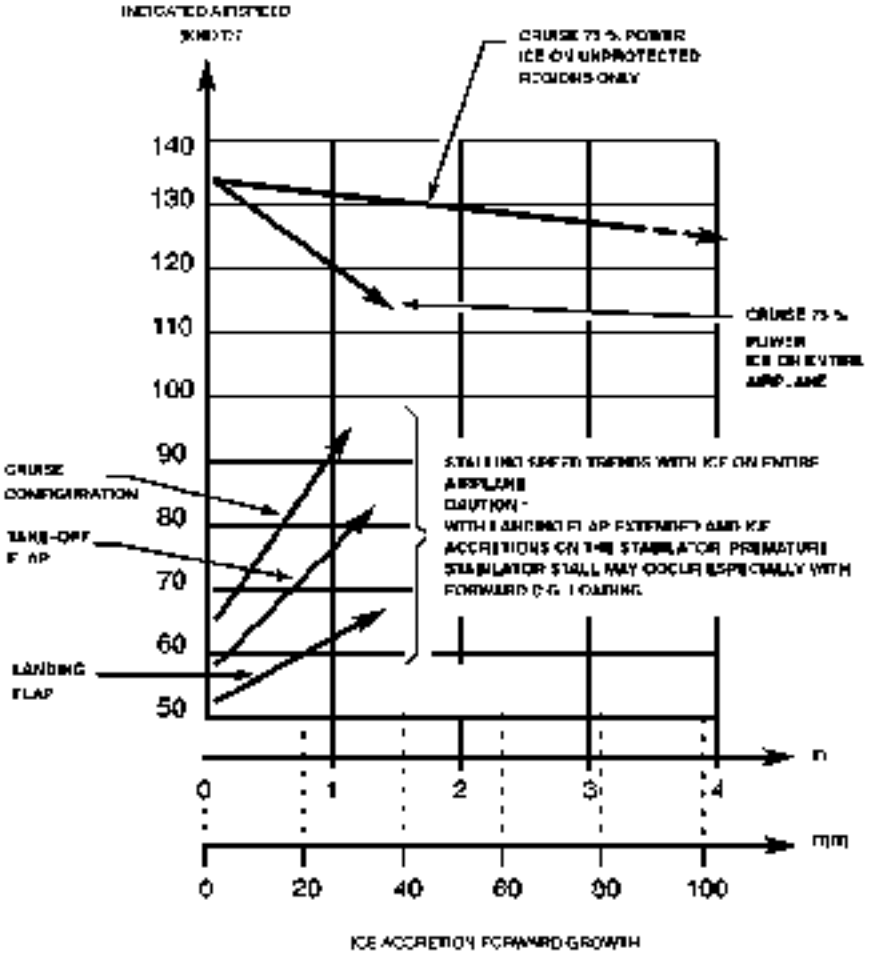

Figure 9.15.7 - TYPICAL PERFORMANCE DEGRADATION WITH ICE ACCRETIONS PRESENT

SUPPLEMENT

OXYGEN EQUIPMENT "EROS"

"OPTIONAL EQUIPMENT N° 617-618-619"

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D.G.A.C. Approved

SECTION 1
GENERAL

This equipment provides the necessary oxygen for 4 persons for flights at high altitude.

A storage oxygen cylinder, located on the rear bulkhead of the baggage hold, supplies the system with a pressure reduced to approximately 75 psi (5 bar) with a pressure-reducing valve.The filling connector (AND 10089-3 type) and a pressure indicator are located on the cylinder.

On the upper duct, at level of pilot's head, are located a shutoff valve and an oxygen cylinder pressure indicator.

Four quick-disconnect fittings are provided for up to four masks. The pilot and co-pilot masks are pressure-demand types, equipped with self-contained regulator and integral microphone. The regulator can be set for either diluter-demand or 100 % oxygen operation.

The passenger masks are of constant-flow type and can be set for two flow rates :

- flow selection ring on position "LO" : flow 0.467 U.S Gal / min to be used up to 17 500 ft.
- flow selection ring on position "HI" : flow 0.700 U.S Gal / min to be used above 17 500 ft.

All masks have a flow indicator incorporated in the tube.

SECTION 2
LIMITATIONS

These limitations complete those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

a) In case of oxygen equipment use, the occupants number is limited to 4

b) The pilot must mandatorily use a mask fitted with a mike.

c) When the oxygen cylinder is installed, the maximum weight of baggage admitted in the baggage compartment is limited to 110 lbs.

d) Endurance

OXYGEN DURATION IN HOURS				
	ALTITUDE			
	10 000 ft	15 000 ft	20 000 ft	TB 21 25 000 ft
pilot	14 hr 05 min	14 hr 05 min	9 hr 34 min	7 hr 03 min
pilot & 1 pass.	7 hr 02 min	7 hr 02 min	4 hr 47 min	3 hr 32 min
pilot & 2 pass.	5 hr 01 min	5 hr 01 min	3 hr 23 min	2 hr 38 min
pilot & 3 pass.	3 hr 54 min	3 hr 54 min	2 hr 38 min	2 hr 12 min

NOTE :

These values are average values which can vary according to persons. They correspond to a cylinder completely filled with a pressure of 126 bar (approximately 1850 psi). When pressure is different, the endurance is proportional to the pressure in the cylinder.

For use limitations of oxygen equipment, comply with operational rules in force.

SECTION 3

EMERGENCY PROCEDURES

These procedures complete those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

If the oxygen flow is interrupted as indicated either by the flow indicators or by symptoms of hypoxia :

- Install another mask, if available on an unused connector.
- If the flow cannot be restored, descent immediately below 12 500 ft.

In case of smoke in the cockpit :

- Set oxygen regulation selector on 100 %

SECTION 4
NORMAL PROCEDURES

These procedures complete those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

BEFORE FLIGHT

- Verify sufficient oxygen cylinder pressure for planned flight duration.
- Connect the masks which are stored in head-rests of the seats. The pilot must mandatorily use a mask fitted with a mike.
- Turn on the oxygen system : valve on "ON"
- The flow must be established in constant flow masks. The flow indicator moves towards the mask.
- Test the pressure-demand type masks : the flow indicator must move on each inhalation.
- Turn off the oxygen system.

IN FLIGHT

- Connect only masks that will be worn by crew or passengers.
- Turn on the oxygen system : valve on "ON".
- Adjust the masks :

  . For the pressure-demand type masks :

  press red tabs on mask to inflate harness.

  slip harness over head and hold mask against face.

  release red tabs, harness will deflate and hold mask in position.

- Adjust the flow :

  . For the pressure-demand type mask : set regulator to **NORMAL** or **100 %** as required .

  NOTE :

  In the NORMAL position, the regulator will supply a mixture of oxygen and ambient air automatically adjusted for altitude. The 100 % position, which should be selected in case of smoke or fumes in the cabin or in case of hypoxia, supplies 100 % oxygen regardless of altitude.

  . Mask with constant flow :

  Up to 17 500 ft : flow selection ring on "LO".

  Above 17 500 ft : flow selection ring on "**HI**".

  NOTE .

  In case of hypoxia or discomfort, the "HI" position can be used at altitudes below 17 500 ft.

Use of the 100 % position on the regulators of the crew masks below 20 000 ft, or use of the "**HI**" position of the passenger masks, below 15 000 ft, increases oxygen flow considerably above the amount used for calculation of the duration table, and oxygen duration may be significantly reduced.

- Observe the flow indicators and the oxygen reserve.

WARNING

SMOKING IS STRICTLY PROHIBITED ANY TIME OXYGEN IS IN USE.

OILY, FATTY, OR GREASY SUBSTANCES, INCLUDING SOAPS, LIPSTICK, AFTER SHAVE LOTION, MAKE UP ARE CAPABLE OF SPONTANEOUS COMBUSTION ON CONTACT WITH OXYGEN

SECTION 5
PERFORMANCE

The installation and the operation of the oxygen equipment "EROS" do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

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SUPPLEMENT

FUEL FLOW TOTALIZER FC / FT-10 "ARNAV"

"OPTIONAL EQUIPMENT N° 821 and D821"

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SECTION 1
GENERAL

A - FUEL FLOW TOTALIZER FT-10 (Figure 9.20.1A)

The FT-10 "ARNAV" fuel flow totalizer is a fuel management system consisting of an instrument located on the R.H. instrument panel and of a transducer located on the fuel line. It complements the standard fuel gaging system by digitally displaying fuel flow and fuel burned.

The system does not require particular preflight procedure.

The FT-10 does not contain a memory retention battery. However, it is fitted with a "RAM" system which retains in memory the quantity of fuel burned during last flight.

B - FUEL FLOW TOTALIZER FC-10 (Figure 9.20.1B)

In addition to the FT-10 functions, the FC-10 fuel flow totalizer determines, according to pilot's data, the total fuel quantity remaining in the tanks, as well as the flight time remaining according to this fuel quantity. It is fitted with a warning light for time remaining.

The use of the FC-10 fuel flow totalizer requires preflight procedure application to enter all data necessary for its functioning.

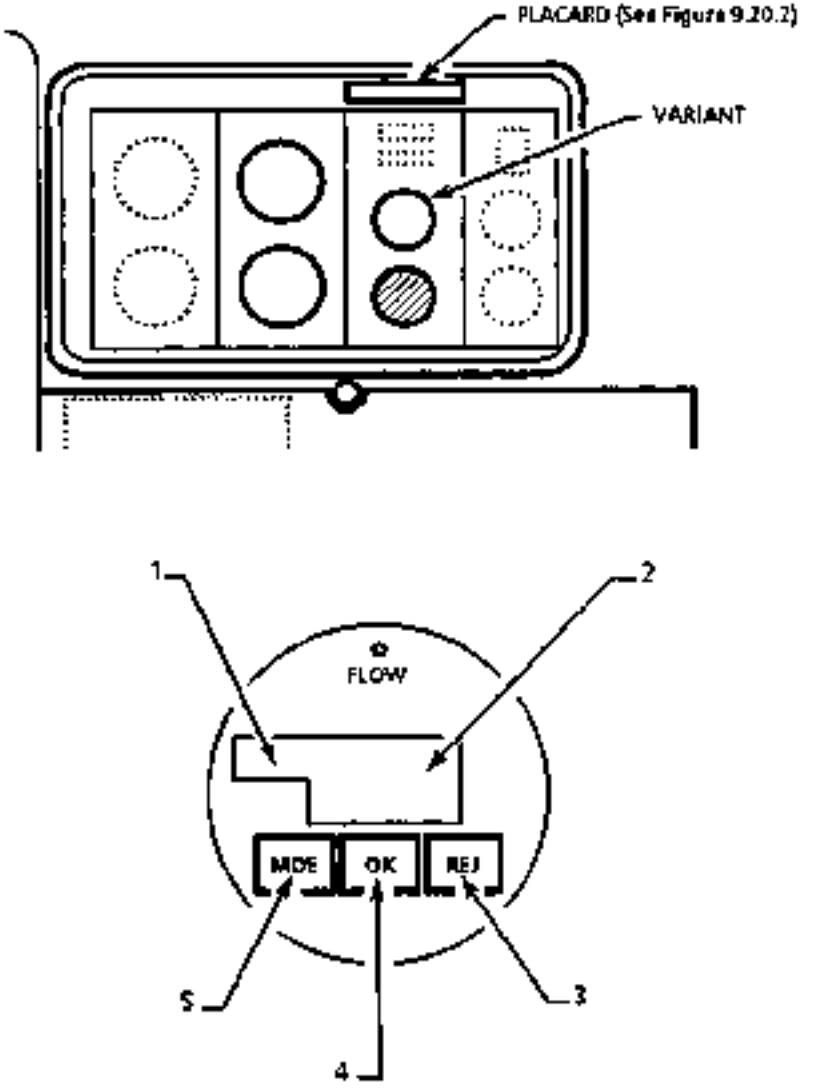


Figure 9.20.1A (1 / 2) - FT-10 fuel flow totalizer

1 - "BURN" mode window : fuel burned quantity mode

2 - Fuel flow or fuel burned quantity display

3 - "CLR?" mode selection button : clear

4 - Button to zero the fuel quantity

5 - Mode control button

Figure 9 20.1A (2 / 2) - FT-10 fuel flow totalizer

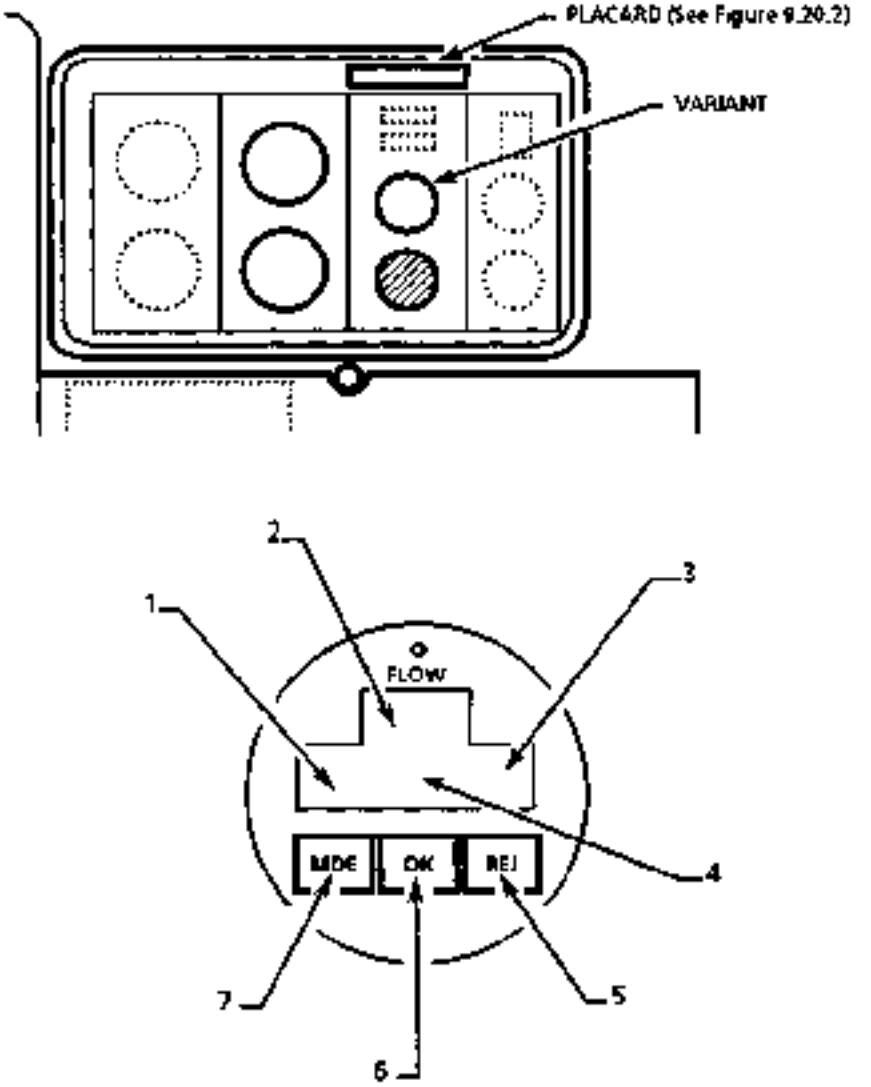


Figure 9.20.1B (1 / 2) - FC-10 fuel flow totalizer

1 - "BURN" mode window : fuel burned quantity mode
"ONBD" mode window : fuel remaining quantity mode

2 - Fuel flow display and / or data entry

3 - "TIME" mode window : time remaining mode
"LOW" mode window : warning mode for time remaining ≤ 45 min

4 - Fuel burned quantity or fuel remaining quantity display

5 - Button for number selection inside a column

6 - Button to zero number or to select the column for entry

7 - Quantity mode control and confirmation button

Figure 9.20.1B (2 / 2) - FC-10 fuel flow totalizer

SECTION 2

LIMITATIONS

The installation and the operation of the fuel flow totalizer do not change the basic limitations of the airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

The fuel flow totalizer FC / FT-10 "ARNAV" shall not be used as a substitute to either the fuel gages or the analog fuel flow meter.

THE "DIGITAL" FUEL FLOW TOTALIZER SHALL SERVE AS SUBSTITUTE TO NEITHER THE FUEL GAUGES NOR THE ANALOG FUEL FLOW METER THE LATTER INSTRUMENTS SHALL ALWAYS BE CONSULTED IN PRIORITY FOR FLIGHT OPERATION.

SECTION 3

EMERGENCY PROCEDURES

The installation and the operation of the fuel flow totalizer do not change the basic emergency procedures of the airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

SECTION 4

NORMAL PROCEDURES

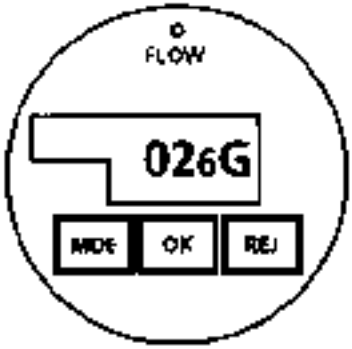
These procedures supplement those of standard airplane described in Section 4 "Normal Procedures" of the basic Pilot's Operating Handbook.

CAUTION

THE FUEL QUANTITY INDICATOR IS THE PRIMARY READING OF FUEL ON BOARD. IT IS ESSENTIAL THAT THE FUEL QUANTITY READING OF THE FUEL TOTALIZER IS PROGRAMMED TO READ THE SAME AS THE FUEL QUANTITY INDICATOR PRIOR TO FLIGHT.

GENERAL OPERATION PROCEDURES

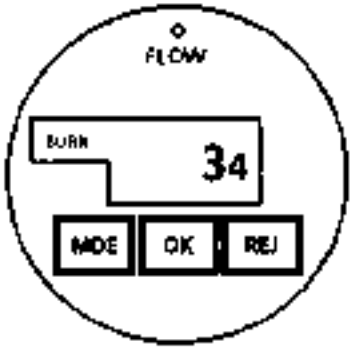
A - FT-10 FUEL FLOW TOTALIZER



On ground or during flight while engine is running :

FUEL FLOW DISPLAY

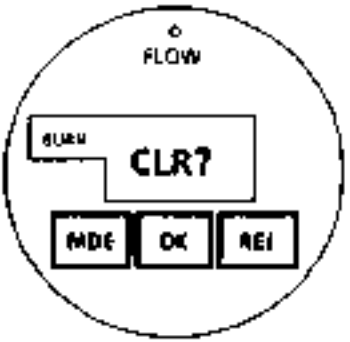
Fuel flow is continuouly displayed in the window.



On ground or during flight while engine is running :

FUEL BURNED DISPLAY

Fuel burned can be displayed by pressing MDE. "BURN" appears.



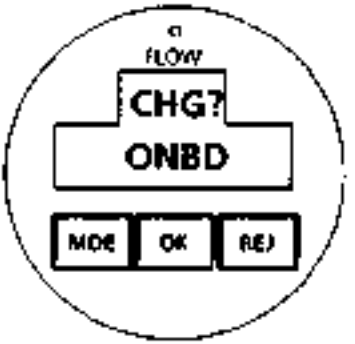
During preflight or flight :

"CLR?" DISPLAY

Fuel burned quantity can be cleared, first by pressing "REJ" from the fuel burned display and then, by pressing "OK" to clear and return fuel burned to zero.

B - FC-10 FUEL FLOW TOTALIZER

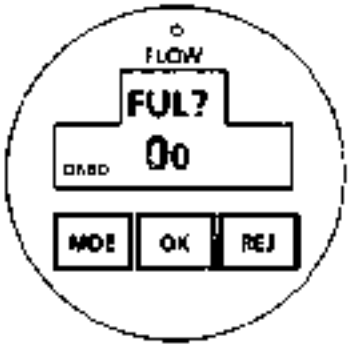
PREFLIGHT

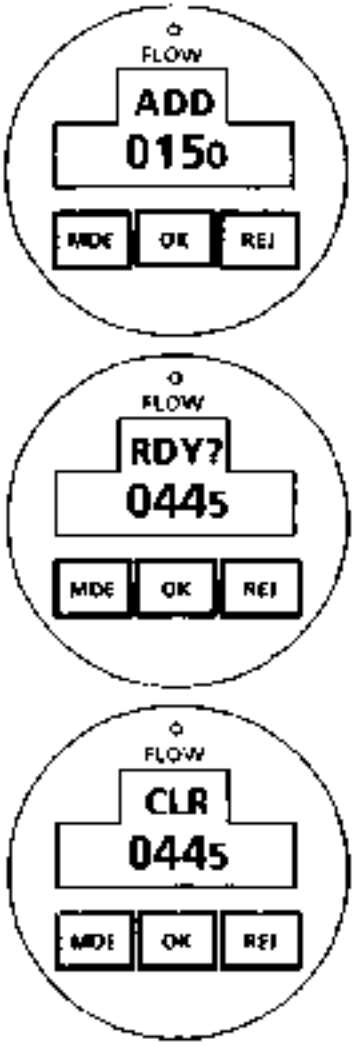


1) When airplane electrical system is ON, "CHG?/ONBD" appears
   NOTE :
   It "NWFL" appears, the flowmeter is not programmed - refer to the Maintenance Manual

2) Since no fuel was added since last flight, press "REJ".

3) If fuel has been added since last flight :
   Press "OK" to display "FUL?" mode
   a) If quantity of fuel added is precisely known :
      - press "OK" again then "REJ" to display "ADD" mode
      - press "OK" to select the column for entry, when it flashes, press "REJ" to select number





- press "MDE", "RDY?" mode appears. If the amount of fuel displayed is the same as the actual amount in the tanks, press "OK". Flowmeter preflight procedure is completed.

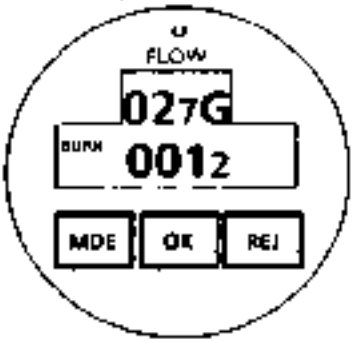
b) If the amount of fuel added is unknown or if there is doubt about the remaining amount displayed by the flowmeter.
- use "CLR?/ONBD" mode by pressing "MDE" and "REJ" at the same time.
- press "OK" to clear the amount recorded.
- press "REJ" to return to "CHG?/ONBD" mode - see Paragraphs 1 and 2.
- display "FUL?" mode - see Paragraph 3, then "ADD" mode to enter the total fuel amount.
- confirm from "RDY?" mode. Flowmeter preflight procedure is completed.

NOTE:
Flowmeter programming can be modified according to the type of fuel used, JET A, JET B or JP4 - see Maintenance Manual

CAUTION
DATA DISPLAYED DURING PREFLIGHT CAN ONLY BE MODIFIED (EXCEPT FUEL BURNED AMOUNT), AFTER SETTING POWER SUPPLY TO OFF

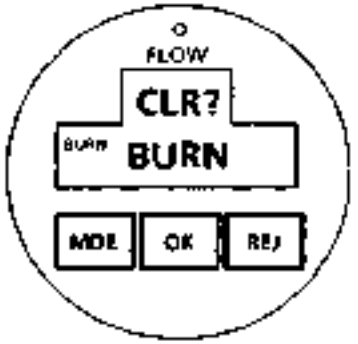
OPERATION DURING FLIGHT

In the lower window of the FC-10, the display is cycled through using the "MODE" button to display Fuel Burned, Fuel On Board and Time Remaining



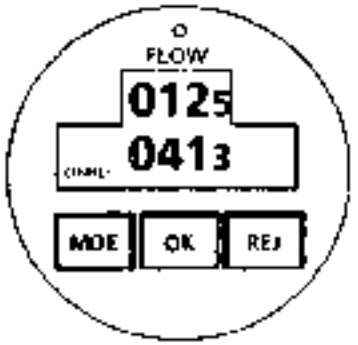
FUEL BURNED DISPLAY

Fuel Flow / Fuel Burned displays the amount of fuel burned since flight mode was entered. The "BURN" light is ON whenever Fuel Burned is displayed.



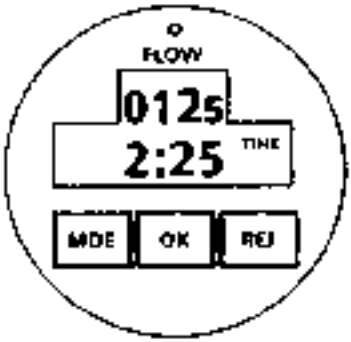
"CLR?/BURN" DISPLAY

Use the "CLR?/BURN" display to clear the fuel burned quantity. "CLR?/BURN" is accessed from the Fuel Flow / Fuel Burned display during flight by pressing "REJ". Press "OK" to clear fuel burned. Press "REJ" again to return to Fuel Flow / Fuel Burned.



FUEL ON BOARD DISPLAY

Fuel Flow / Fuel On Board displays the amount of Fuel On Board as calculated by the FC-10.
The "ONBD" light is ON whenever Fuel On board is displayed



TIME REMAINING DISPLAY

The Fuel Flow / Time Remaining displays the amount of flight time remaining based on Fuel Flow according to usable fuel remaining.
The "TIME" light is ON whenever Time Remaining is displayed.

"LOW" LIGHT

The "LOW" light is ON whenever time remaining according to Fuel Flow / Fuel Remaining drops below 45 min.
The "LOW" light can appear on any of the Flight Displays.

CAUTION

REFER TO PARTICULAR INSTRUCTIONS PROVIDED BY THE PLACARD LOCATED NEAR THE INDICATOR - see Figure 9.20.2

THE DIGITAL FUEL FLOW TOTALIZER SHALL SERVE AS SUBSTITUTE TO NEITHER THE FUEL GAUGES NOR THE ANALOG FUEL FLOW METER. THE LATTER INSTRUMENTS SHALL ALWAYS BE CONSULTED IN PRIORITY FOR LIGHT OPERATION.

Figure 9.20.2 - Digital fuel flow totalizer placard

ERROR MESSAGES

Error Messages are shown by a number code with the exception of the "TANK OVRF" message. Acknowledge error messages by pressing "OK". If the unit is inoperable, the message will not go away.

TANK OVRF : Indicates a fuel quantity has been entered during preflight operation that when added to the fuel on board, exceeds the full usable fuel capacity. Press "OK" to return to the "ADD" display for correct value entry

E 05 : Indicates displayed value exceeds four digits. Message will continue to occur every five seconds after pressing "OK" Return to factory and question whether transducer installed is correct for airplane.

E 16 or E 17 : Indicates display malfunction. Question validity of data and return to factory

E 18 , E 19, E 20 or E 21 : Indicates indicator light malfunction. Return for light replacement.

E 60 : Indicates essential data known to the FC / FT-10 System has been corrupted. No recovery. Return to factory.

E 61 : Indicates RAM error. No recovery. Return to factory.

E 62 : Indicates ROM error No recovery Return to factory.

E 88 : Indicates errors in pilot entry. Press "OK" and reselect full usable fuel.

E 50 or E 51 : Occurs twin engine system indicating communication error. Press "OK" If error does not occur again, continue flight, temporary problem.

E 99 : Indicates molding or preprogramming process did not occur at factory. Return to factory.

SECTION 5

PERFORMANCE

The installation and the operation of the fuel flow totalizer do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

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SUPPLEMENT

FUEL FLOW TOTALIZER FT 101 A "HOSKINS"

"OPTIONAL EQUIPMENT N° D838"

TABLE OF CONTENTS

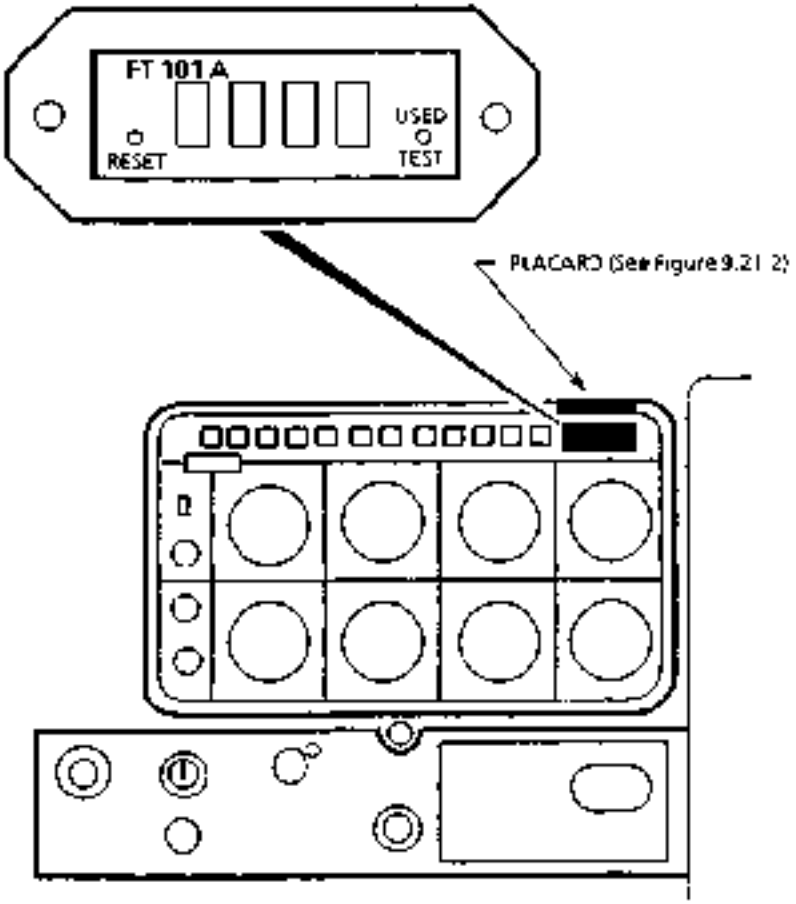

Figure 9.21.1 - FUEL FLOW TOTALIZER FT 101 A "HOSKINS"

SECTION 1

GENERAL

The fuel flow totalizer FT 101 A "HOSKINS" located on top right side of the L.H. instrument panel (see Figure 9.21.1) can be used as single flight totalizer (one single flight) or as long term flight totalizer (many flights)

SECTION 2

LIMITATIONS

The installation and the operation of the fuel flow totalizer do not change the basic limitations of the airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

The fuel flow totalizer FT 101A "HOSKINS" shall not be used as a substitute to either the fuel gages or the analog fuel flow meter.

THE "DIGITAL" FUEL FLOW TOTALIZER SHALL SERVE AS SUBSTITUTE TO NEITHER THE FUEL GAUGES NOR THE ANALOG FUEL FLOW METER THE LATTER INSTRUMENTS SHALL ALWAYS BE CONSULTED IN PRIORITY FOR FLIGHT OPERATION.

SECTION 3

EMERGENCY PROCEDURES

The installation and the operation of the fuel flow totalizer do not change the basic emergency procedures of the airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

SECTION 4

NORMAL PROCEDURES

These procedures complete those of standard airplane described in Section 4 "Normal Procedures" of the basic Pilot's Operating Handbook.

CAUTION

THE FUEL QUANTITY INDICATOR IS THE PRIMARY READING OF FUEL ON BOARD. IT IS ESSENTIAL THAT THE FUEL QUANTITY READING OF THE FUEL TOTALIZER IS PROGRAMMED TO READ THE SAME AS THE FUEL QUANTITY INDICATOR PRIOR TO FLIGHT.

GENERAL OPERATIONS PROCEDURES

- Switch on the airplane main switch.
- On activating the airplane electrical system, the indicator display will flash zeros (000.0). This flashing is a reminder for the pilot to reset or check the fuel used number by pressing either the RESET or USED / TEST button.

  Once the RESET or USED / TEST button is depressed, the display will stop flashing and read fuel flow.
- After starting the airplane engine, the indicator will continuously display fuel flow. Total fuel used may be displayed by pressing and holding the USED / TEST button on the right of the instrument. Total fuel used will be displayed as long as the USED / TEST button is depressed (or for 2 seconds), whichever comes first. This number may be reset to zero (0.0) by depressing and holding the RESET button for at least 1 second.

SINGLE FLIGHT TOTALIZER (ONE SINGLE FLIGHT)

- The airplane should be topped with fuel before each flight so the total usable fuel will be known.
- Switch on the airplane main switch.
- On activating the airplane electrical system, the FT 101 A will begin its power-on sequence. At the completion of this sequence, press the RESET button to zero the total fuel used.

- On starting the engine, the indicator will begin displaying fuel flow. Total fuel used may be checked by depressing the USED / TEST button.

LONG TERM TOTALIZER (MANY FLIGHTS)

- Switch on the airplane main switch.
- On actuating the airplane electrical system, the FT 101 A will perform its power-on sequence.
- The indicator will display the total fuel used from previous flights. DO NOT push the RESET button !
- On starting the engine, the FT 101 will display fuel flow and continue counting fuel used up to 999.9 gallons, 9999 pounds, or 9999 litres depending on the model. Once this value is reached, the next display will be that of a RESET function and the fuel used value will automatically begin at zero.

TEST FUNCTION

A test function is provided in the flow totalizer, so the pilot may verify that all digits are functioning prior to each flight. To use the test function, depress and hold the USED / TEST button two times within one second and the indicator will display all eights (888.8).

CAUTION

REFER TO SPECIAL INSTRUCTIONS GIVEN ON THE PLACARD LOCATED ABOVE "HOSKINS" INDICATOR.

THE "DIGITAL" FUEL FLOW TOTALIZER SHALL SERVE AS SUBSTITUTE TO NEITHER THE FUEL GAUGES NOR THE ANALOG FUEL FLOW METER THE LATTER INSTRUMENTS SHALL ALWAYS BE CONSULTED IN PRIORITY FOR FLIGHT OPERATION.

SECTION 5

PERFORMANCE

The installation and the operation of the fuel flow totalizer do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SUPPLEMENT

"BFG" WX-1000 / 1000+ OR WX-900 OR WX-500 STORMSCOPE

TABLE OF CONTENTS

"BFG" WX-1000 / WX-1000+ OR WX-900 OR WX-500
STORMSCOPE

SECTION 1

GENERAL

This supplement supplies information to the pilot about limitations, normal and emergency procedures when the optional "BFG" WX-1000/1000* or WX-900 or WX-500 stormscope is installed on the SOCATA TB airplanes. The stormscope must be used within limits of this supplement.

SECTION 2

LIMITATIONS

These limitations supplement those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

The "BFG" WX-1000/1000* or WX-900 or WX-500 stormscope systems signal displays are not intended for the purpose of penetrating thunderstorm areas or areas of severe turbulence ; such intentional use is prohibited.

NOTE :
Range selector determines receiver sensitivity and therefore relative range. Displayed range is based on signal strength and is not to be used for accurate determination of thunderstorm location.

The "BFG" WX-1000/1000* stormscope systems check-list functions are for reference only.

CAUTION

THE STORMSCOPE MUST NOT BE USED FOR THUNDERSTORM PENETRATION

- The "BFG" Stormscope Pilot's Handbook, Range II, No. 75-0299-7690-1 (WX-1000/1000+)

or

- The WX-900 Pilot's guide, No. 76-8060-6027-9

or

- The WX-500 Pilot's guide, No. 009-11501-001 with :
  - the KMD 550/850 Multi-function Display Pilot's Guide No. 006-18222-0000

  or

  the "GARMIN" GNS 530 Pilot's Guide, No. 190-00181-00,

at their last revision, shall be readily available to the pilot, each time the "BFG" stormscope operation is foreseen.

SECTION 3

EMERGENCY PROCEDURES

Installation and operation of "BFG" WX-1000/1000+ or WX-900 or WX-500 stormscope systems do not change the basic emergency procedures of the airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

SECTION 4

NORMAL PROCEDURES

Normal operating procedures are outlined in the "BFG" WX-1000/1000+ stormscope Pilot's Handbook, Range II, No. 75-0299-7890-1 at last revision.

Normal operating procedures are outlined in the "BFG" WX-900 stormscope Pilot's Guide, Range II, No. 78-8060-6027-9 at last revision.

Normal operating procedures are outlined in the "BFG" WX-500 stormscope Pilot's Guide, Range II, No. 009-11501-001 at last revision.

SECTION 5

PERFORMANCE

Installation and operation of "BFG" WX-1000/1000+ or WX-900 or WX-500 stormscope systems do not change the basic emergency procedures of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6

WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT		EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in. (m)
	34 – NAVIGATION				
A	Stormscope (on panel skip) (J820 00M)	WX-1000	BFG	15.432 (7.000)	83.07 (2.11)
A	Stormscope (on R.H. instrument panel) (J820 10M)	WX-1000	BFG	15.432 (7.000)	83.07 (2.11)
A	Stormscope (J828 00M)	WX-1000*	BFG	15.432 (7.000)	83.07 (2.11)
A	Stormscope (with converter assy) (J828 10M)	WX-1000*	BFG	15.432 (7.000)	83.07 (2.11)
A	Stormscope (J918 00M)	WX-900	BFG	4.806 (2.180)	85.43 (2.17)
A	Stormscope (CPT10 34502A)	WX-500	BFG	4.960 (2.250)	116.32 (2.96)

SECTION 7

DESCRIPTION

The "BFG" (Series II) WX-1000/1000+ or WX-900 or WX-500 stormscope weather mapping systems provide a visual screen readout of the electrical discharges associated with thunderstorms. This information with proper interpretation, will allow the pilot to detect severe thunderstorm activity. Stormscope information (dots or strike points according to stormscope type) will be displayed on the screen to indicate the electrical discharge areas.

Stormscope information may be displayed on two selectable views : 360° view of surrounding airspace and 120° view of forward airspace only (WX-1000/1000+ or WX-500).

The display scope provides full scale selectable ranges of :

- 200, 100, 50 and 25 nautical miles (WX-1000/1000+ or WX-500)
- 100, 50 and 25 nautical miles (WX-900).

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SUPPLEMENT

AIR CONDITIONING SYSTEM

"OPTIONAL EQUIPMENT N° F845"

TABLE OF CONTENTS

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D.G.A.C. Approved

SECTION 1
GENERAL

The air conditioning installation consists of a West Air Systems, Inc. freon vapor cycle air conditioning system.

SECTION 2
LIMITATIONS

These limitations supplement those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

- The air conditioning system must be "OFF" during engine starting.
- The air conditioning system must be "OFF" for take-off and landing.
- The air conditioning system must be "OFF" when alternator is inoperative.
- When air conditioning system is "ON", monitor ammeter. Do not exceed 70 Amps.

SECTION 3
EMERGENCY PROCEDURES

These procedures supplement those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

Turn "OFF" air conditioner whenever any of emergencies occurs and also those listed in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

SECTION 4
NORMAL PROCEDURES

These procedures supplement those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

CHECK-LIST

ENGINE PRE-STARTING

Air conditioning switch	"OFF"
Circuit-breaker	"ENGAGE"
Air vent	OPEN

AFTER ENGINE STARTING

NOTE :
When the atmosphere is wet and hot, before starting air conditioning system :

Doors	*Locked*
Pilot's / front passenger vents	*Locked*
Temperature rheostat	*≥ 59°F (15°C)*
Air conditioning switch	"RESET" then "ON" if air conditioning required
Temperature rheostat	As required
Fan rheostat	As required
Engine RPM	Maintain 1500 RPM to assure an electrical flow sufficient for the alternator

BEFORE TAKE-OFF

Air conditioning switch	"OFF"

TAKE-OFF AND CLIMB

When landing gear is up and locked :

Air conditioning switch	"ON"
Ammeter	Do not exceed 70 Amps

BEFORE LANDING

During final stage and before short final :

Air conditioning switch	"OFF"

SECTION 5
PERFORMANCE

These performance supplement those of standard airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

The electrical consumption of the system, when it is operating, leads to a loss of performance about :

- 60 ft / min during climb (maximum values)
- 2.5 kt during cruise (maximum values)

The air conditioning system has an auto load shed system. If the AIR COND switch is left "ON", the shed will turn off the air conditioning system during take-off, as main gear strut extends. In this case, the amber warning light located next to the air conditioning control switch, illuminates.

- To reengage the air conditioning system, turn the control switch to FAN / RESET (the amber warning light switches off).
- DO NOT TURN ON, until the gear is up and locked.
- To reengage the air conditioning system, turn the control switch to ON.

If air conditioning switch is left "ON" when lowering landing gear, the system will turn off automatically. In this case, the amber warning light located next to the air conditioning control switch, illuminates.

- To reengage the air conditioning system, turn the control switch to FAN / RESET (the amber warning light switches off).

After landing :

The air conditioning may be reengaged, return to the ON position. Maintain 1500 RPM to assure an electrical flow sufficient for the alternator.

SECTION 6
WEIGHT AND BALANCE

The Installation and the operation of the air conditioning system do not change the basic weight and balance of the airplane described in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

SECTION 7
DESCRIPTION

The air conditioning system provides for cabin comfort during all operations, both on the ground and in flight. During ground operations, with the engine running, cooling may be selected. During ground operation, 1500 RPM should be maintained in order to assure an electrical flow sufficient for the alternator.

The installation (Figures 9.23.1 and 9.23.2) includes :

- a condenser with an electric motor blower,
- evaporator with electric motor driven fan,
- a belt driven compressor driven from the engine output shaft,
- high and low pressure safety switches,
- circuit-breakers for electrical system protection,
- ammeter
- auto load shed system,
- a cabin air distributon system to assure cool air to all occupants.

The total system is interconnected electrically and by refrigerant lines to operate from an Air Conditioning Control Box.

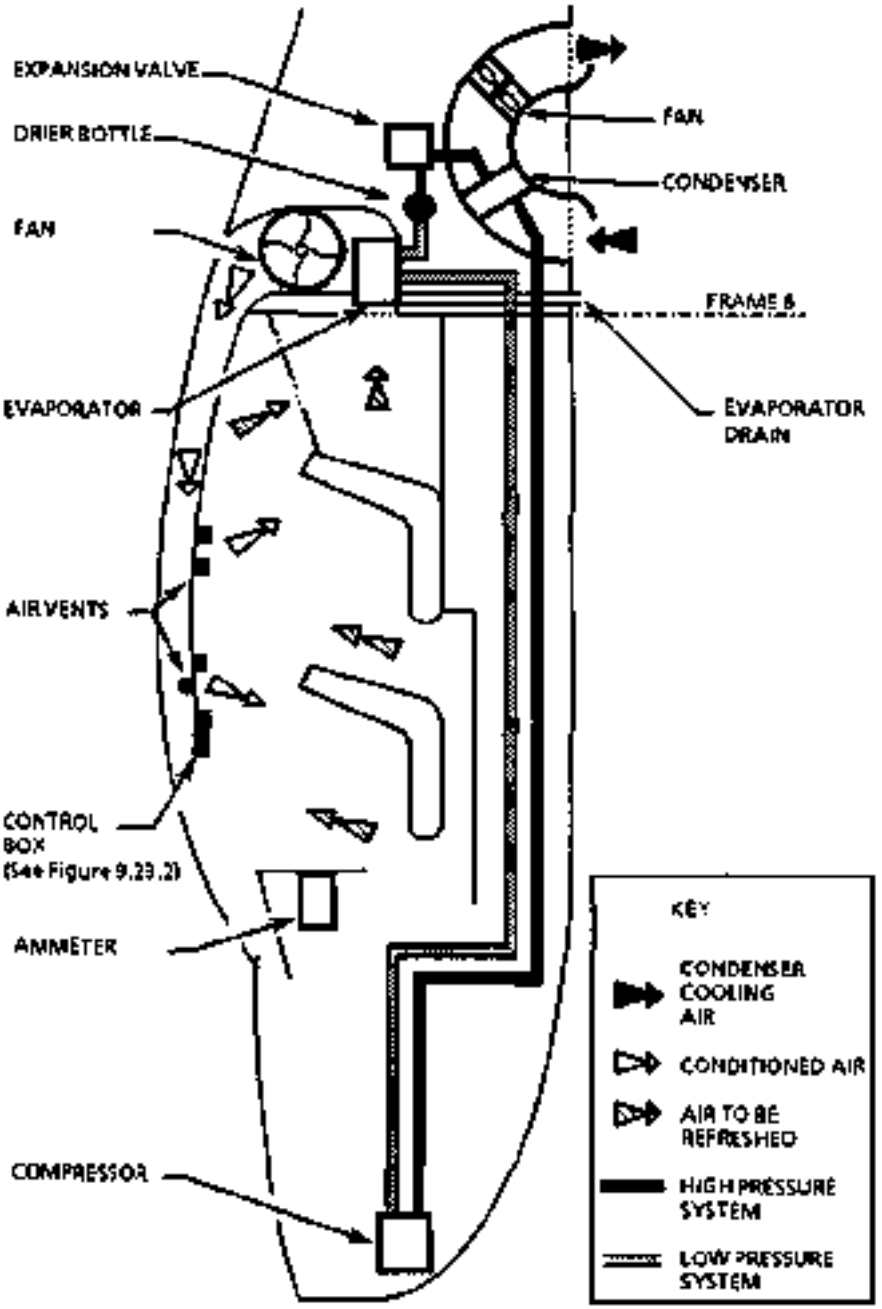

Figure 9.23.1 - Air conditioning system

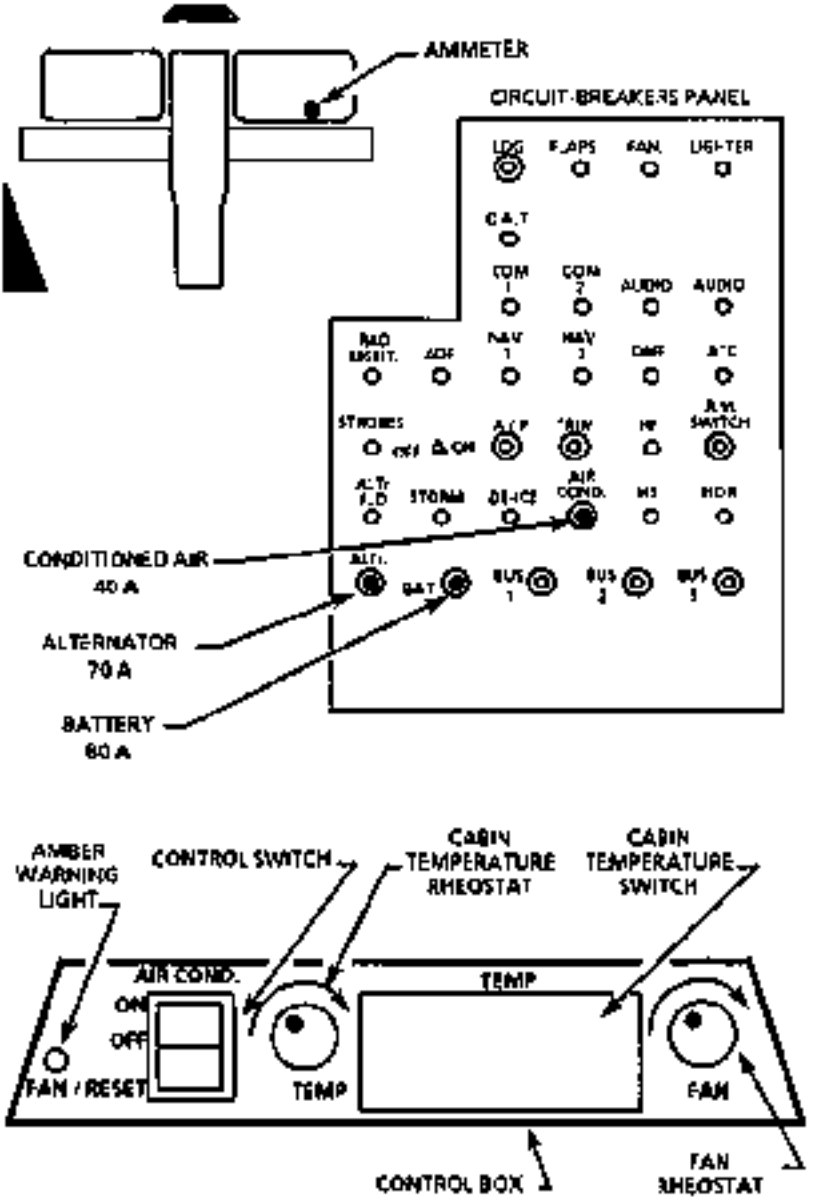

Figure 9.23.2 - Control box and circuit-breakers assembly

SUPPLEMENT

"KEITH" AIR CONDITIONING SYSTEM

TABLE OF CONTENTS

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SECTION 1
GENERAL

The air conditioning installation consists of a "KEITH" vapor cycle air conditioning system.

SECTION 2
LIMITATIONS

These limitations supplement those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

- The air conditioning system must be "OFF" during engine starting.
- The air conditioning system must be "OFF" when alternator is inoperative.

SECTION 3
EMERGENCY PROCEDURES

These procedures supplement those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

Turn "OFF" air conditioner whenever any of emergencies occurs and also those listed in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook

SECTION 4
NORMAL PROCEDURES

These procedures supplement those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

CHECK-LIST

ENGINE PRE-STARTING

Air conditioning switch	"OFF"
Circuit breakers	CLOSED
"WEMAC" air outlets (upper duct)	OPEN

AFTER ENGINE STARTING

<u>With 70 amp alternator</u>

Day operation :

Air conditioning switch	"AIR COND" if air conditioning required

Night operation :

Air conditioning switch	"OFF"

<u>With 90 amp alternator</u>

Day or night operation :

Air conditioning switch	"AIR COND" if air conditioning required

BEFORE TAKE-OFF

Air conditioning switch	"OFF"

TAKE-OFF AND CLIMB

When landing gear is up and locked :

Air conditioning switch	"AIR COND" above 1000 ft AGL if air conditioning required

NOTE :
If oil temperature reaches 244°F (118°C) (red arc), increase airspeed or decrease power.

APPROACH - LANDING

Short final :

Air conditioning switch	"OFF"

AFTER LANDING

Day operation :

Air conditioning switch	"AIR COND" If air conditioning required

Night operation :

Air conditioning switch	"OFF"

SHUTDOWN/SECURING AIRPLANE

Air conditioning switch	"OFF"

AMPLIFIED PROCEDURES

The air conditioning system has an auto load shedding system. If the switch is left on "AIR COND", the shedding will turn off the air conditioning system as full power is selected and main gear strut extended. In this case, the warning light located next to the air conditioning control switch, goes OFF.

- To reset the air conditioning system, turn the control switch to "OFF".
- To reengage the air conditioning system, turn the control switch to "AIR COND".

<u>With 70 amp alternator</u>

During night operation, the electrical capacity of the 70 amp alternator with the engine running at 1200 RPM is inadequate to permit selection of the air conditioning system with all lights and electrical systems ON. It is requested to taxi and land with air conditioning OFF.

<u>All</u>

Air conditioning can be used normally after landing by day, if required.

SECTION 5
PERFORMANCE

These performance supplement those of standard airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

The electrical consumption of the system, when it operates, leads to a loss of performance about :

- 60 ft/min during climb (maximum values)
- 2.5 kt during cruise (maximum values)

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or D	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in. (m)
	21 - ENVIRONMENTAL SYSTEM			
A	Air conditioning system (TB 20) with alternator 70A LW 14363 (OPT10 F674 004)	KEITH LYCOMING	67.000 (30.390) 13.000 (5.900)	72.83 (1.850) - 37.80 (- 0.96)
A	Reinforced air conditioning system (TB 20) with alternator 70A LW 14363 (OPT10 F674 104)	KEITH LYCOMING	67.000 (30.390) 13.000 (5.900)	72.83 (1.850) - 37.80 (- 0.96)
A	Air conditioning system (TB 21) (OPT10 21002A)	KEITH	67.000 (30.390)	72.83 (1.850)

SECTION 7
DESCRIPTION

The "KEITH" air conditioning system improves the passengers and crew comfort in warm and/or humid atmospheric conditions. The refrigerant used is called R134A.

The installation (Figures 9.24.1 and 9.24.2) comprises :

- a compressor,
- a condenser heat exchanger,
- a condenser blower,
- an evaporator heat exchanger,
- an evaporator blower,
- a receiver/drier,
- a thermostatic expansion valve with remote bulb,
- a freeze switch (if installed and wired),
- an overpressure relief valve,
- a binary pressure switch,
- a sight glass,
- two service valves,
- a control panel,
- pipe system,
- distribution ducts.

The system is electrically supplied by the alternator.

The compressor compresses the low pressure refrigerant into high pressure.

The compressor features an integral electromagnetic clutch controlled by the "AIR CONDITIONING" switch set to "AIR COND".

The compressor is driven through a belt by a pulley integrated in the starter ring gear. This ring gear, specific to this installation, features two grooves, one for the alternator and one for the compressor.

When the "AIR CONDITIONING" switch is set to "AIR COND", the magnetic clutch engages the compressor and rotates the wobble plate and pistons to compress the refrigerant.

The compressor is mounted on a bracket to the L.H. front side of the engine.

The condenser heat exchanger cools and liquefies or condenses the refrigerant discharged by the compressor.

It is installed in an airtight housing in the baggage compartment between the R.H. side fuselage skin, the bulkhead C6 and the compartment floor.

The housing air inlet, protected by a screen, is located on the R.H. side fuselage skin, between the bulkhead C6 and the frame C5.

The air outlet is located on the bulkhead C6.

The condenser blower provides cooling airflow across the condenser heat exchanger.

The condenser blower is controlled by the "AIR CONDITIONING" switch set to "AIR COND".

It is installed on the rear side of the bulkhead C6 and sucks ambient air through the condenser.

The blower outlet is connected by a flexible duct to a screened air outlet located under the fuselage aft of the frame C7

The evaporator heat exchanger removes the heat and humidity from cabin air

The evaporator is installed in the upper section of the condenser housing on top of the condenser compartment.

The inlet communicates with the baggage compartment through a foam filter and the outlet is connected to the bulkhead C6 with a flexible duct.

The evaporator blower provides airflow across the evaporator heat exchanger and delivers the air to the cabin through the cabin overhead distribution duct.

The blower is attached to the rear fuselage top skin between bulkhead C6 and frame C7.

It is controlled by the "AIR CONDITIONING" switches set to "AIR COND" or "FAN" and "HI-FAN" or "LO-FAN"

The receiver/drier removes moisture and retains solids from being carried by the refrigerant into the system.

It features a sight glass to control the system charge. The presence of bubbles indicates a system malfunction or a loss of refrigerant.

An overpressure relief valve providing additional safety in the event of the binary pressure switch malfunction is installed in the head.

The receiver/drier is installed in the rear fuselage between the bulkhead C6 and the frame C7.

The thermostatic expansion valve meters the proper amount of liquid refrigerant into the evaporator, activated by a remote bulb sensing the evaporator outlet temperature.

The thermostatic expansion valve is screwed on the evaporator inlet.

The system low side and high side service values are installed on a cross or a tee fitting in the piping system.

They are located in the rear fuselage behind the bulkhead C6, adjacent to the receiver/drier.

On the compressor discharge side, a binary pressure switch set to open at low pressure of 40 psi (2.7 bars) or high pressure of 325 psi (22.4 bars) protects the system by opening when system pressures are below or above limits causing the compressor electromagnetic clutch to disengage.

The controls and indicating devices are located on the instrument panel below the L.H. control wheel in the area identified "AIR CONDITIONING".

A three-position switch :

"OFF" : No air conditioning or cabin fan functions operate.

"FAN" : Evaporator blower operates to provide recirculating cabin airflow

"AIR COND" : Compressor, condenser blower and evaporator blower operate to provide conditioned airflow.

A two-position switch controls the speed of the evaporator blower in either "FAN" or "AIR COND" operating positions.

A blue light illuminates to indicate that the air conditioning system operates.

When the "AIR CONDITIONING" switch is set to "AIR COND", the compressor sucks the low pressure vapor refrigerant and discharges it as a high pressure, high heat vapor through the binary pressure switch toward the condenser.

The high pressure, high temperature gaseous refrigerant flows in the condenser where it gives up heat to ambient air drawn through the condenser by the blower and expels overboard.

The refrigerant liquefies or condenses and leaves the condenser as a high pressure liquid.

From the condenser, the refrigerant, cooled by the condenser blower, continues through the receiver/drier which removes moisture and retains impurities particules and reaches the thermostatic expansion valve at the evaporator inlet.

The remote bulb senses the evaporator outlet temperature and throttles the thermostatic valve to modulate and control the refrigerant flow through the evaporator.

The evaporator blower draws the humid and warm cabin air through the evaporator and blows it cool and dry in the cabin distribution duct equipped with "WEMAC" air outlets.

The low pressure liquid vaporises as it picks up heat and returns to the compressor as low pressure vapor.

The dried cabin air condenses on the evaporator fins and water droplets are collected and drained overboard.

The freeze switch (if installed and wired) on the evaporator prevents from a too important long by disengaging the compressor, which is engaged again as soon as temperature has reached the freeze switch energization threshold.

The process is repeated as long as the system is ON.

The air conditioning installation includes an automatic load shedding feature at max power/landing gear extended condition.

That shedding, elimination of the electrical supply to the compressor electromagnetic clutch and condenser blower is automatically achieved by the mean of the existing landing gear extended and look down microswitch and an additional microswitch on the throttle in the pedestal.

To reengage the system, set "AIR CONDITIONING" switch to "OFF" and back to "AIR COND".

The electric protection of the air conditioning system is ensured by :

- 3 pull-off type circuit breakers located on the circuit breaker panel and marked "EVAP FAN", "AIR COND" and "A/C CTL".
- 1 pull-off type circuit breaker marked "A/C CLUTCH", located on the evaporator heat exchanger, in the baggage compartment.

1 - Compressor
2 - "WEMAC" air outlets
3 - Evaporator heat exchanger
4 – Evaporator blower
5 – Condenser blower
6 - Receiver/drier
7 – Condenser heat exchanger
8 - Condenser airtight housing
9 - Service valves
10 - Overhead distribution duct

Figure 9.24 1 (1/3) - "KEITH" AIR CONDITIONING SYSTEM

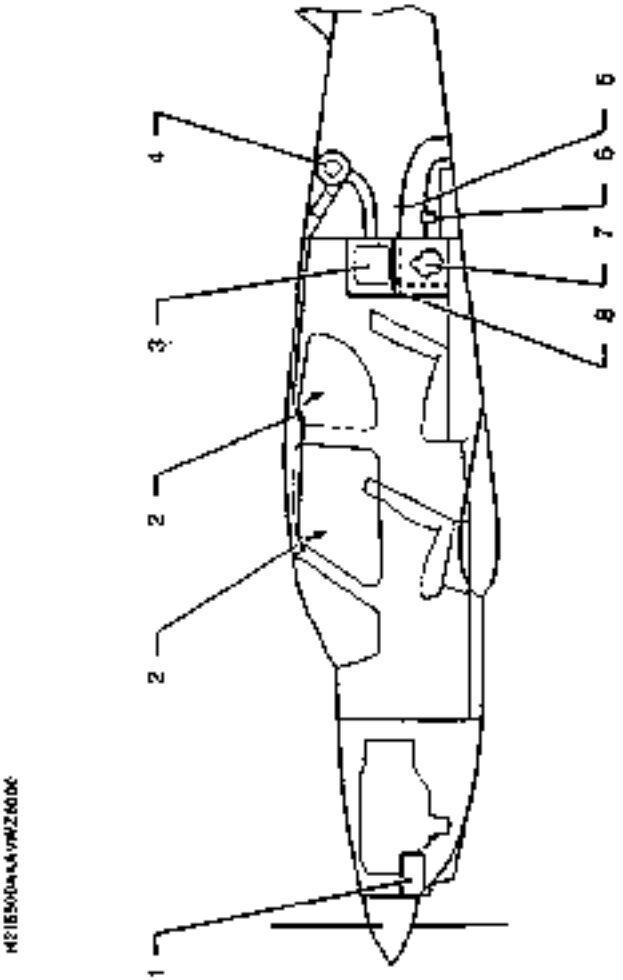

Figure 9.24.1 (2/3) - "KEITH" AIR CONDITIONING SYSTEM

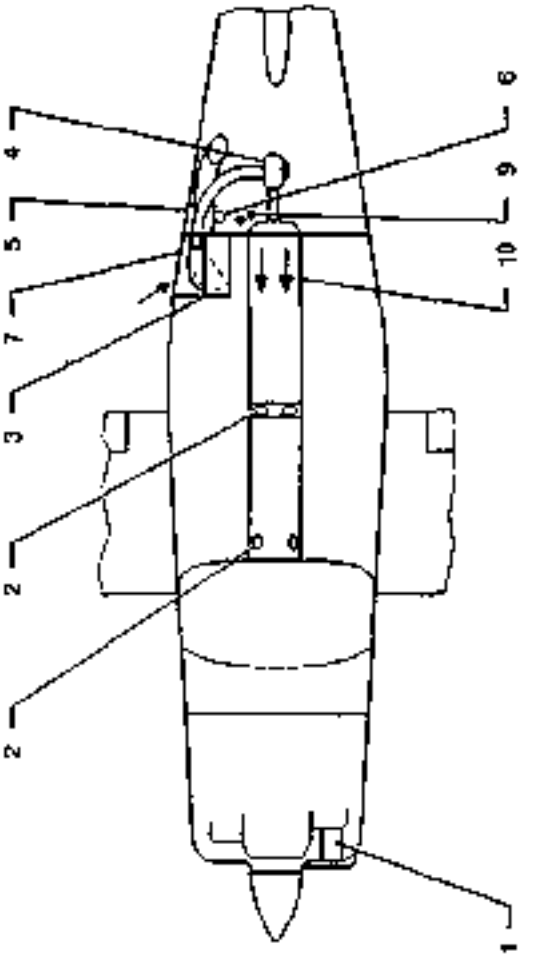

Figure 9.24.1 (3/3) - "KEITH" AIR CONDITIONING SYSTEM

1 - Operation control switch
2 - Speed control switch
3 - Light

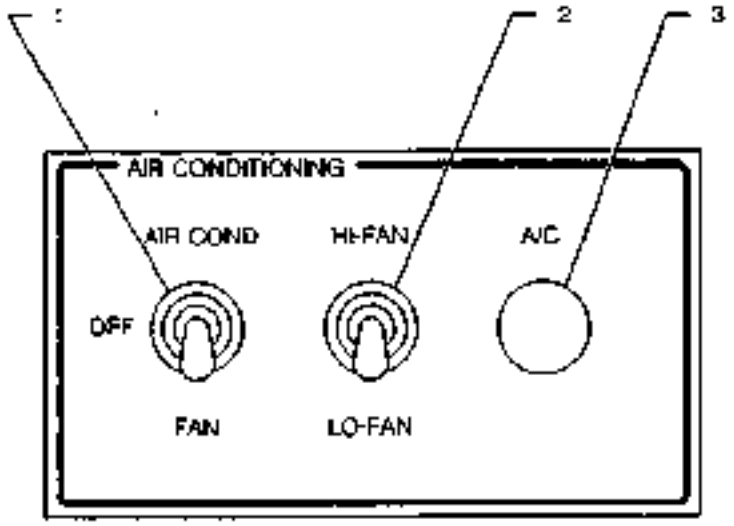

Figure 9.24.2 - CONTROL PANEL

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SUPPLEMENT

"GARMIN" 100 AVD GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A

"OPTIONAL EQUIPMENT No. J870 00 - J870 30 - J870 40"

TABLE OF CONTENTS

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SECTION 1
GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the aircraft is equipped with the option "GARMIN" 100 AVD GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A.

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB 20 aircraft is equipped with the option "GARMIN" 100 AVD GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A.

Using information provided by satellites ("GARMIN" 100 AVD is able to track up to 8 satellites at a time), GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means. It also uses data recorded in a data base (two different data bases are available : North American base or international base). The data base has to be updated every 28 days.

Each data base contains information about airports, communication frequencies, VORs, NDBs, intersections, flight service stations ...

There is also room for up to 100 user defined waypoints and 10 different flight plans.

SECTION 2
LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option "GARMIN" 100 AVD GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A.

GPS "GARMIN" 100 AVD is installed in accordance with FAA notice 8110.47 dated 23 April 93.

This equipment is approved for use as a VFR navigation system for en route and terminal area only. Therefore, GPS navigation must be crosschecked with usual means.

Database updating must be verified before each flight.

GPS "GARMIN" 100 AVD is not approved for navigation as a primary source.

Figure 9.25.1 - GPS limitation placard

"GARMIN" 100 AVD Owner's Manual at its latest revision shall be readily available to the pilot whenever the operation of the GPS navigation system is predicted.

SECTION 3
EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard aircraft described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option "GARMIN" 100 AVD GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A.

If "GARMIN" 100 AVD GPS information is flagged (Flag "NAV" on HSI), revert to remaining operational navigation equipment. Press the NAV 1 / GPS button-switch to select the NAV 1 navigation source.

SECTION 4
NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard aircraft described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option "GARMIN" 100 AVD GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A.

Normal operating procedures of the "GARMIN" 100 AVD GPS are outlined in the "GARMIN" 100 AVD Owner's Manual at the latest revision.

However, it is essential to precise the following points :

SET UP CONDITIONS

- Verify if the data base is current.
- Check that CDI settings are as follows :
  - CDI scale > ± 5.00 (Section II.3 of the Owner's Manual).
  - STEER TO > D - BAR (Section II.3 of the Owner's Manual).
- Check tone setting : MSG and key or MSG only (Section II.5 of the Owner's Manual).
- Check that MAP DATUM is WGS 84 or as indicated on the navigation charts used (Section II.7 of the Owner's Manual).
- Check that OUTPUT parameter is set to AVIATION (Section II.7 of the Owner's Manual).

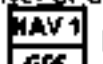
SYSTEM ANNUNCIATOR

The system annunciator is located above the ADI.

MESSAGE (MSG) - Will flash to alert the pilot of a situation that requires attention. It also generates an audible tone to alert the pilot of the message. Messages that require immediate attention such as an arrival alarm or a loss of GPS data generate a quick tone that will not stop until MSG key is pressed. All other messages generate a slow tone that will cease after 15 seconds.

SYSTEM SWITCHES

- This button-switch is used for selecting data to be presented on the pilot's HSI, either NAV data from the number one navigation receiver or GPS data from the "GARMIN" 100 AVD GPS.

The 

button-switch is located above the ADI.

PILOT'S DISPLAY

Left / right steering information is provided via the course deviation indicator on the pilot's HSI as a function of the source selected with the NAV 1 / GPS button-switch position.

GPS navigation parameters are presented on the HSI as :

- desired track [DTK] information,
- cross track error (XTK).

About one minute prior to reaching a waypoint, MSG alarm lights on, audio warning is on for 15 seconds. The message "Approaching waypoint" can be displayed.

As HSI is not slaved to DTK GPS output, it is necessary to adjust manually the selected course of the HSI to the present DTK of the navigation leg. This has to be made when crossing a waypoint.

FLIGHT DIRECTOR / AUTOPILOT COUPLED OPERATION

Whether the NAV 1 / GPS button-switch is selected on GPS data or NAV data engaging the NAV mode on the autopilot mode controller will make the FD appear, using selected course and left / right steering information presented on the HSI.

The autopilot is coupled to the HSI when AP is engaged on the mode controller.

WARNING

WHEN CROSSING A WAYPOINT, WITH THE AUTOPILOT ENGAGED ON NAV MODE AND USING GPS DATA, IF THE COURSE POINTER IS NOT ADJUSTED AT THE VALUE OF THE NEW DESIRED TRACK AND IF THE COURSE CHANGE IS MORE THAN 5°, THE FLIGHT DIRECTOR AND AUTOPILOT WILL STEER A DIVERGENT ROUTE AFTER THE WAYPOINT.

NOTE :
When the HSI is selected on GPS navigation source, the RMI remains selected on NAV 1 or NAV 2 source.

CAUTION

"GARMIN" 100 TURN OFF

THE "GARMIN" 100 AVD GPS HAS AN INTEGRATED BATTERY PACK. WHEN SELECTING RADIO MASTER SWITCH OFF AT ENGINE SHUT DOWN, GPS STAYS ON, USING THE BATTERY PACK.
PRESS AND HOLD THE OFF / DIM SIDE OF THE ON / OFF KEY FOR 3 SECONDS UNTIL THE DISPLAY IS BLANK.

SECTION 5
PERFORMANCE

Installation and operation of the "GARMIN" 100 AVD GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A do not change the performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

Weight and balance corresponding to the "GARMIN" 100 AVD GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A are given in the optional equipment list attached to Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

SECTION 7
DESCRIPTION

Normal operating procedures are described in the "GARMIN" 100 AVD Owner's Manual at the latest revision.

CONTROLS - see Figure 9.25.2

The front panel consists of a 3-line, 22-character LCD display and 21 keys. Information displayed on the LCD is commonly referred to as a page.

Access to the pages is made by the keys on the left and bottom of the LCD. Alphanumeric keys on the right of the LCD are used to enter data.

The rocker key (← →) activates a cursor that can be moved on the page to locations called fields. This function is visible by an area of inverse video on the screen.

The CLR key erases information in the cursor field or toggles through several available options on a cyclic field.

ENT key completes the process of data entry and indicates approval.

ANNUNCIATORS - see Figure 9.25.3

The annunciators include :

- 1 amber warning light marked "MSG",
- 1 button-switch composed of :
  - a green indicator light marked "NAV 1",
  - a blue indicator light marked "GPS".

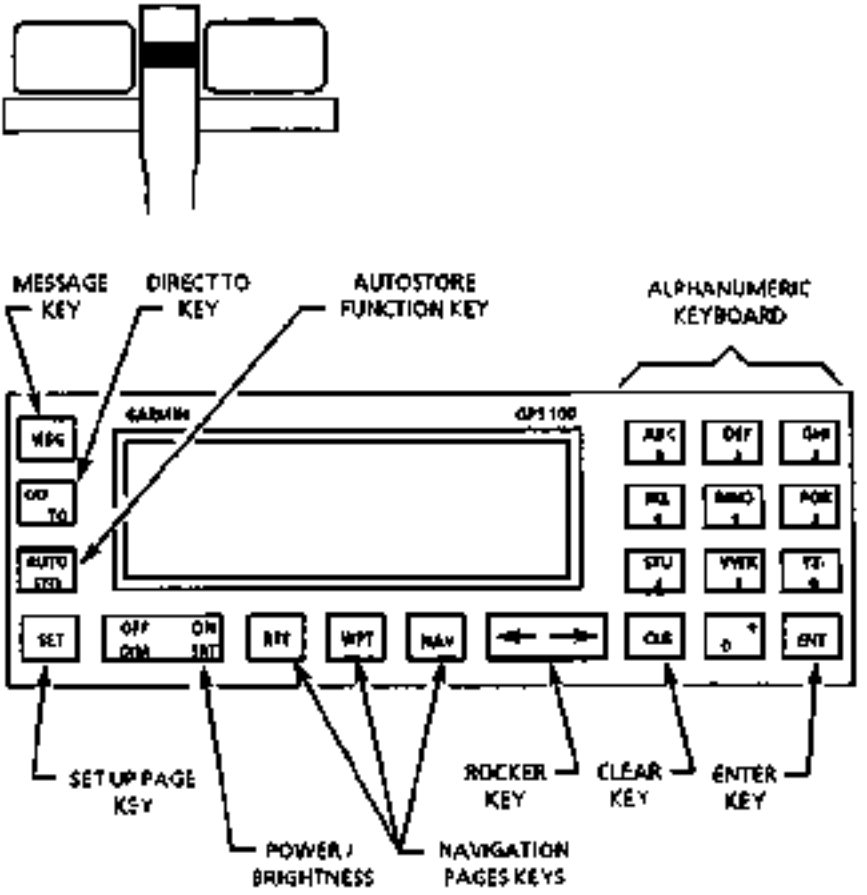


Figure 9.25.2 - Controls

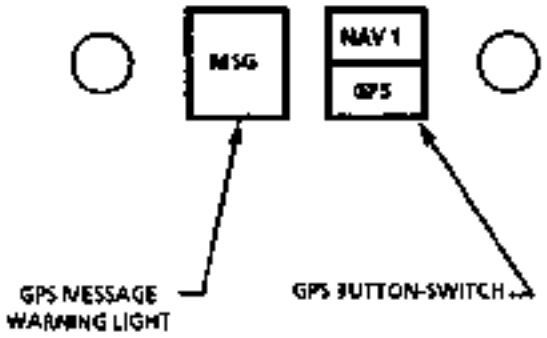


Figure 9.25.3 – GPS annunciators

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SUPPLEMENT

"BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A

"OPTIONAL EQUIPMENT No. K860 10M - K860 30M - K860 40M"

TABLE OF CONTENTS

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SECTION 1
GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the aircraft is equipped with the option ""BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A".

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option ""BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A".

Using information provided by satellites ("BENDIX / KING" KLN90A is able to track up to 8 satellites at a time), GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means. It also uses data recorded in a data base (two different data bases are available : North American one or International one). The data base is housed in a cartridge plugged into the back of the KLN90A and is updated every 28 days by means of diskettes and a computer (a jack located on left lower panel provides a means of interfacing the KLN90A with the computer via an interface cable).

Each data base contains information about airports, communication frequencies, VORs, NDBs, intersections, flight service stations ...

There is also room for up to 250 user defined waypoints and 26 different flight plans.

The KLN90A0 receives altitude code from the encoding altimeter.

SECTION 2
LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option ""BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A"

Data base updating must be verified before each flight.

NOTE :
The KLN90A genuine data base is referenced to WGS 84 geodetic datum.

If the data base or chart are not referenced to WGS 84 or to NAD 83 geodetic datum, in the absence of agreed operating procedure, the GPS navigation must be disabled for terminal area.

GPS "BENDIX / KING" KLN90A is not approved for navigation as a primary source.

Figure 9 26 1 - GPS limitation placard

The navigation must be performed with the primary navigation means. In any case, GPS use is limited to "en route" and terminal areas.

"BENDIX / KING" KLN90A Pilot's Guide at its latest revision shall be readily available to the pilot whenever the operation of the GPS navigation system is predicted.

D.G.A.C. Approved

SECTION 3
EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard aircraft described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option ""BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A".

If KLN90A GPS information is flagged (Flag "NAV" on HSI) or GPS integrity (RAIM) capability is lost, revert to remaining operational navigation equipment. Press the NAV 1 / GPS button-switch to select the NAV 1 navigation source.

SECTION 4
NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard aircraft described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option ""BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A".

Normal operating procedures of the KLN90A GPS are outlined in the "BENDIX / KING" KLN90A Pilot's Guide at the latest revision.

However, it is important to precise the following points :

SET UP CONDITIONS

- Verify if the data base is current.

- Verify the baro setting.

- Set turn anticipation mode (SET / 6) to :
  - ENABLE (turn anticipation ENABLED) : recommended mode,
  - DISABLE (turn anticipation DISABLED) : not recommended mode.

- Check that the proper criteria are used for nearest airport selection.

COURSE DEVIATION INDICATOR

In any mode, the course deviation indicator sensitivity is plus or minus 5 Nm full scale.

NOTE :
Transmission on VHF 1 or 2 communication frequencies 121.15, 121.175, 121.20, 131.25, 131.275 and 131.30 MHz may adversely affect reception of the GPS signal. Transmissions in excess of 10 seconds may result in loss of GPS signal reception and WRN annunciator activation. Navigation will be restored within 5 seconds after the completion of the transmission. If UHF communication system is installed, the same behaviour can be observed on the first harmonic of the VHF frequencies, 242.30, 242.35, 242.40, 262.50, 262.55 and 262.60 MHz.

D.G.A.C. Approved

SYSTEM ANNUNCIATORS

The system annunciators are located above the main horizon :

1) WAYPOINT (WPT) - Prior to reaching a waypoint in the active flight plan, the KLN90A GPS will provide navigation along a curved path segment to ensure a smooth transition between two adjacent legs in the flight plan. This feature is called turn anticipation. Approximately 20 seconds prior to the beginning of turn anticipation the WPT annunciator will flash, going solid upon initialization of the turn, and extinguishing upon turn completion.

WARNING

TURN ANTICIPATION IS AUTOMATICALLY DISABLED FOR WAYPOINTS USED EXCLUSIVELY IN SID / STARS WHERE OVERFLIGHT IS REQUIRED. FOR WAYPOINTS SHARED BETWEEN SID / STARS AND PUBLISHED EN ROUTE SEGMENTS (REQUIRING OVERFLIGHT IN THE SID / STARS) PROPER SELECTION ON THE PRESENTED WAYPOINT PAGE IS NECESSARY TO PROVIDE ADEQUATE ROUTE PROTECTION ON THE SID / STARS.

2) MESSAGE (MSG) - Will flash to alert the pilot of a situation that requires attention. Press the MSG button on the KLN90A GPS to view the message (Appendix B of the KLN90A Pilot's Guide contains a list of all of the message page messages and their meanings)

3) WARN (WRN) - Annunciates that GPS integrity (RAIM) capability is lost.

NOTE :
The warning annunciator may be tested by pressing on "TEST" knob of the alarm panel.

SYSTEM SWITCHES

- This button-switch is used for selecting data to be presented on the pilot's HSI, either NAV data from the number one navigation receiver or GPS data from the KLN90A GPS.

The 

button-switch is located below the HSI.

D.G.A.C. Approved

PILOT'S DISPLAY

Left / right steering information is provided via the course deviation indicator on the pilot's HSI as a function of the source selected with the NAV 1 / GPS button-switch position.

EN ROUTE-LEG mode

When using the en route-leg mode, it is necessary to adjust manually the course indicator at the value of the desired track between two waypoints.

When the KLN90A is used with the TURN ANTICIPATION ENABLED, at the beginning of turn anticipation, WPT alert annunciator goes on steady, MSG annunciator begins flashing. At this time, the KLN90A will notify the pilot with a message on the Message Page of the new desired track to select on the HSI. This message will not be given if the course change is less than 5°.

CAUTION

IT IS RECOMMENDED TO USE KLN90A WITH TURN ANTICIPATION ENABLED

WHEN TURN ANTICIPATION IS DISABLED, waypoint alerting occurs approximately 35 seconds prior to actually reaching the waypoint. MSG annunciator remains OFF. There is no course change message displayed by the KLN90A.

When the KLN90A is used WITH TURN ANTICIPATION DISABLED, the "Super NAV 5" page allows a rapid visualisation of the aircraft position in horizontal navigation with regards to the route and the waypoints. It is strongly recommended to use this page.

EN ROUTE-OBS mode

When using the en route-OBS mode, it is also necessary to adjust manually the course indicator at the value of the OBS selected on the KLN90A. The desired track selection is made only from the KLN90A control box.

FLIGHT DIRECTOR / AUTOPILOT COUPLED OPERATION

The HSI can be coupled to KAP 100, KAP 150 or KFC 150 autopilots.

The NAV mode engagement on the autopilot mode controller arms the autopilot in navigation mode, using selected course and left / right steering information presented on the HSI. It makes the FD appear in the case of the KFC 150 autopilot.

When AP is engaged on the mode controller, the autopilot is coupled to the HSI.

WARNING

WHEN CROSSING A WAYPOINT, WITH THE AUTOPILOT ENGAGED ON NAV MODE AND USING GPS DATA, IF THE COURSE POINTER IS NOT ADJUSTED AT THE VALUE OF THE NEW DESIRED TRACK AND IF THE COURSE CHANGE IS MORE THAN 5°, THE FLIGHT DIRECTOR AND AUTOPILOT WILL STEER A DIVERGENT ROUTE AFTER THE WAYPOINT (EN ROUTE-LEG MODE SELECTED ON THE KLN90A).

NOTE :
When the HSI is selected on GPS navigation source, the RMI (if installed) remains selected on NAV 1 source (VOR or RNAV).

SECTION 5
PERFORMANCE

Installation and operation of the "BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH HSI KI 525A do not change the performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	ITEM No.	OPTIONAL EQUIPMENT	WEIGHT lb	ARM in.
A	K860 10M	GPS KLN 90A "KING" interfaced with HSI and A/P, with RMI	9.17	21.65
A	K860 80M	GPS KLN 90A "KING" interfaced with HSI, with RMI	9.17	21.65
A	K860 40M	GPS KLN 90A "KING" interfaced with HSI and A/P, without RMI (For export only)	9.17	21.65

SECTION 7
DESCRIPTION

Normal operating procedures are described in the "BENDIX / KING" KLN90A Pilot's Guide at the latest revision

CONTROLS - see Figure 9.26.2

Controlled by two sets of concentric knobs and two cursor buttons, the KLN90A can present a variety of information in a number of different page formats.

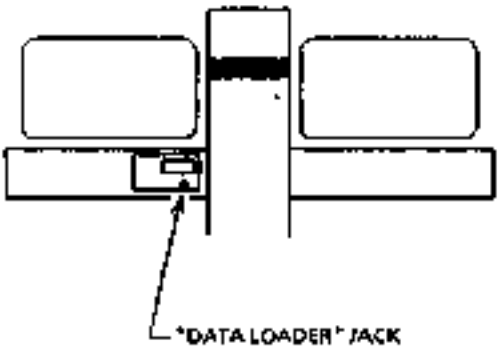
The various display types can be considered as chapters in a book, each chapter having as many as 26 numbered pages at once. With a few exceptions, each of these pages can be changed independently.

Generally the 2 concentric knobs and the cursor button to the left of the screen are used to select data on L.H. page, just as the right knobs and cursor on the right control the R.H. page.

The large outer knobs control the chapters and the small inner knobs turn the pages.

To change data in a page use the cursor function. This function is an area of inverse video on the screen brought up by depressing the cursor buttons.

Then rotate the outer knob to position the cursor and the inner knob to select the desired characters. Repeat this operation as many times as necessary and valid (ENT button).



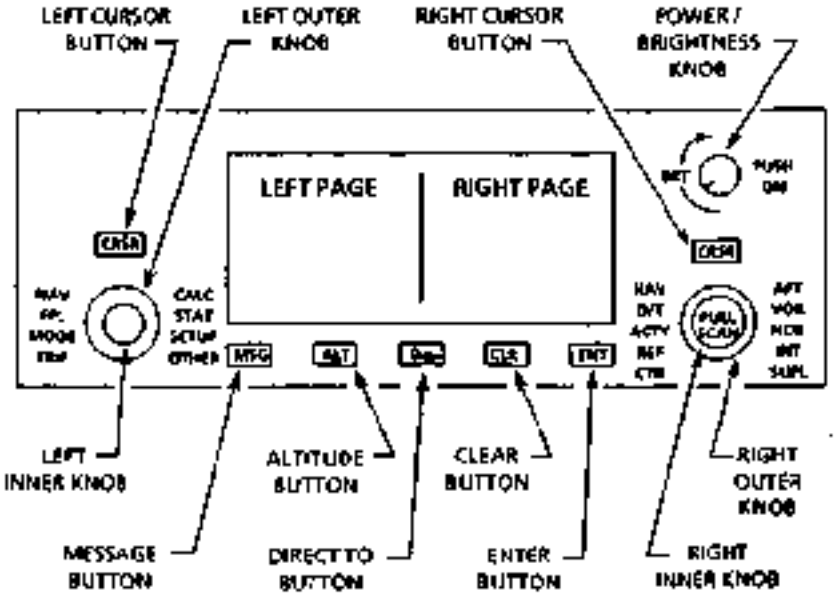
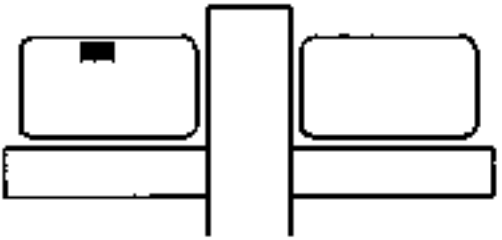


Figure 9.26.2 - Controls



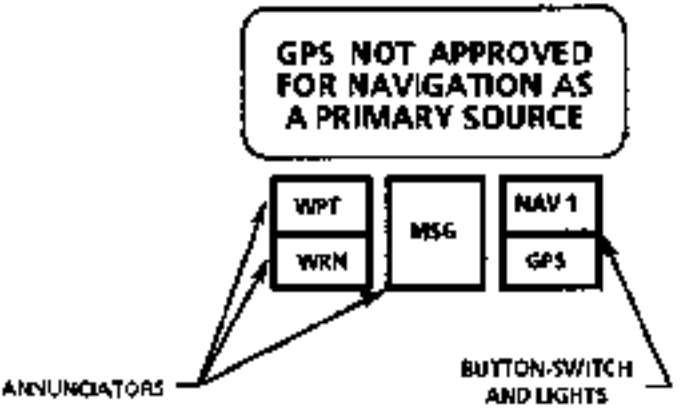


Figure 9.26.3 - GPS placard and annunciators

SUPPLEMENT

LOW NOISE EXHAUST

"OPTIONAL EQUIPMENT N° A888"

TABLE OF CONTENTS

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SECTION 1
GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the aircraft is equipped with the option "LOW NOISE EXHAUST".

SECTION 2
LIMITATIONS

The installation and the operation of the option "LOW NOISE EXHAUST" do not change the basic limitations of the aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

SECTION 3
EMERGENCY PROCEDURES

The installation and the operation of the option "LOW NOISE EXHAUST" do not change the emergency procedures of the aircraft described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

SECTION 4
NORMAL PROCEDURES

The normal procedures hereafter partially replace those of the standard aircraft described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option "LOW NOISE EXHAUST".

PREFLIGHT INSPECTIONS

AIRFRAME

6 - Forward fuselage

Windshield and window panels	Clean
Engine cowling attachment	Check
Oil	Check level and absence of leak
Propeller	Clean, good condition
Propeller cone	Check (no play)
Air intakes	Clean
Oil pump breather	Unobstructed
Exhaust pipe	Check
Exhaust muffler	Check condition and attachment
Fuel filter draining	Fuel free of water and sediment
Fuel filter drain	Check CLOSED

SECTION 5
PERFORMANCE

The performance hereafter partially replace those of the standard aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

ACOUSTIC LIMITATION

With a noise level lower than the limit noise level by 4.5 dB (A) the TB 20 aircraft complies with Chapter 10, appendix 6, annex 16 of the agreement relative to International Civil Aviation Organization (ICAO).

The noise limit authorized in above-mentioned ICAO conditions is 88.0 dB (A).

The noise level which was determined in above-mentioned ICAO conditions at maximum continuous power and at 2575 RPM is 83.5 dB (A).

Consequently, according to above-mentioned ICAO conditions, the noise limitation type certificate is extended to SOCATA TB 20 aircraft equipped with the option Nr A888.

CLIMB PERFORMANCE

CONDITIONS : Weight: 2370 lbs (1075 kg)
Indicated speed : 86 KIAS - 99 MPH IAS
Mixture : full rich
Landing gear UP - Flaps retracted
Power : 2575 RPM - full throttle
With option N/ A888 "LOW NOISE EXHAUST"

PRESSURE ALTITUDE	CLIMB SPEEDS					
	ISA - 20°C		ISA		ISA + 20°C	
Feet	m/s	ft/min	m/s	ft/min	m/s	ft/min
500	8.22	1619	7.37	1450	6.64	1308
2500	7.48	1473	6.66	1311	5.96	1174
4500	6.74	1328	5.95	1171	5.28	1040
6500	6.02	1184	5.24	1032	4.59	903
8500	5.28	1039	4.54	892	3.91	769
10500	4.55	895	3.83	753	3.21	633
12500	3.82	752	3.12	614	2.52	497

Figure 9.29.1 - CLIMB PERFORMANCE

CLIMB PERFORMANCE

CONDITIONS : Weight : 3086 lbs (1400 kg)
Indicated speed : 95 KIAS – 109 MPH IAS
Mixture : full rich
Landing gear UP – Flaps retracted
Power : 2575 RPM - full throttle
With option Nr A888 "LOW NOISE EXHAUST"

PRESSURE ALTITUDE	CLIMB SPEED					
	ISA - 20°C		ISA		ISA + 20°C	
Feet	m/s	ft/min	m/s	ft/min	m/s	ft/min
500	5.81	1144	5.14	1012	4.56	899
2500	5.20	1023	4.54	894	3.99	785
4500	4.58	901	3.95	776	3.40	671
6500	3.97	780	3.35	659	2.82	556
8500	3.35	659	2.75	541	2.24	441
10500	2.73	538	2.15	423	1.66	325
12500	2.13	419	1.55	305	1.07	210

Figure 9.29.2 - CLIMB PERFORMANCE

CLIMB PERFORMANCE

CONDITIONS : Weight : 2370 lbs (1075 kg)
Climb speed: 86 KIAS - 99 MPH IAS
Mixture : full rich
Landing gear UP - flaps retracted
Power : 2575 RPM – full throttle
With option Nr A888 "LOW NOISE EXHAUST"

PRESSURE ALTITUDE	CLIMB FROM SEA LEVEL								
	ISA -20°C			ISA			ISA +20°C		
Feet	TIME min's"	FUEL US Gal	DIST. NM	TIME min's"	FUEL US Gal	DIST. NM	TIME min's"	FUEL US Gal	DIST. NM
500	0'16"	0.1	0.4	0'21"	0.2	0.5	0'23"	0.2	0.6
2500	1'36"	0.6	2.3	1'47"	0.7	2.6	1'58"	0.7	3.0
4500	3'01"	1.1	4.4	3'23"	1.2	5.0	3'45"	1.2	5.8
6500	4'38"	1.6	6.8	5'11"	1.7	7.9	5'46"	1.8	9.0
8500	6'27"	2.2	9.6	7'15"	2.3	11.2	8'07"	2.4	13.0
10500	8'31"	2.7	12.9	9'40"	2.9	15.2	10'54"	3.0	17.8
12500	10'58"	3.4	16.9	12'35"	3.6	20.2	14'22"	3.8	23.9

Figure 9.29.3 - CLIMB PERFORMANCE

CLIMB PERFORMANCE

CONDITIONS : Weight: 3086 lbs (1400 kg)
Climb speed: 95 KIAS - 109 MPH IAS
Mixture : full rich
Landing gear UP - flaps retracted
Power : 2575 RPM - full throttle
With option Nr A888 "LOW NOISE EXHAUST"

PRESSURE ALTITUDE	CLIMB FROM SEA LEVEL								
	ISA -20°C			ISA			ISA +20°C		
Feet	TIME min's"	FUEL US Gal	DIST. NM	TIME min's"	FUEL US Gal	DIST. NM	TIME min's"	FUEL US Gal	DIST. NM
500	0'26"	0.2	0.6	0'29"	0.2	0.8	0'32"	0.2	0.9
2500	2'16"	0.9	3.6	2'34"	0.9	4.1	2'54"	1.0	4.8
4500	4'21"	1.6	6.9	4'57"	1.7	8.1	5'35"	1.8	9.5
6500	6'45"	2.4	10.8	7'43"	2.5	12.9	8'47"	2.7	15.2
8500	9'33"	3.2	15.6	11'02"	3.5	18.7	12'42"	3.7	22.3
10500	12'55"	4.1	21.6	15'09"	4.5	26.3	17'47"	4.9	32.0
12500	17'09"	5.2	29.3	20'37"	5.8	36.6	25'00"	6.5	46.1

Figure 9.29.4 - CLIMB PERFORMANCE

LEVEL FLIGHT PERFORMANCE

When aircraft is equipped with option Nr A888 "LOW NOISE EXHAUST", level flight performance are reduced by 3 kt at ISO power.

SECTION 6
WEIGHT AND BALANCE

The weight and balance hereafter complete those of the standard aircraft described in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	ITEM N°	OPTIONAL EQUIPMENT	*	WEIGHT lb	ARM in
		A - ENGINE & ACCESSORIES			
A	A0880M	LOW NOISE EXHAUST		19.84	15.75

SECTION 7
DESCRIPTION

The description hereafter partially replaces those of the standard aircraft described in Section 7 "Description" of the basic Pilot's Operating Handbook.

EXHAUST SYSTEM – see Figure 9.29.5

Exhaust gases from each cylinder are collected by pipes to be conducted, in order to reduce their noise level to an exhaust duct which is located at the front, crosswise under the power plant.

Then, exhaust gases route through a pipe under engine compartment up to an additional muffler located longitudinally under the fuselage R.H. side. Then they are discarged in the atmosphere.

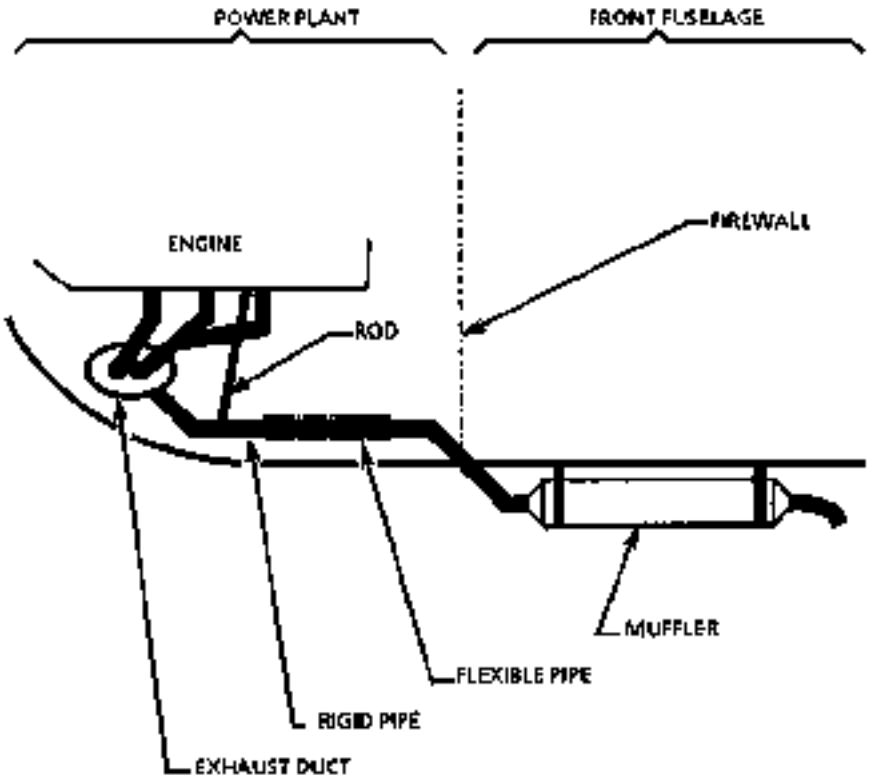

Figure 9.29.5 - EXHAUST SYSTEM (PRINCIPLE)

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SUPPLEMENT

"BENDIX / KING" VERTICAL SPEED AND ALTITUDE SELECTOR TYPE KAS 297B

"OPTIONAL EQUIPMENT N° D675"

TABLE OF CONTENTS

SECTION 1
GENERAL

This supplement is provided to acquaint the pilot with the limitations as well as the normal and emergency operating procedures of the BENDIX / KING KAS 297B Vertical Speed and Altitude Selector when added to a KFC 150 or KAP 150 Flight Control System.

The KAS 297B provides the pilot with the following features - ability to select vertical speed hold ; ability to select, arm and, upon approaching the selected altitude, automatically transfer into Altitude Hold ; altitude alerting as specified by the regulation

SECTION 2
LIMITATIONS

When the aircraft is equipped with the KAS 297B, in addition to the autopilot, limitations are identical to those of the standard aircraft plus those of the autopilot.
Refer to Section 2 "Limitations" of the basic Pilot's Operating Handbook and of the Autopilot Supplement.

SECTION 3
EMERGENCY PROCEDURES

No change in the basic emergency procedures of the aircraft described in Section 3 "Emergency Procedures" of the basic Pilot's Operating Handbook and of the Autopilot Supplement.

SECTION 4
NORMAL PROCEDURES

These procedures supplement those of standard aircraft described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook and of the Autopilot Supplement.

BEFORE TAXIING

TEST OF THE VERTICAL SPEED AND ALTITUDE SELECTOR

1 - AP "TEST" knob ..... **PRESS**

2 - Check .

- All legends and digits are displayed on the KAS 297B.

VERTICAL SPEED MODES

MODE ENGAGEMENT

1 - Select knob ..... **PULL, then ROTATE to display the desired vertical speed**

2 - "ENG" push-button ..... **PRESS**

VERTICAL SPEED CHANGE

1 - Using "CWS"

- "CWS" push-button ..... **PRESS until the desired vertical speed is displayed**
- "CWS" push-button ..... **RELEASE when the desired vertical speed is reached**

The autopilot will maintain the desired vertical speed.

VERTICAL SPEED MODES (Cont'd)

2 – Using Vertical Trim Control

– Vertical Trim Control . . . . . **PRESS either "UP" or "DN"**

The search of the new vertical speed will be performed at the rate of 100 ft/min per second the Vertical Trim Control is pressed.

- Vertical Trim Control . . . . . **RELEASE when desired time in seconds has passed (for example : press 5 seconds for a change of 500 ft/min)**

The autopilot will maintain the desired vertical speed.

CAUTION

VERTICAL SPEED HOLD MODE USE REQUIRES MONITORING OF THE INDICATED SPEED ESPECIALLY WHEN INDICATED SPEEDS ARE LOW (CLIMB) OR HIGH (DESCENT).

CAUTION

WHEN NEARING A PRESELECTED ALTITUDE, VERTICAL TRIM USE OR PRESELECTED ALTITUDE CHANGES WHILE THE SYSTEM IS IN CAPT MODE, WILL CANCEL THE MODE AND THE PRESELECTED ALTITUDE WILL BE DISREGARDED. THE SYSTEM MUST BE RE-ARMED BY THE PILOT. IF THE AIRCRAFT HAS PASSED BEYOND THE SELECTED ALTITUDE, THE PILOT MUST ALSO RE-ESTABLISH THE NECESSARY INTERCEPT ATTITUDE

ALTITUDE PRESELECT MODES

MODE ENGAGEMENT

1 - **Select knob** ..... **PRESS on the middle knob, then ROTATE, to display the desired altitude : the larger (outer) knob for a 1000 foot increment, the small (inner) knob for a 100 foot increment**

2 - **"ARM" push-button** ..... **PRESS**

3 - Display an aircraft attitude or a longitudinal mode ("IAS" or "VS") necessary to intercept the selected altitude.

SECTION 5

PERFORMANCE

No change in the basic performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6

WEIGHT AND BALANCE

Weight and balance corresponding to the BENDIX / KING KAS 297B are given in the optional equipment list attached to Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

SECTION 7
DESCRIPTION

7.1 - KAS 297B CONTROLS AND DISPLAYS

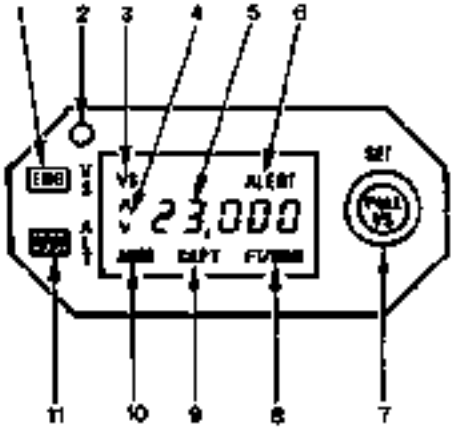

Figure 9.30.1 - KAS 297B CONTROLS AND DISPLAYS

Item 1 - VERTICAL SPEED MODE (ENG) BUTTON
When pressed will engage the Vertical Speed Hold mode. When pressed a second time will disengage the Vertical Speed Hold mode. When pressed with altitude displayed, will engage the Vertical Speed Hold mode and re-sync the Vertical speed Hold mode to the current vertical speed of the aircraft.

Item 2 - PHOTOCELL
Automatically dims display according to the cockpit ambient light.

Item 3 - VERTICAL SPEED (VS) ANNUNCIATOR
Illuminates when the Vertical Speed Hold mode is engaged.

Item 4 - VERTICAL SPEED UP / DOWN CARETS (^ or v)
Indicates whether the selected vertical speed is up or down.

Item 5 - DISPLAY
Displays selected altitude from 100 to 35000 feet or the selected vertical speed from 0 to 3000 ft per minute up or down.

Item 6 - ALTITUDE ALERT (ALERT) ANNUNCIATOR
The ALERT annunciator is illuminated 1000 ft prior to the selected altitude, goes out 300 ft prior to the selected altitude and illuminates momentarily when the selected altitude is reached. Once the selected altitude is reached, the light signifies that the 300 ft "safe band" has been exceeded and will remain on until 1000 ft from the selected altitude. The alert light is accompanied by a 2 second, pulsating aural tone anytime the light initially comes on.

Item 7 - VERTICAL SPEED / ALTITUDE SELECT KNOB
Concentric knobs which allow easy setting of altitude or vertical speed. The small knob (inner) has an IN and OUT position.
Altitude is displayed and selected when the small knob is in the IN position. When rotated the small knob selects altitude in 100 foot increments with roll over into the 1000 digits. The larger knob (outer) selects altitude in 1000 foot increments with roll over into the 10000 digits.
Vertical speed is displayed and selected when the small knob is in the OUT position. When rotated the small knob selects vertical speed in 100 ft / min increments.
The larger knob selects vertical speed in 1000 ft / min increments up to a maximum of 3000 ft / min.

Item 8 - MODE (FT or FT / MIN) ANNUNCIATOR
Indicates FT / MIN when in the Vertical Speed Hold mode and FT when in the Altitude Select mode.

Item 9 - ALTITUDE CAPTURE (CAPT) ANNUNCIATOR
Indicates the KAS 297B has switched the autopilot from Pitch Attitude Hold or Vertical Speed Hold mode into the pitch roundout mode (CAPT). The point, just prior to transfer into Altitude Hold, at which the CAPT mode becomes active varies with the vertical speed, i.e. the higher the rate of climb, the sooner the CAPT mode becomes active ; at low rates of climb the activation of the CAPT mode and transfer to altitude hold occur almost simultaneously. Engagement of any vertical mode or use of vertical trim, when in CAPT mode, will cancel this mode.

Item 10 - ALTITUDE SELECT MODE (ARM) ANNUNCIATOR
Indicates that the Altitude Select mode is armed to capture the selected altitude.

Item 11 - ALTITUDE SELECT MODE (ARM) BUTTON
When pressed and the selected altitude is displayed, will arm the Altitude Select mode. The Altitude Select (ARM) mode will cancel altitude hold (ALT) if ALT is already engaged. If Altitude Select (ARM) mode is present when GS couple occurs, the GS mode will cancel Altitude Select (ARM) mode. The engagement of ALT by the pilot's use of the ALT switch will cancel the altitude Select (ARM) mode.

Item 12 - CONTROL WHEEL STEERING (CWS) BUTTON (Not shown) - When pressed, in addition to the normal autopilot functions, the CWS also interfaces with the KAS 297B. When operating in the Vertical Speed Hold mode, the CWS will re-sync the vertical Speed Hold mode to the current vertical speed of the aircraft. If altitude is displayed when the CWS is pressed, the display will automatically display vertical speed as long as the CWS is depressed. CWS does not affect the Altitude Select mode.

7.2 - KC 191 AND KC 192 CONTROL BOXES

Figure 9.30.2 - KC 192 CONTROL BOX (KFC 150)

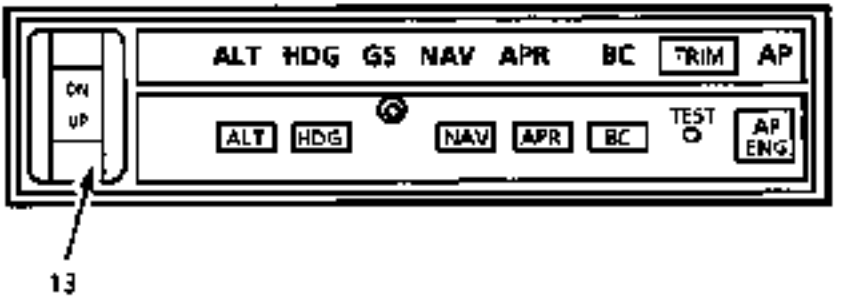

Figure 9.30.3 - KC 191 CONTROL BOX (KAP 150)

Item 13 - VERTICAL TRIM CONTROL
When in the Vertical Speed Hold mode this control can be used to slew the vertical speed up or down at 100 ft / min for every second the rocker switch is held down. If altitude is being displayed at the time the rocker switch is depressed, vertical speed will be displayed until 1 - 2 seconds after the rocker switch is released.

7.3 - CIRCUIT-BREAKERS

Autopilot components are supplied through following circuit-breakers :

LABEL	FUNCTION
AP / TRIMS	Supplies power to the KCP 220, the autopilot pitch, roll and yaw servos and the "PITCH TRIM", "AIL TRIM", "RUD TRIM" and "AP DISC" circuit-breakers.
AP ALERT	Supplies power to the KAA 15 audible alarm.
AP ALT SEL	Supplies power to the KAS 297B.
HSI RMI	Supplies the compass system.
PITCH TRIM	Supplies power to the manual electric pitch trim.
AP DISC	Delivers a control signal (28 VDC switched by "AP DISC TRM INT" switch) to the KCP 220 autopilot computer and to the KAA 15 alarm unit.

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SUPPLEMENT

"BENDIX / KING"
EHI 40

"BENDIX / KING" EHI 40
is part of option No. KB91 00M or K923 00M
""BENDIX / KING" Radio/Navigation Assy
with "BENDIX / KING" EFIS EHI 40 system (EHSI only)"

TABLE OF CONTENTS

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SECTION 1
GENERAL

This supplement provides information necessary for airplane utilization when the system EFIS "BENDIX / KING" EHI 40 type is installed on the airplane.

SECTION 2
LIMITATIONS

These limitations supplement those of standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

To undertake an IFR-flight :
- The EHSI must be available.
- No red or yellow "SG" or "DU" warning must be present.
- The "CHECK CONFIG" warning must not be present.
- The HDG warning must not be present.

CAUTION

THE EHI 40 CONFIGURATION IS MENTIONED ON FIGURE 9.31.1. MODIFICATION OF THIS CONFIGURATION IS PROHIBITED

0	VIEW / EDIT EQUIPMENT			PG 01
2	ITEM	SG	RK1	RK2
6	ATTITUDE/HDG #1	3	3	3
7	ATTITUDE/HDG #2	3	3	3
9	ADF #1	1	1	1
11	VOR/ILS #1	2	2	2
12	VOR/ILS #2	2	2	2
0	VIEW / EDIT EQUIPMENT			PG 02
2	ITEM	SG	RK1	RK2
3	DME #1	2	2	2
7	FMS #1	5	5	5
0	VIEW / EDIT EQUIPMENT			PG 03
2	ITEM	SG	RK1	RK2
5	AFCS TYPE	1	1	1
0	VIEW / EDIT OPERATING			PG 06
2	ITEM	SG	RK1	RK2
6	DISPLAY WIND VEC	1	1	1
7	DISPLAY DRIFT	1	1	1
9	DME DIST ONLY	1	1	1
0	VIEW / EDIT OPERATING			PG 08
2	ITEM	SG	RK1	RK2
4	VERT PTR TYPE	2	2	2
5	DISPLAY FMS MSG	1	1	1
0	VIEW / EDIT OPERATING			PG 09
2	ITEM	SG	RK1	RK2
4	HDG FAIL ANNUNC	1	1	1
0	VIEW / EDIT OPERATING			PG 10
2	ITEM	SG	RK1	RK2
5	ADF PTR HOLD DST	1	1	1

NOTE :
- Confirm all missing lines above mentioned as follows :

SG	*RK1*	*RK2*
0	*0*	*0*

- "PG 10" is specific for the optional equipment No. K923 00M.

Figure 9.31.1 - TABLE OF CERTIFIED OPERATING CONFIGURATIONS

The "BENDIX / KING Pilot's Guide EHI 40 system" P/N 006-08423-0005 1K at its latest revision shall be readily available for the pilot.

SECTION 3
EMERGENCY PROCEDURES

These procedures supplement those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Manual.

TABLE OF CONTENTS OF EMERGENCY PROCEDURES

RED WARNING

This warning, displayed on EHSI lubber line indicator location, indicates a directional gyro or a power supply converter failure. It involves the disconnection of the autopilot.

- Control the heading referring to emergency compass.

NOTE :
- *Only bearing information remains valid for ADF.*
- *Only QDM and course deviation information remain valid for the VOR.*

EHSI FAILURE

If EHSI symbols partially or completely disappear, the display is out of order. This involves the disconnection of the autopilot.

Control referring to the navigation instruments available (the DME information is no longer available).

YELLOW WARNING

This warning, displayed on the lower left corner of the EHSI, indicates a loss of airflow of the display.

- Reduce display brightness if possible.
- Expect an EHSI failure.

NOTE :
In the worst ambient temperature conditions, the display correctly operates during at least 30 minutes after annunciation.

YELLOW WARNING SG

This warning, displayed on the lower right corner of the EHSI, indicates a loss of airflow of the symbol generator.

1 - Reduce display brightness if possible.

2 - Lighten the display information if possible (navigation secondary information)

NOTE :
In the worst ambient temperature conditions, the symbol generator correctly operates during at least 30 minutes after annunciation.

RED WARNING CP

This warning, displayed on the L.H. of the EHSI indicates that a control panel switch of the EHSI has become stuck.

In this case, ALL CURRENTLY SELECTED CONDITIONS ARE FROZEN.

SELF-TEST DISPLAY

A self-test display during the flight indicates :

- that the pilot pressed the TST / REF push-button during more than 3 seconds,
- or that the TST / REF push-button remained stuck after having been briefly depressed.

In the case of a stuck button, the EHSI returns to normal display after 6 seconds.

The self-test display results in the disconnection of the autopilot.

RED CROSS DISPLAY ON HEADING BUG

A red cross, displayed on the HEADING BUG, indicates an HDG rotactor failure.

In this case, THE HEADING SELECTION IS FROZEN.

RED CROSS DISPLAY ON COURSE POINTER

A red cross, displayed on head and tail of the COURSE pointer, indicates a CRS rotactor failure.

In this case, THE COURSE SELECTION IS FROZEN.

SMALL RED WARNING SG

This warning, displayed on EHSI upper part, indicates that information present on the concerned display are no longer valid.

- Use these information only after validation with emergency instruments and only as additional information.

BIG RED WARNING SG

This warning, displayed on the entire EHSI screen, indicates that the symbols generator of the concerned display is unusable. It involves the autopilot disconnection.

- Control referring to navigation instruments available (the DME information is no longer available).

SECTION 4
NORMAL PROCEDURES

4.1 - GENERAL

These procedures supplement those of standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

4.2 - LIST OF GROUND CHECKS

BEFORE TAXIING

1 - Check for no flags
"DU", "5G", "CP"

EHI 40 SYSTEM AUTOTEST (if desired)

1 - "TST/REF" button ..... **PRESS AND HOLD for 3 seconds**

2 - Check that :

- the EHSI test pattern appears
- the "SELF TEST PASS" or "SELF TEST FAIL" message is annunciated in the center of the test pattern

If the "SELF TEST FAIL" message appears, the EHI 40 system must be serviced.

4.3 - LIST OF INFLIGHT CHECKS

SELECTION OF NAVIGATION SYSTEM

1 - Push-button [1/2] ..... PRESS

NOTE :
If only one navigation sensor is installed, the display will not cycle and the sensor annunciation will not show a system number. Pressing [1/2] push-button has no effect.

SELECTION OF THE PRIMARY NAVIGATION SENSOR

1 - Push-button [NAV] ..... PRESS

A press of the NAV push-button sequentially selects the primary navigation sensor. The sequence movement is :

- VOR, GPS (if installed), ADF then VOR, etc...

NOTE :
When the VOR navigation sensor is selected and an ILS frequency displayed, the VOR annunciation is replaced by LOC.

SELECTION OF THE 360-DEGREE HSI MODE

1 - Push-button [HSI] ..... PRESS

A press of the HSI push-button, sequentially selects the 360-degree display formats. The movement sequence is :

- COMPASS ROSE
- COMPASS ROSE AND NAVIGATION MAP

SELECTION OF BEARING POINTERS

1 - Push-button [→] or [⇒] ..... PRESS

The button [→] is paired with the white single bar pointer.

The button [⇒] is paired with the magenta double bar pointer.

A press of the bearing pointer buttons, sequentially selects the navigation sensors which are interfaced with the pointers.

The movement sequence is :

- no pointer (declutter function)
- VOR
- GPS (if installed)
- ADF
- no pointer, etc...

SELECTION OF BEARING POINTERS (Cont'd)

NOTE :

- *The pointers are displayed only if a valid radio-electric information exists.*
- *The VOR position is withdrawn from the sequence if an ILS frequence is selected.*
- *The DME information is displayed below the sensor annunciation - in VOR function, if a VOR-DME frequence is selected - in ADF function, if a VOR-DME frequence is selected and the DME positioned to "HOLD".*
- *The distance indication is displayed only if a valid DME signal is really received.*

SELECTION OF THE "ARC" DISPLAY MODE

1 - Push-button [ARC] ..... **PRESS**

A press of the ARC push-button, sequentially selects the ARC display formats. An approximate 85-degree sector display of the compass is presented. The movement sequence is :

- ARC
- ARC AND NAVIGATION MAP

RANGE SELECTION

1 - Push-button [Δ] or [∇] . . . . . **PRESS**

A press of the buttons [Δ] or [∇] respectively selects the next higher or lower range to be displayed while in the MAP mode of operation in the HSI or ARC formats. The selectable ranges are :

5 NM - 10 NM - 20 NM - 40 NM - 80 NM - 160 NM - 240 NM - 320 NM - 1000 NM.

COURSE SELECTION

1 - (CRS) knob . . . . . **ROTATE**

Pushing the center of the (CRS) knob will cause the course pointer to slew to the direct course to the selected NAVAID or active waypoint.

HEADING SELECTION

1 - (HDG) knob . . . . . **ROTATE**

Pushing the center of (HDG) knob will cause the heading bug to slew to the present aircraft heading.

DISPLAY OF NAVIGATION PAGES

1 - TST / REF button ..... **PRESS**

A brief press of the TST / REF button displays the title of the navigation page.

When pressed twice consecutively, the TST/REF button allows the cyclic permutation of the navigation pages following the FPL ID/AIRPORT/NAVAIDS sequence.

CAUTION

WHEN THE TST / REF BUTTON IS PRESSED AND HELD FOR 3 SECONDS, IT INITIATES THE EHI 40 SYSTEM TEST AND DISENGAGES THE AUTOPILOT

SECTION 5
PERFORMANCE

The installation and the operation of "BENDIX / KING" EHI 40 system do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given in Section 6 "Weight and Balance" of the basic Pilot's Operating Handbook.

A or O	OPTION No.	OPTIONAL EQUIPMENT	WEIGHT lb	ARM in.
A	K891 00M	Radio / Navigation assy "BENDIX / KING" with EHI 40 EFIS system "BENDIX / KING" (EHSI only). The K891 00M option consists of the following elements : - KMA 24H70 audio control box - VHF1 VOR/ILS KX 165-25 - VHF2 VOR/ILS KX 165-25 with KI 206 indicator - DME KN 63 - ADF KR 87 - ATC KT 76A - MARKER KR 21 - RMI KI 229 - GPS KLN 90A - KCS 305 gyro unit The EHI 40 part components are as follows : - SG 465 symbol generator - ED 461 EHSI indicator - KN 40 adapter	98.325	65.75

A or O	OPTION No.	OPTIONAL EQUIPMENT	WEIGHT lb	ARM in.
A	K923 00M	Radio / Navigation assy "BENDIX / KING" with EHI 40 EFIS system "BENDIX / KING" (EHSI only). The K923 00M option consists of the following elements : - KMA 24H70 audio control box - VHF1 VOR/LS KX 165-25 - VHF2 VOR/ LS KX 165-25 with KI 206 indicator - DME KN 63 - ADF KR 87 - MARKER KR 21 - RMI KI 229 - GPS KLN 90B - KCS 305 gyro unit The EHI 40 part components are as follows : - SG 465 symbol generator - ED 461 EHSI indicator - KN 40 adapter	94.577	68.11

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SECTION 7
DESCRIPTION

7.1 - EHI 40 CONTROLS

1) DME frequency tuning selecting rotary switch
2) EHSI
3) Push-button of EHI 40 self-test or DME ground speed or time-to-station alternate display
4) Scale setting push-button in MAP mode
5) ARC symbologic mode selecting push-button
6) Selected heading bug knob
7) ERMI dual pointer selecting push-button
8) EHSI brightness setting knob
9) ERMI single pointer selecting push-button
10) Navigation course selecting knob
11) EHSI figuration modes selecting push-button
12) Navigation source selecting push-button
13) Navigation system selecting push-button
14) EHSI MASTER switch - see Figure 9.31.4

Figure 9.31.2 (1 / 2) - CONTROLS AND DISPLAY

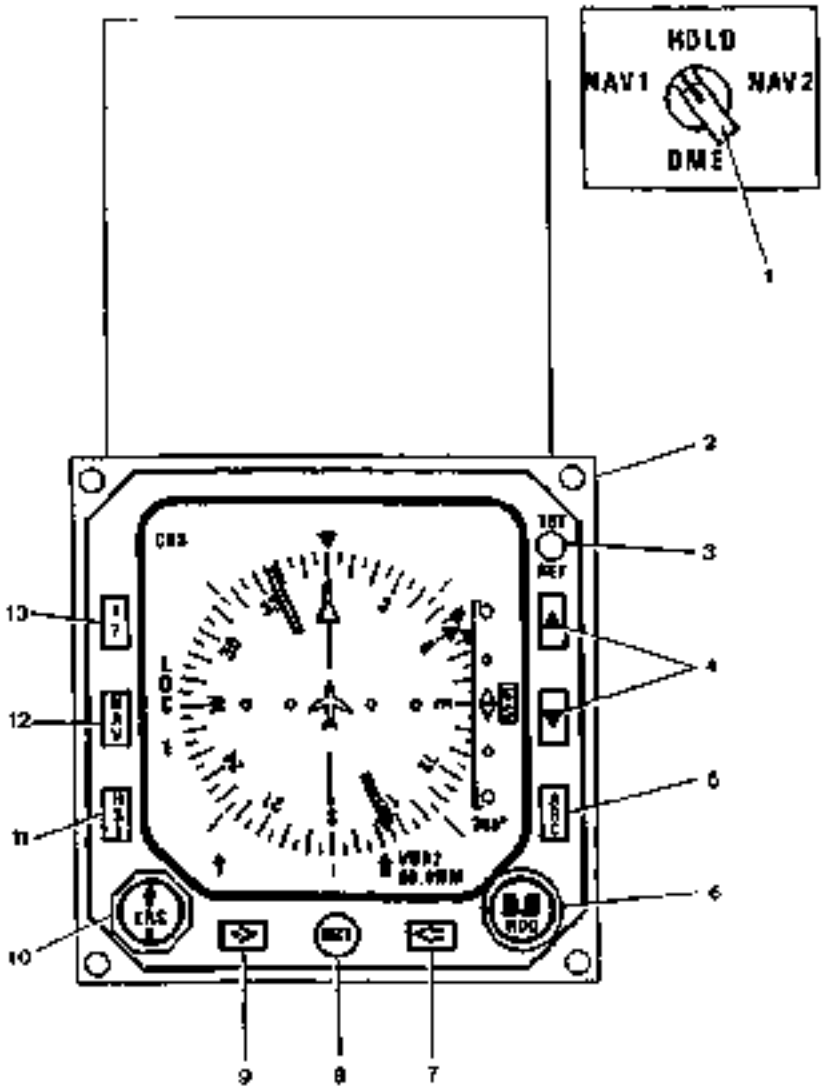

Figure 9.31.2 (2 / 2) - CONTROLS AND DISPLAY

Item 3 - TST / REF button - It allows to self-test the EHI 40 system by pressing at least 3 seconds. A brief switching allows to alternately display navigation pages.

Item 4 - PUSH-BUTTONS Δ and ∇ - They allow to modify the range scale in NAV MAP mode.

Item 5 - ARC PUSH-BUTTON - It allows to select the desired ARC figuration ;
by switching:
. ARC COMPASS ROSE
. ARC NAV MAP

Item 6 - (HDG) KNOB - It allows to set the bug to the desired heading. Depress to synchronise with the present heading.

Item 7 - PUSH-BUTT ⇐ - It allows to allocate the ERMI dual pointer to the different navigation sensors.

Item 8 - BRT KNOB - It allows to set the EHSI brightness.

Item 9 - PUSH-BUTTON ⇒ - It allows to allocate the ERMI single pointer to the different navigation sensors.

Item 10 - (CRS) KNOB - It allows to display the desired radial. Depress to select the present QDM.

Item 11 - HSI PUSH-BUTTON - It allows to select the EHSI desired figuration :
by switching :
. HSI COMPASS ROSE
. HSI NAV MAP

Item 12 - NAV PUSH-BUTTON - It allows to select the primary navigation source.

Item 13 - NAVIGATION SYSTEM SELECTING PUSH-BUTTON - It allows to select the navigation system used (system 1 or 2).

Figure 9.31.3 (1 / 2) - EHSI CONTROLS

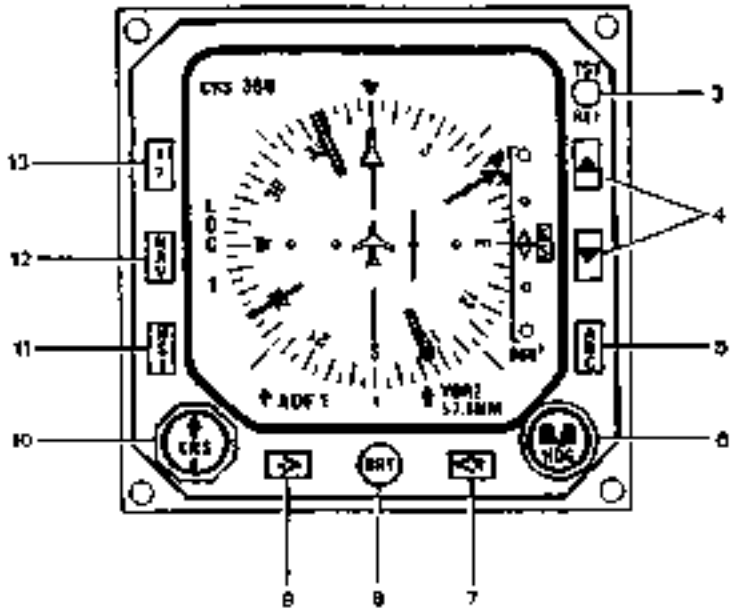

Figure 9.31.3 (2 / 2) - EHSI CONTROLS

Item 1 - DME ROTARY SWITCH - It allows to tune DME receiver frequency to the navigation system 1 or 2 (NAV_1 and NAV_2 positions). Furthermore, when tuning is performed, the rotary switch allows to memorize the selected frequency in the DME receiver (HOLD position).

Item 14 - EHSI MASTER SWITCH - It controls the power to all EHI 40 system components.

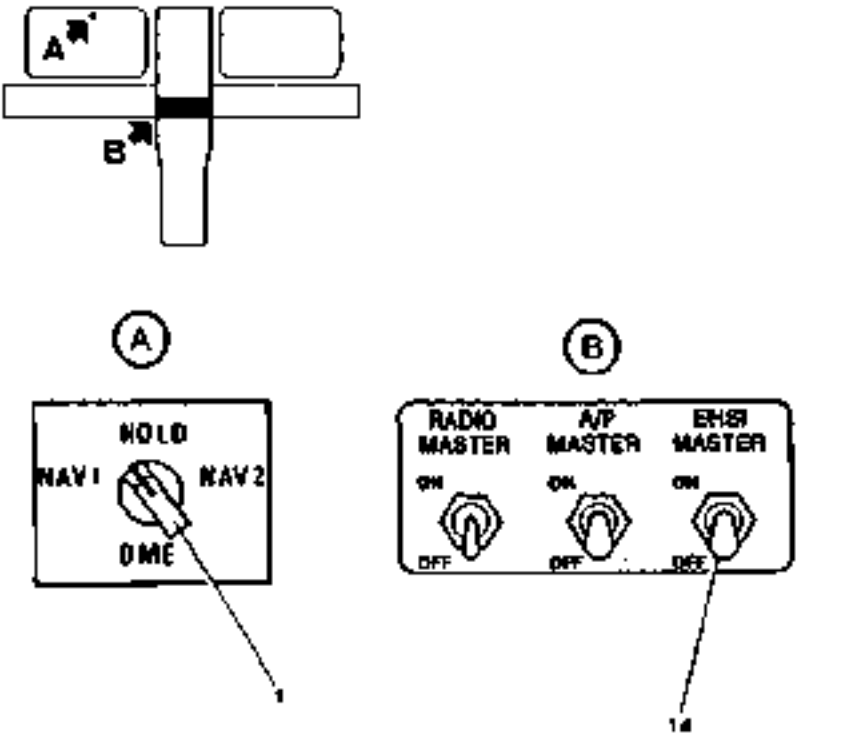

Figure 9.31.4 - EHSI CONTROLS

7.2 - EHSI SYMBOLOGY

1) Selected course
2) Lubber line
3) Selected heading bug
4) Distance bound to the primary navigation source (or other navigation system when in HOLD function)
5) Ground speed or time-to-station or H when in HOLD function
6) Glide Slope scale
7) Glide Slope pointer
8) Selected heading value
9) Heading rose
10) ERMI dual pointer
11) DME 2 distance
12) Navigation system allocated to ERMI dual pointer
13) DME 1 distance
14) Navigation system allocated to ERMI single pointer
15) ERMI single pointer
16) Deviation bar
17) Navigation system No. 1 or No. 2 used
18) Primary navigation source selected
19) Airplane symbol
20) Selected radial pointer

Figure 9.31.5 (1 / 2) - STANDARD EHSI SYMBOLOGY

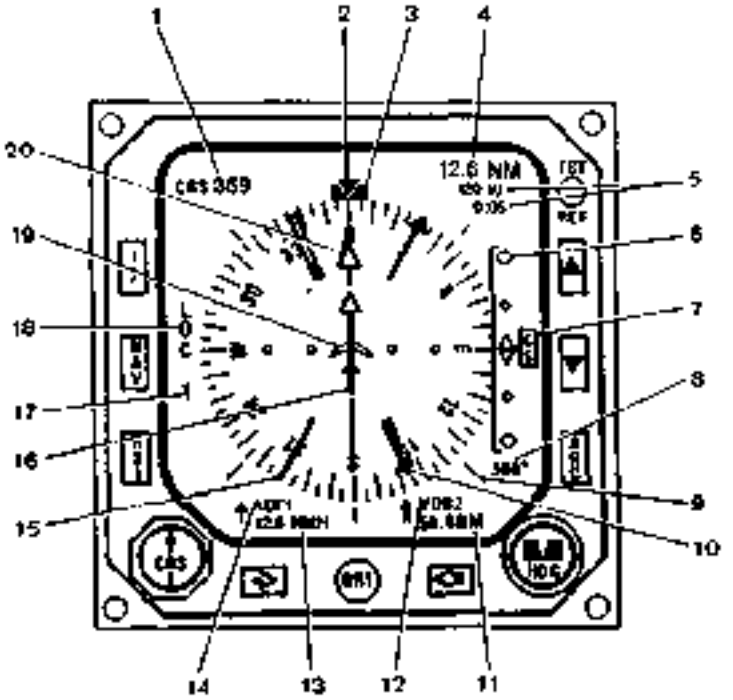

Figure 9.31.5 (2 / 2) - STANDARD EHSI SYMBOLOGY

7.3 - ELECTRICAL PROTECTIONS

The EHI 40 system is protected by the following circuit breakers :

LABEL	FUNCTION
EHSI	Protection of the supply line of SG465 functions generator and the supply of portion B of KN40 adapter (NAV / COM_2 portion).
EHSI Adapt	Protection of the supply line of portion A of KN40 adapter (NAV / COM_1 portion).
COMPASS	Controllable protection of SPC5 converter supply line and, by direct repercussion, of the gyro unit (K5G105) (cut-off of the 115V / 400 Hz and of all the 26V / 400 Hz).
DME	Controllable protection of the DME supply line (KN63).

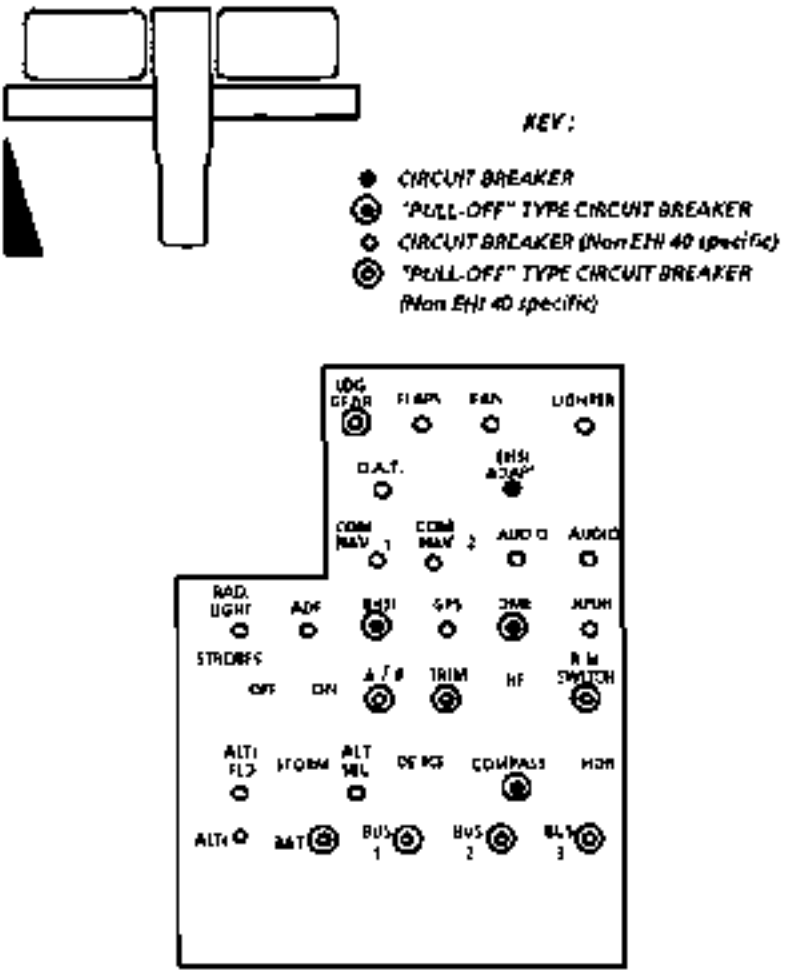

Figure 9.31.6 - CIRCUIT BREAKERS PANEL

SUPPLEMENT

"BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH EHI 40 EHSI

This "BENDIX / KING" KLN90A GPS is part of the Option No. K891 00M "Radio/Navigation assy "BENDIX / KING" with EFIS EHI 40 "BENDIX / KING" system (EHSI only)"

TABLE OF CONTENTS

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SECTION 1
GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the aircraft is equipped with the option ""BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH THE EHI 40 EHSI".

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option ""BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH THE EHI 40 EHSI".

Using information provided by satellites ("BENDIX / KING" KLN90A is able to track up to 8 satellites at a time), GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means. It also uses data recorded in a data base (two different data bases are available : North American one or International one). The data base is housed in a cartridge plugged into the back of the KLN90A and is updated every 28 days by means of diskettes and a computer (a jack located on left lower panel provides a means of interfacing the KLN90A with the computer via an interface cable).

Each data base contains information about airports, communication frequencies, VORs, NDBs, intersections, flight service stations ...

There is also room for up to 250 user defined waypoints and 26 different flight plans.

The KLN90A receives altitude code from the encoding altimeter.

SECTION 2
LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option ""BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH THE EHI 40 EHSI".

Data base updating must be verified before each flight.

NOTE :
The KLN90A genuine data base is referenced to WGS 84 geodetic datum.

If the data base or chart are not referenced to WGS 84 or to NAD 83 geodetic datum, in the absence of agreed operating procedure, the GPS navigation must be disabled for terminal area.

GPS "BENDIX / KING" KLN90A is not approved for navigation as a primary source.

Figure 9.32.1 - GPS limitation placard

The navigation must be performed with the primary navigation means. In any case, GPS use is limited to "en route" and terminal areas.

"BENDIX / KING" KLN90A Pilot's Guide at its latest revision shall be readily available to the pilot.

SECTION 3
EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard aircraft described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option ""BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH THE EHI 40 EHSI".

If KLN90A GPS information is flagged (Flag "NAV" on HSI) or GPS integrity (RAIM) capability is lost, revert to remaining operational navigation equipment. Press the "NAV" push-button on the EHSI to obtain the ADF or VOR sources.

When the system integrity is recovered, the return to the GPS mode must be accompanied by a consistency validation of the desired and followed courses using the primary navigation sources.

SECTION 4
NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard aircraft described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the aircraft is equipped with the option "BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH THE EHI 40 EHSI".

Normal operating procedures of the KLN90A GPS are outlined in the "BENDIX / KING" KLN90A Pilot's Guide at the latest revision.

However, it is important to precise the following points :

SET UP CONDITIONS

- Verify if the data base is current.

- Verify the baro setting.

- Set turn anticipation mode (SET / 6) to :
  . ENABLE (turn anticipation ENABLED) : recommended mode,
  . DISABLE (turn anticipation DISABLED) : not recommended mode.

- Check that the proper criteria are used for nearest airport selection.

COURSE DEVIATION INDICATOR

In any mode, the course deviation indicator sensitivity is plus or minus 5 Nm full scale.

NOTE :
Transmission on VHF 1 or 2 communication frequencies 121.15, 121.175, 121.20, 131.25, 131.275 and 131.30 MHz may adversely affect reception of the GPS signal. Transmissions in excess of 10 seconds may result in loss of GPS signal reception and WRN annunciator activation. Navigation will be restored within 5 seconds after the completion of the transmission. If UHF communication system is installed, the same behaviour can be observed on the first harmonic of the VHF frequencies, 242.30, 242.35, 242.40, 262.50, 262.55 and 262.60 MHz.

SYSTEM ANNUNCIATORS

The system annunciators are located above the main horizon :

1) WAYPOINT (WPT) - Prior to reaching a waypoint in the active flight plan, the KLN90A GPS will provide navigation along a curved path segment to ensure a smooth transition between two adjacent legs in the flight plan. This feature is called turn anticipation. Approximately 20 seconds prior to the beginning of turn anticipation the WPT annunciator will flash, going solid upon initialization of the turn, and extinguishing upon turn completion.

WARNING

TURN ANTICIPATION IS AUTOMATICALLY DISABLED FOR WAYPOINTS USED EXCLUSIVELY IN SID / STARS WHERE OVERFLIGHT IS REQUIRED. FOR WAYPOINTS SHARED BETWEEN SID / STARS AND PUBLISHED EN ROUTE SEGMENTS (REQUIRING OVERFLIGHT IN THE SID / STARS) PROPER SELECTION ON THE PRESENTED WAYPOINT PAGE IS NECESSARY TO PROVIDE ADEQUATE ROUTE PROTECTION ON THE SID / STARS.

2) MESSAGE (MSG) - Will flash to alert the pilot of a situation that requires attention. Press the MSG button on the KLN90A GPS to view the message (Appendix B of the KLN90A Pilot's Guide contains a list of all of the message page messages and their meanings).

3) WARN (WRN) - Annunciates that GPS integrity (RAIM) capability is lost.

NOTE 1 :
The warning annunciator may be tested by pressing on "TEST" knob of the alarm panel

NOTE 2 :
WPT and MSG warnings are duplicated in the L.H. portion of the EHSI, above the GPS identification.

NAVIGATION SOURCE SELECTION

The push-button "NAV" located on the EHSI L.H. instrument panel strip enables to select the navigation source. The movement sequence is VOR, GPS and ADF.

PILOT'S DISPLAY

EN ROUTE-LEG mode

When using the en route-leg mode, GPS navigation data are differently presented according to the selected mode :

- display equivalent to an electromechanical HSI (track, deviation course, TO / FROM) in ARC or HSI modes,
- trace of the navigation in MAP mode. The active leg is blue, the following legs are white.

When crossing a waypoint, the track resetting on following navigation leg automatically occurs.

When turn anticipation is ENABLED, the WPT annunciator will flash, going solid upon initialization of the turn, and extinguishing upon turn completion.

When turn anticipation is DISABLED, the WPT annunciator will flash, until waypoint vertical line is crossed, then extinguishes.

The navigation course selecting knob (CRS) is inactive.

With the autopilot engaged on NAV mode, the EHSI automatic resetting, when crossing a waypoint, allows to the aircraft an automatic transition from leg to leg without pilot action.

EN ROUTE-OBS mode

When using the en route-OBS mode, the desired radial selection on the waypoint is made equally from the course selecting knob (CRS) on EHSI or from the KLN90A control box. The recopy is quasi instantaneous.

FLIGHT DIRECTOR / AUTOPILOT COUPLED OPERATION

The EHSI can be coupled to KAP 100, KAP 150 or KFC 150 autopilots.

The NAV mode engagement on the autopilot mode controller arms the autopilot in navigation mode, using selected course and left / right steering information presented on the EHSI. It makes the FD appear in the case of the KFC 150 autopilot.

When AP is engaged on the mode controller, the autopilot is coupled to the EHSI and uses the information displayed (course and course deviation).

NOTE :
When the EHSI is selected on GPS navigation source, the RMI (if installed) remains selected on NAV 1 source (VOR or RNAV).

SECTION 5
PERFORMANCE

Installation and operation of the "BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH THE EHI 40 EHSI do not change the performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

The weight and balance data of the "BENDIX / KING" KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH THE EHI 40 EHSI are included in K891 00M option : refer to Supplement 31 - Section 6.

SECTION 7
DESCRIPTION

Normal operating procedures of the "BENDIX / KING KLN90A GPS NAVIGATION SYSTEM INTERFACED WITH EHI 40 EHSI are described in the "BENDIX / KING" KLN90A Pilot's Guide at the latest revision.

CONTROLS - see Figure 9.32.2

Controlled by two sets of concentric knobs and two cursor buttons, the KLN90A can present a variety of information in a number of different page formats.

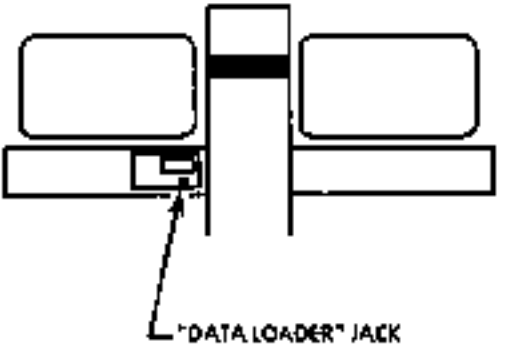
The various display types can be considered as chapters in a book, each chapter having as many as 26 numbered pages at once. With a few exceptions, each of these pages can be changed independently.

Generally the 2 concentric knobs and the cursor button to the left of the screen are used to select data on L.H. page, just as the right knobs and cursor on the right control the R.H. page.

The large outer knobs control the chapters and the small inner knobs turn the pages.

To change data in a page use the cursor function. This function is an area of inverse video on the screen brought up by depressing the cursor buttons.

Then rotate the outer knob to position the cursor and the inner knob to select the desired characters. Repeat this operation as many times as necessary and valid (ENT button).



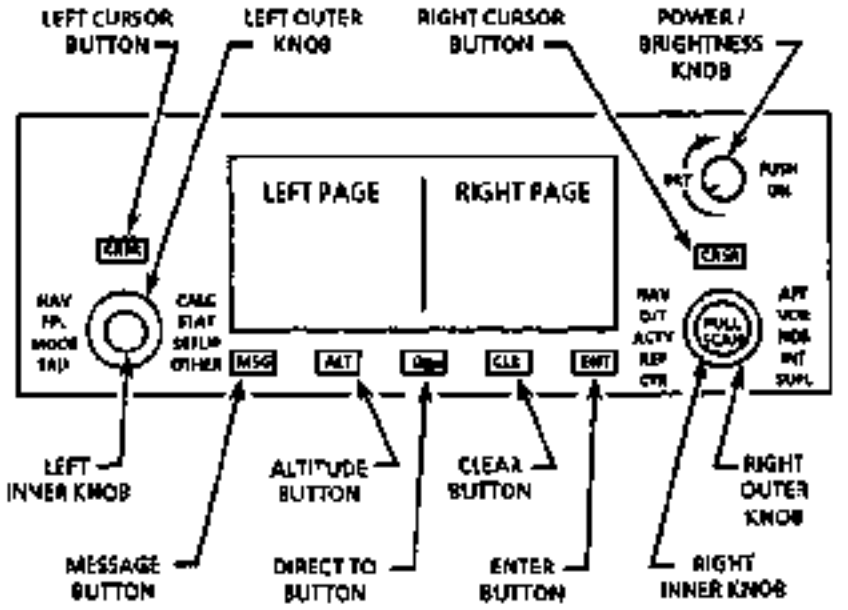
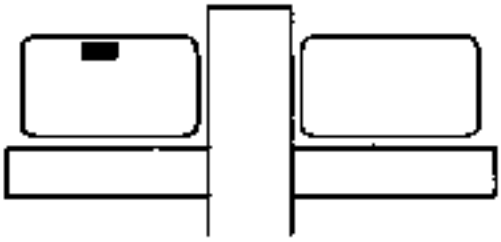


Figure 9.32.2 - Controls



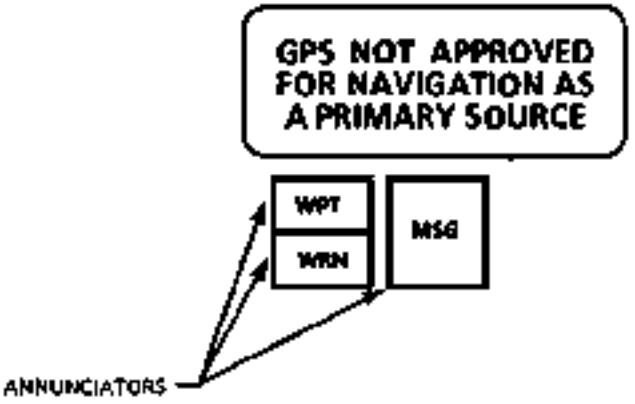


Figure 9.32.3 - GPS placard and annunciators

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SUPPLEMENT

"BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A

"OPTIONAL EQUIPMENT No. K899 00M - K899 10M - K899 20M - K899 30M - K927 00M"

TABLE OF CONTENTS

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SECTION 1
GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB aircraft is equipped with the option "**"BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A"**.

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "**"BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A"**.

Using information provided by satellites ("BENDIX / KING" KLN90B is able to track up to 8 satellites at a time), GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means. It also uses data recorded in a data base (two different data bases are available : North American one or International one). The data base is housed in a cartridge plugged into the back of the KLN90B and is updated every 28 days by means of diskettes and a computer (a jack located on right lower panel PL25 provides a means of interfacing the KLN90B with the computer via an interface cable)

Each data base contains information about airports, communication frequencies, VORs, NDBs, intersections, SIDs, STARs, instrument approaches, flight service stations ...

There is also room for up to 250 user defined waypoints and 26 different flight plans.

CAUTION

IT IS STRONGLY ADVISED NOT TO LOAD USER WAYPOINTS IN DATA BASE IN TERMINAL AREA NAVIGATION DUE TO THE INCREASE OF WORK LOAD FOR THE PILOT

The KLN90B receives altitude code from the encoding altimeter

SECTION 2
LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A".

Data base updating must be verified before each flight.

NOTE :
The original KLN90B data base is in accordance with the WGS84 geodetic model.

If the data base or the cartridge are not in accordance with WGS84 or NAD 83 geodetic model, and as there is no means of operation published, GPS navigation system must be disengaged in terminal area.

GPS "BENDIX / KING" KLN90B is not approved for navigation as a primary source.

GPS NOT APPROVED FOR NAV AS PRIMARY SOURCE

Figure 9.33.1 - GPS limitation placard
Valid for options No. K899.00M - K899.10M - K899.20M - K899.30M

Navigation must be conducted with primary sources. In any case, GPS use is limited to the En route or terminal area of the flight.

"BENDIX / KING" KLN90B Pilot's Guide at its latest revision shall be readily available to the pilot.

The use of GPS approach mode is prohibited.

USE OF GPS APPROACH MODE IS PROHIBITED

Figure 9.33.2 - GPS limitation placard

IFR navigation is restricted as follows :

- The system must utilize ORS level 20 or later.
- IFR en route and terminal area navigation is prohibited unless the pilot verifies the currency of the data base and verifies each selected waypoint for accuracy by reference to current approved data.

CAUTION
USE OF GPS APPROACH MODE IS PROHIBITED

SECTION 3
EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A".

NAV FLAG

If the NAV flag appears on the HSI when it is interfaced with GPS KLN90B, this means that the GPS signal integrity has been lost.

1 - "NAV 1 / GPS" inverter ..... PRESS

Return to the NAV1 navigation source and to remaining operational navigation equipment.

"MSG" ANNUNCIATOR ILLUMINATION

1 - "MSG" push-knob of KLN90B ..... PRESS

Check the message.

If the message mentions the loss of GPS system integrity (RAIM NOT AVAILABLE) or detects a too important position error (RAIM POSITION ERROR) :

2 - "NAV 1 / GPS" inverter ..... PRESS

Return to the NAV1 navigation source and to remaining operational navigation equipment.

When the system integrity is restored, the return to GPS mode must be accompanied by the validation of the followed and desired track concordance by using primary sources of navigation.

SECTION 4
NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A".

Normal operating procedures of the KLN90B GPS recommended by "BENDIX / KING" manufacturer are outlined in the "BENDIX / KING" KLN90B Pilot's Guide at the latest revision and KLN90B Memory Jogger at the latest revision.

However, it is important to precise the following points for the use of KLN90B on TB :

SET UP CONDITIONS

- The system must utilize ORS level 20 or later in compliance with the Pilot's Guide.
- Verify if the data base is current. Verify data on the self test page.
- Verify that altitude data is valid for the KLN90B prior to flight.
- Set turn anticipation mode (SET / 6) to .
  - ENABLE (turn anticipation ENABLED) : recommended mode,
  - DISABLE (turn anticipation DISABLED) : not recommended mode.
- Check that the proper criteria are used for nearest airport selection (SET / 3).

COURSE DEVIATION INDICATOR

The course deviation indicator sensitivity is adjustable with a maximum value which is the default value selected by the KLN90B. It is recommended not to change the default value which is ± 5 NM full scale.

NOTE :
Transmission on VHF 1 or 2 communication frequencies 121.15, 121.175, 121.20, 131.25, 131.275 and 131.30 MHz may adversely affect reception of the GPS signal. Transmissions in excess of 10 seconds may result in loss of GPS signal reception and WRN annunciator activation. Navigation will be restored within 5 seconds after the completion of the transmission. If UHF communication system is installed, the same behaviour can be observed on the first harmonic of the VHF frequencies, 242.30, 242.35, 242.40, 262.50, 262.55 and 262.60 MHz.

SYSTEM ANNUNCIATORS / SWITCHES / CONTROLS

"NAV 1/GPS" inverter

It may be used to select data for presentation on the pilot's HSI (L.H. instrument panel) ; either NAV data from NAV 1 navigation receiver or GPS data from the KLN90B GPS. The presentation on the HSI is also required for the autopilot connection.

"MSG" message annunciator

CAUTION

"MSG" ANNUNCIATOR MAY BE PERMANENTLY ILLUMINATED IF THERE EXISTS A PERMANENT MESSAGE. WHEN A NEW MESSAGE APPEARS, "MSG" ANNUNCIATOR ONLY FLASHES. IN THIS CASE, RETURN TO NAVIGATION PRIMARY MEANS BY PRESSING ON "NAV 1/GPS" INVERTER

It will flash to alert the pilot of a situation that requires his attention. Press the "MSG" button on the KLN90B GPS to view the message. (Appendix B of the KLN90B Pilot's Guide contains a list of all the messages likely to appear on the "Message" page and their meanings). "MSG" annunciator is amber.

"WPT" Waypoint annunciator

WARNING

TURN ANTICIPATION IS AUTOMATICALLY DISABLED FOR WAYPOINTS USED IN "SID / STARS" WHERE OVERFLIGHT IS MANDATORY. FOR WAYPOINTS SHARED BETWEEN "SID / STARS" AND PUBLISHED ENROUTE SEGMENTS (REQUIRING OVERFLIGHT IN THE "SID / STARS"), PROPER SELECTION ON THE PRESENTED "WAYPOINT" PAGE IS NECESSARY TO PROVIDE ADEQUATE ROUTE PROTECTION ON THE "SID / STARS".

Prior to reaching a waypoint in the active flight plan, the KLN90B GPS will provide navigation along a curved path segment to ensure a smooth transition between two adjacent legs in the flight plan. This feature is called turn anticipation. Approximately 20 seconds prior to the beginning of the turn anticipation, the "WPT" annunciator will flash, going solid upon initiation of the turn, and extinguishing upon turn completion.
"WPT" annunciator is amber.

GPS approach "GPS APR ARM / GPS APR ACTV" switch / annunciator

CAUTION

THE USE OF GPS KLN90B APPROACH MODE IS PROHIBITED

This switch / annunciator is used to select or deselect approach mode of the KLN90B. This operation mode is not certified.

GPS course "GPS CRS OBS / GPS CRS LEG" switch / annunciator

This switch / annunciator is used to select the basic operation modes of the KLN90B, either a single waypoint with omnibearing course (OBS) selection through the waypoint (like a VOR) or automatic leg sequencing (LEG) between waypoints.
"GPS CRS OBS" annunciator is amber. "GPS CRS LEG" annunciator is green.

NOTE :
Either "GPS CRS LEG" or "GPS CRS OBS" will illuminate during system self-test depending on switch position.

EN ROUTE-LEG mode

When using the "EN ROUTE-LEG" mode, it is necessary to adjust manually the course indicator at the value of the desired track between two waypoints.

When the KLN90B is used with the TURN ANTICIPATION ENABLED, at the beginning of turn anticipation, WPT alert annunciator goes on steady, MSG annunciator begins flashing. At this time, the KLN90B will notify the pilot with a message on the Message Page of the new desired track to select on the HSI. This message will not be given if the course change is less than 5°.

CAUTION

IT IS RECOMMENDED TO USE KLN90B WITH TURN ANTICIPATION ENABLED

WHEN TURN ANTICIPATION IS DISABLED, WAYPOINT ALERTING OCCURS APPROXIMATELY 35 SECONDS PRIOR TO ACTUALLY REACHING THE WAYPOINT. MSG ANNUNCIATOR REMAINS OFF. THERE IS NO COURSE CHANGE MESSAGE DISPLAYED BY THE KLN90B.

When the KLN90B is used WITH TURN ANTICIPATION DISABLED, the "Super NAV 5" page allows a rapid visualisation of the airplane position in horizontal navigation with regards to the route and the waypoints. It is strongly recommended to use this page.

EN ROUTE-OBS mode

The "OBS" mode has to be selected as follows :

- press the "OBS / LEG" inverter to select the "OBS" mode,
- adjust the course indicator at the value of the desired track. When selecting the "OBS" mode, the active "WPT" of the "LEG" mode is chosen as reference "WPT" for the "OBS" mode,
- check the desired track from MOD 2 page of the KLN90B control box.

FLIGHT DIRECTOR / AUTOPILOT COUPLED OPERATION

The HSI may be coupled with KAP 150 or KFC 150 autopilot.

Engaging the "NAV" mode on the autopilot mode controller engages the autopilot in navigation mode by using the selected course and left / right steering information presented on the HSI. It makes FD appear.

When AP is engaged on the mode controller, the autopilot is coupled to the HSI.

WARNING

WHEN CROSSING A WAYPOINT, WITH THE AUTOPILOT ENGAGED ON NAV MODE AND USING GPS DATA, IF THE COURSE POINTER IS NOT ADJUSTED TO THE VALUE OF THE NEW DESIRED TRACK AND IF THE COURSE CHANGE IS MORE THAN 5°, THE FLIGHT DIRECTOR AND AUTOPILOT WILL STEER A DIVERGENT ROUTE AFTER THE WAYPOINT (ENROUTE-LEG MODE SELECTED).

NOTE :
When the HSI is selected on GPS navigation source, the RMI (if installed) remains selected on NAV 1 source (VOR or RNAV).

"SID" PROCEDURE

NOTE :
"SID" procedure can only be loaded in the Active Flight Plan (FPL 0).

Prior to take-off - Select an appropriate "SID" from the ACT 7 page. If necessary, select runway and transition point.

NOTE 1 :
Using right hand outer knob, select the ACT (Active Flight Plan waypoints) pages. Pull right hand inner knob out and scroll to the departure airport then push the inner knob in and select the ACT 7 page.
To delete or replace a "SID", select FPL 0 page. Place the cursor over the name of the procedure, press ENT to change it, or CLR then ENT to delete it.

NOTE 2 :
After "SID" loading in the Active Flight Plan, using right hand outer knob, select the ACT (Active Flight Plan waypoints) pages. To check position of the "SID" waypoints, pull this knob and scroll each waypoint of the departure procedure.

"STAR" PROCEDURE

NOTE :
"STAR" procedure can only be loaded in the Active Flight Plan (FPL 0).

Prior to arrival - Select an appropriate "STAR" from the **ACT 7** page.

NOTE 1 :
Using right hand outer knob, select the ACT (Active Flight Plan waypoints) pages. Pull right hand inner knob out and scroll to the destination airport, then push the inner knob in and select the ACT 7 page.
To delete or replace a STAR, select FPL 0 page. Place the cursor over the name of the procedure, press ENT to change it, or CLR then ENT to delete it.

NOTE 2 :
After "STAR" loading in the Active Flight Plan, using right hand outer knob, select the ACT (Active Flight Plan waypoints) page. To check position of the "STAR" waypoints, pull this knob and scroll each waypoint of the arrival procedure.

SECTION 5

PERFORMANCE

Installation and operation of the "BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A" do not change the performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6

WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	ITEM No.	OPTIONAL EQUIPMENT	WEIGHT lb	ARM in.
A	K899 006M	GPS KLN 90B "KING" interfaced with HSI and A/P, without RMI (KA91 antenna) (For export only)	9.94	21.26
A	K899 10M	GPS KLN 90B "KING" interfaced with HSI and A/P, without RMI (KA92 antenna) (For export only)	9.94	21.26
A	K899 20M	GPS KLN 90B "KING" interfaced with HSI and A/P, with RMI (KA92 antenna) (French-speaking countries)	9.94	21.26
A	K899 30M	GPS KLN 90B "KING" interfaced with HSI and A/P, with RMI (KA92 antenna) (English-speaking countries)	9.94	21.26
A	K927 00M	GPS KLN 90B "KING" interfaced with HSI and A/P, without RMI (KA92 antenna)	9.94	21.26

SECTION 7
DESCRIPTION

Normal operating procedures of the "BENDIX / KING" KLN90B GPS navigation system interfaced with the HSI KI525A are described in the "BENDIX / KING" KLN90B Pilot's Guide at the latest revision.

CONTROLS - see Figure 9.33.3

Controlled by two sets of concentric knobs and two cursor buttons, the KLN90B can present a variety of information in a number of different page formats.

The various display types can be considered as chapters in a book, each chapter having 26 pages. With a few exceptions, each of these pages can be changed independently.

Generally the 2 concentric knobs and the cursor button to the left of the screen are used to select data on L.H. page, the knobs and cursor on the right control the R.H. page.

The large outer knobs control the chapters and the small inner knobs turn the pages.

To change data in a page use the cursor function. This function is an area of inverse video on the screen brought up by depressing the cursor button.

Then rotate the outer knob to position the cursor and the inner knob to select the desired characters. Repeat this operation as many times as necessary and valid (ENT button).

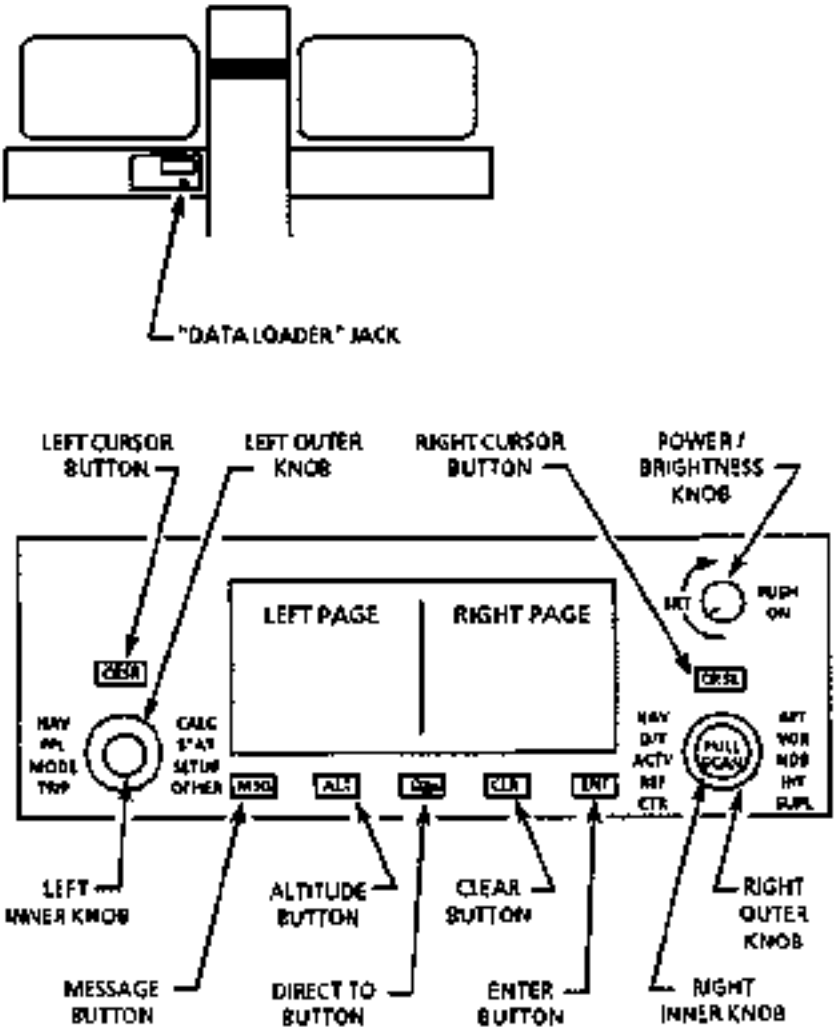

Figure 9.33.3 - Controls

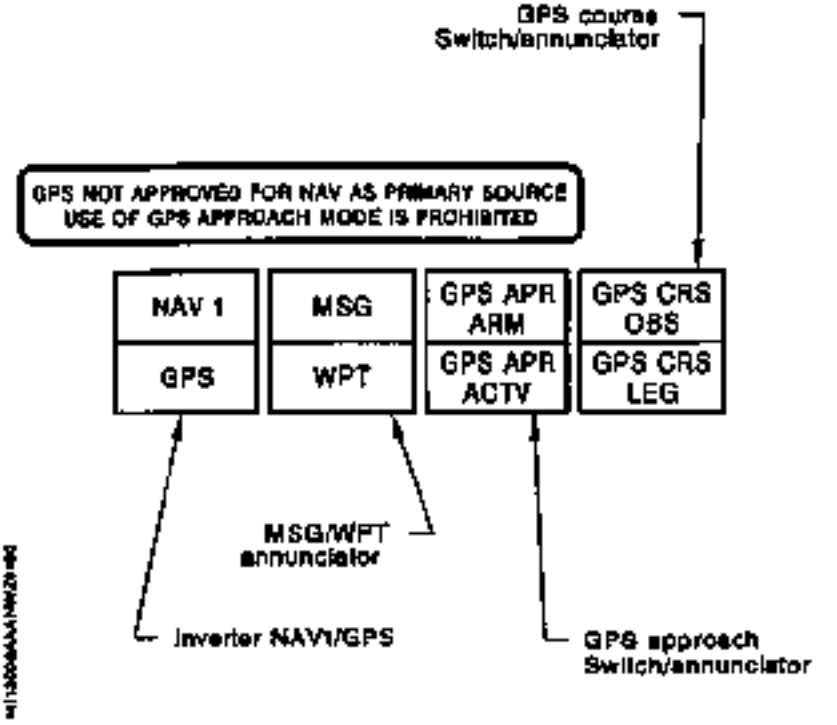

Figure 9.33.4 - GPS placard and annunciators
Valid for options No. K899 00M - K899 10M - K899 20M - K899 30M

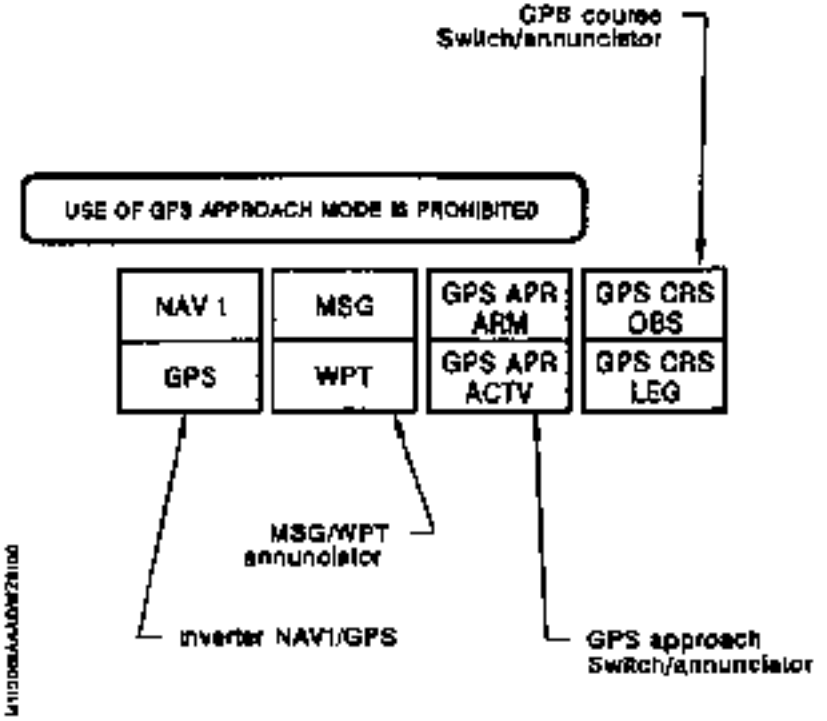

Figure 9.33.4A - GPS placard and annunciators
Valid for option No. K927 00M

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SUPPLEMENT

EDM 700

D906 00M

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SECTION 1
GENERAL

This supplement supplies information necessary for the operation of the aircraft when "EDM 700" option is installed on the aircraft.

SECTION 2
LIMITATIONS

Installation and operation of the "EDM 700" do not change the limitations of the aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

SECTION 3
EMERGENCY PROCEDURES

Installation and operation of the "EDM 700" do not change the emergency procedures of the aircraft described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

SECTION 4
NORMAL PROCEDURES

Installation and operation of the "EDM 700" do not change the normal procedures of the aircraft described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

SECTION 5
PERFORMANCE

Installation and operation of the "EDM 700" do not change the performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	ITEM No.	OPTIONAL EQUIPMENT	WEIGHT lb	ARM in.
A	D906 00M	EDM 700	3.59	- 1.3

SECTION 7
DESCRIPTION

The EDM 700 consists of a multiple indicator which combines the 6 temperatures (CHT) and the 6 temperatures (EGT). It is located on the instrument panel and is connected with 12 thermocouple temperature probes.

Normal operating procedures of the "EDM 700" are described in the EDM 700 Operating Pilot's Guide at the latest revision.

STEP button

- First press changes from Automatic to Manual Scan Mode. Return back to Automatic Scan Mode is done 15 minutes after last press on the STEP button.
- In Manual Mode, pressing STEP will display the engine parameters in the sequence BAT (voltage), DIF (difference between hottest and coldest EGT), EGT / CHT (cylinders 1 to 6), CLD (shock cooling, greatest rate of CHT cooling).
- In Automatic Scan Mode, engine parameters are sequencely displayed each 4 seconds.

LF button

- When pressed, changes to the Lean Find Mode (Note : in Scan Mode, holding LF for 3 seconds will switch between Percentage and Normalize views).
- Return to Automatic Scan Mode is done by pressing the STEP button.

Leaning procedure

- Set LF mode and lean slowly the mixture until PEAK EGT warning appears.
- Adjust mixture according to LYCOMING specific restrictions.

1) Dash line indicates Normalize or Percent view
2) °F or °C
3) Cylinder numbers 1 through 6.
   T is for TIT, missing T is for oil temperature
4) Dot indicates which cylinder temperatures are shown in the digital display
5) Exhaust Gas Temperature (EGT) is the top of the column
6) Cylinder Head Temperature (CHT) trend is shown as a missing bar
7) LF button
8) STEP button
9) 50 % line is half of redline
10) Maximum line is the EGT redline

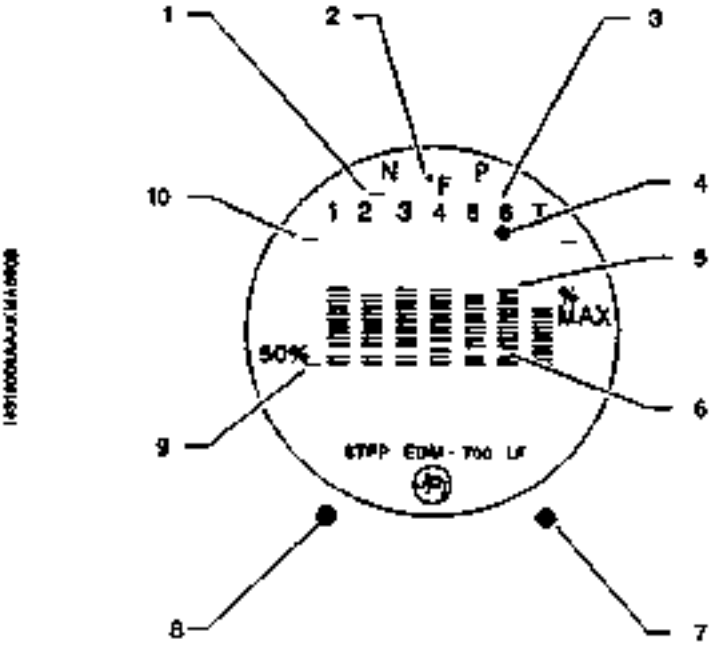

Figure 9.34.1 - Controls

1) "PEAK EGT" displayed for 2 seconds when peak is found
2) Number of LEANEST cylinder flashes
3) Dot indicates LEANEST cylinder
4) Column of LEANEST cylinder flashes
5) EGT of the LEANEST cylinder displayed with the word "SET"

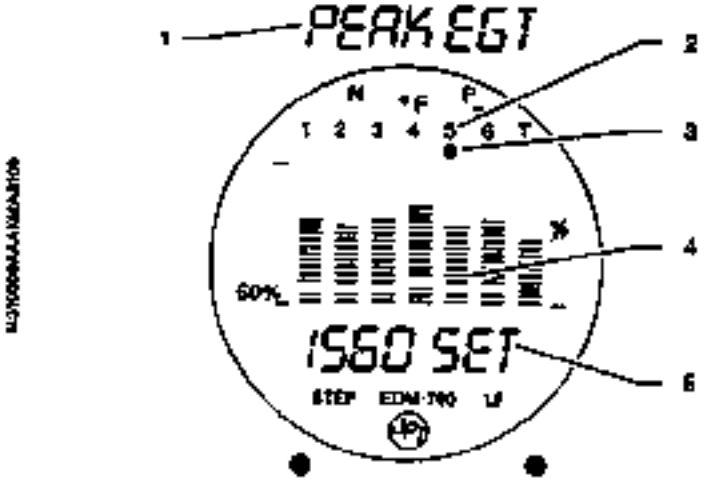

Figure 9.34.2 - Leaning procedure

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SUPPLEMENT

"SHADIN" DIGITAL FUEL MANAGEMENT SYSTEM

"OPTIONS No. D905 00M - D905 10M - D905 30M - D905 40M"

TABLE OF CONTENTS

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SECTION 1
GENERAL

This supplement supplies information necessary for the operation of the aircraft when "SHADIN DIGITAL FUEL MANAGEMENT SYSTEM" option is installed on the aircraft.

The Digital Fuel Management System displays fuel flow, fuel on board, fuel used and endurance.

The system can be connected to the KLN90A or KLN90B GPS receivers to transmit the fuel management data.

SECTION 2
LIMITATIONS

Installation and operation of the "SHADIN DIGITAL FUEL MANAGEMENT SYSTEM" do not change the limitations of the aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

The Digital Fuel Management System shall not be used as a substitute to either the fuel gages or the analog fuel flowmeter.

THE DIGITAL FUEL FLOW TOTALIZER SHALL SERVE AS SUBSTITUTE TO NEITHER THE FUEL GAGES, NOR THE ANALOG FUEL FLOWMETER. THE LATTER INSTRUMENTS SHALL ALWAYS BE CONSULTED IN PRIORITY FOR FLIGHT OPERATION.

SECTION 3
EMERGENCY PROCEDURES

Installation and operation of the "SHADIN DIGITAL FUEL MANAGEMENT SYSTEM" do not change the emergency procedures of the aircraft described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

SECTION 4
NORMAL PROCEDURES

These procedures supplement those of standard aircraft described in Section 4 "Normal Procedures" of the basic Pilot's Operating Handbook.

BEFORE STARTING ENGINE

Fuel flowmeter/totalizer — ONBD fuel recorded

SECTION 5
PERFORMANCE

Installation and operation of the "SHADIN DIGITAL FUEL MANAGEMENT SYSTEM" do not change the performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	ITEM No.	OPTIONAL EQUIPMENT	WEIGHT lb	ARM in.
A	0905-00M	Digital Fuel Management System (TB 20) "SHADIN"	1.16	33.5
A	0905-10M	Digital Fuel Management System (TB 21) "SHADIN"	1.16	33.5
A	0905-30M	Digital Fuel Management System, EHSI coupled (TB 20) "SHADIN"	1.16	33.5
A	0905-40M	Digital Fuel Management System, EHSI coupled (TB 21) "SHADIN"	1.16	33.5

SECTION 7
DESCRIPTION

The digital fuel management system indicator is installed at the lower part of the R.H. instrument panel. It helps the pilot to manage fuel during the flight.

FUEL FLOW

- The fuel flow is continuously displayed unless another function is selected.

ADDING FUEL

- Press "ONBD" switch.
- Move "ONBD +" or "ONBD–" switch while onboard fuel is being displayed until reaching the fuel onboard value.
- This value will be saved automatically 3 seconds after the "ONBD", "ONBD +" or "ONBD–" switch has been released. The display will show "SAVE" and flash, the onboard figure being stored in memory.
- The maximum usable fuel (full tanks) is the following :

FULL FUEL AMOUNTS			
U S gal	lbs	kg	litres
86.1	577	262	326

TEST FUNCTION

- Press "TEST" button.

  If the computer checks out, the word "GOOD" will be displayed for 3 seconds.

  If the test is not successful, the word "BAD" will be displayed.

1) Fuel onboard
2) To enter fuel onboard partial or full
3) Self test
4) Brightness control
5) Endurance (hours and minutes)
6) Fuel used

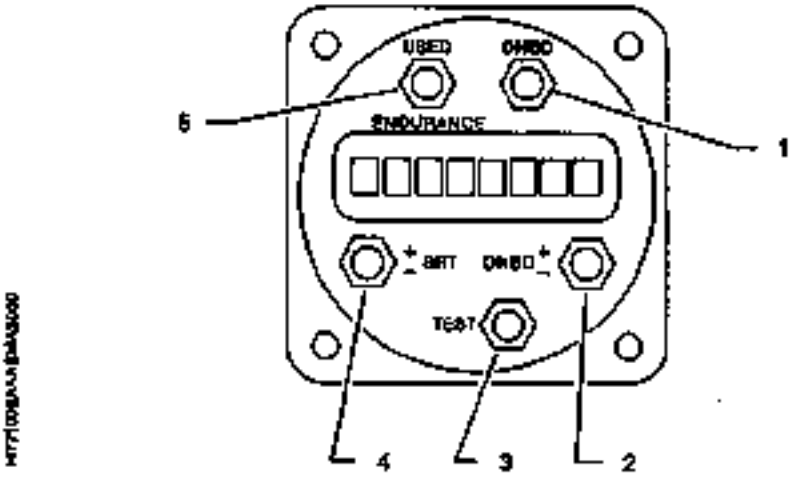

Figure 9.35.1 - Digital fuel management indicator

FUEL ONBOARD

- Press "ONBD" switch.
- The fuel onboard value will be displayed for 3 seconds after releasing the switch.

FUEL USED

- Move the switch to "USED".
- The fuel used will be displayed for 3 seconds after releasing the switch.

ENDURANCE

- Move the switch to "ENDURANCE".
- The endurance in hours:minutes will be displayed for 3 seconds after releasing the switch.

BRIGHTNESS CONTROL

- The brightness of the display is normally controlled by the master dimmer. In case of problem, the switch "BRT+/−" can be used.

SUPPLEMENT

"BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM - "STAND ALONE"

OPTIONAL EQUIPMENT No. K920 00M

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SECTION 1
GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB aircraft is equipped with the option ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM - "STAND ALONE"".

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM - "STAND ALONE"".

Using information provided by satellites ("BENDIX / KING" KLN89B is able to track up to 8 satellites at a time), GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means. It also uses data recorded in a data base (three different data bases are available : Americas, Atlantic, Pacific). The data base is housed in a cartridge plugged into the front face of the KLN89B and is updated every 28 days by means of diskettes.

Each data base contains information about airports, communication frequencies, VORs, NDBs, intersections, SIDs, STARs, instrument approaches, flight service stations ...

There is also room for 500 user defined waypoints and 26 different flight plans.

CAUTION

IT IS STRONGLY ADVISED NOT TO LOAD USER WAYPOINTS IN DATA BASE IN TERMINAL AREA NAVIGATION DUE TO THE INCREASE OF WORK LOAD FOR THE PILOT

The KLN89B can receive altitude code from the encoding altimeter.

SECTION 2
LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM - "STAND ALONE"".

Data base updating must be verified before each flight.

NOTE :
The original KLN89B data base is in accordance with the WGS84 geodetic model.

If the data base or the cartridge are not in accordance with WGS84 or NAD 83 geodetic model, and as there is no means of operation published, GPS navigation system must be disengaged in terminal area.

GPS "BENDIX / KING" KLN89B can only be used as a supplemental source for navigation in VFR (the instruments required for navigation in VFR must be available onboard).

GPS USED FOR NAVIGATION IN VFR ONLY

Figure 9.37.1 - GPS limitation placard

"BENDIX / KING" KLN89B Pilot's Guide at its latest revision shall be readily available to the pilot.

SECTION 3
EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM - "STAND ALONE" ".

"MSG" ANNUNCIATOR ILLUMINATION

1 - "MSG" push-knob of KLN89B ..... **PRESS**

Check the message.

If the message mentions the loss of GPS system integrity (RAIM NOT AVAILABLE) :

2 - Continue the VFR flight with the primary sources of navigation (VOR, ADF,...) if they exist.

When the system integrity is restored, the return to GPS mode must be accompanied by the validation of the followed and desired track concordance by using the other sources of navigation, if they exist.

SECTION 4
NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM - "STAND ALONE"".

Normal operating procedures of the KLN89B GPS recommended by "BENDIX / KING" manufacturer are outlined in the "BENDIX / KING" KLN89B Pilot's Guide at the latest revision and KLN89B Memory Jogger at the latest revision.

However, it is important to precise the following points for the use of KLN89B on TB :

SET UP CONDITIONS

- The system must utilize ORS level 20 or later in compliance with the Pilot's Guide.
- Verify if the data base is current. Verify data on the self test page.
- Verify that altitude data is valid for the KLN89B prior to flight
- Set turn anticipation mode (SET / 4) to :
  - ENABLE (turn anticipation ENABLED) : recommended mode,
  - DISABLE (turn anticipation DISABLED) : not recommended mode.
- Check that the proper criteria are used for nearest airport selection (SET / 6).

COURSE DEVIATION INDICATOR

The course deviation indicator sensitivity is adjustable with a maximum value which is the default value selected by the KLN89B. It is recommended not to change the default value which is ± 5 NM full scale.

NOTE :
Transmission on VHF 1 or 2 communication frequencies 121.15, 121.175, 121.20, 131.25, 131.275 and 131.30 MHz may adversely affect reception of the GPS signal. Transmissions in excess of 10 seconds may result in loss of GPS signal reception. Navigation will be restored within 5 seconds after the completion of the transmission. If UHF communication system is installed, the same behaviour can be observed on the first harmonic of the VHF frequencies, 242.30, 242.35, 242.40, 262.50, 262.55 and 262.60 MHz.

SYSTEM ANNUNCIATORS / SWITCHES / CONTROLS

"MSG" message annunciator

CAUTION

"MSG" ANNUNCIATOR MAY BE PERMANENTLY ILLUMINATED IF THERE EXISTS A PERMANENT MESSAGE. WHEN A NEW MESSAGE APPEARS, "MSG" ANNUNCIATOR ONLY FLASHES.

It will flash to alert the pilot of a situation that requires his attention. Press the "MSG" button on the KLN 90B GPS to view the message. (Appendix B of the KLN89B Pilot's Guide contains a list of all the messages likely to appear on the "Message" page and their meanings). "MSG" annunciator is amber.

"WPT" Waypoint annunciator

Prior to reaching a waypoint in the active flight plan, the KLN89B GPS will provide navigation along a curved path segment to ensure a smooth transition between two adjacent legs in the flight plan. This feature is called turn anticipation. Approximately 20 seconds prior to the beginning of the turn anticipation, the "WPT" annunciator will flash, going solid upon initiation of the turn, and extinguishing upon turn completion.
"WPT" annunciator is amber.

"LEG" mode

The use of "LEG" mode is selected by the "OBS" button.

When the KLN89B is used with the TURN ANTICIPATION ENABLED, at the beginning of turn anticipation, WPT alert annunciator goes on steady, MSG annunciator begins flashing. At this time, the KLN89B will notify the pilot with a message on the Message Page of the new desired track. This message will not be given if the course change is less than 5°.

CAUTION

IT IS RECOMMENDED TO USE KLN89B WITH TURN ANTICIPATION ENABLED

WHEN TURN ANTICIPATION IS DISABLED, WAYPOINT ALERTING OCCURS APPROXIMATELY 35 SECONDS PRIOR TO ACTUALLY REACHING THE WAYPOINT. MSG ANNUNCIATOR REMAINS OFF. THERE IS NO COURSE CHANGE MESSAGE DISPLAYED BY THE KLN89B.

When the KLN89B is used WITH TURN ANTICIPATION DISABLED, the "Super NAV 5" page allows a rapid visualisation of the airplane position in horizontal navigation with regards to the route and the waypoints. It is strongly recommended to use this page.

"OBS" mode (selected by the "OBS" button)

The "OBS" mode has to be selected as follow :

- press the "OBS" button to select the "LEG" mode, then the "OBS" mode,
- when selecting the "OBS" mode, the active "WPT" of the "LEG" mode is chosen as reference "WPT" for the "OBS" mode.

SECTION 5
PERFORMANCE

Installation and operation of the ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM - "STAND ALONE"" do not change the performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	ITEM No.	OPTIONAL EQUIPMENT	WEIGHT lb	ARM in.
A	K920 00M	"BENDIX / KING" KLN89B GPS navigation system - "Stand Alone"	4.519	25.20

SECTION 7
DESCRIPTION

Normal operating procedures of the ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM - "STAND ALONE"" are described in the "BENDIX / KING" KLN89B Pilot's Guide at the latest revision.

CONTROLS - see Figure 9.37.2

Controlled by one set including concentric knobs and one cursor button, the KLN89B can present a variety of information in a number of different page formats.

The various display types can be considered as chapters in a book, each chapter having some number of pages. With a few exceptions, each of these pages can be changed independently.

The large outer knob controls the chapters and the small inner knob turns the pages.

To change data in a page, use the cursor function. This function is an area that flashes on the screen brought up by depressing the cursor button.

Then rotate the outer knob to position the cursor and the inner knob to select the desired characters. Repeat this operation as many times as necessary and valid (ENT button).

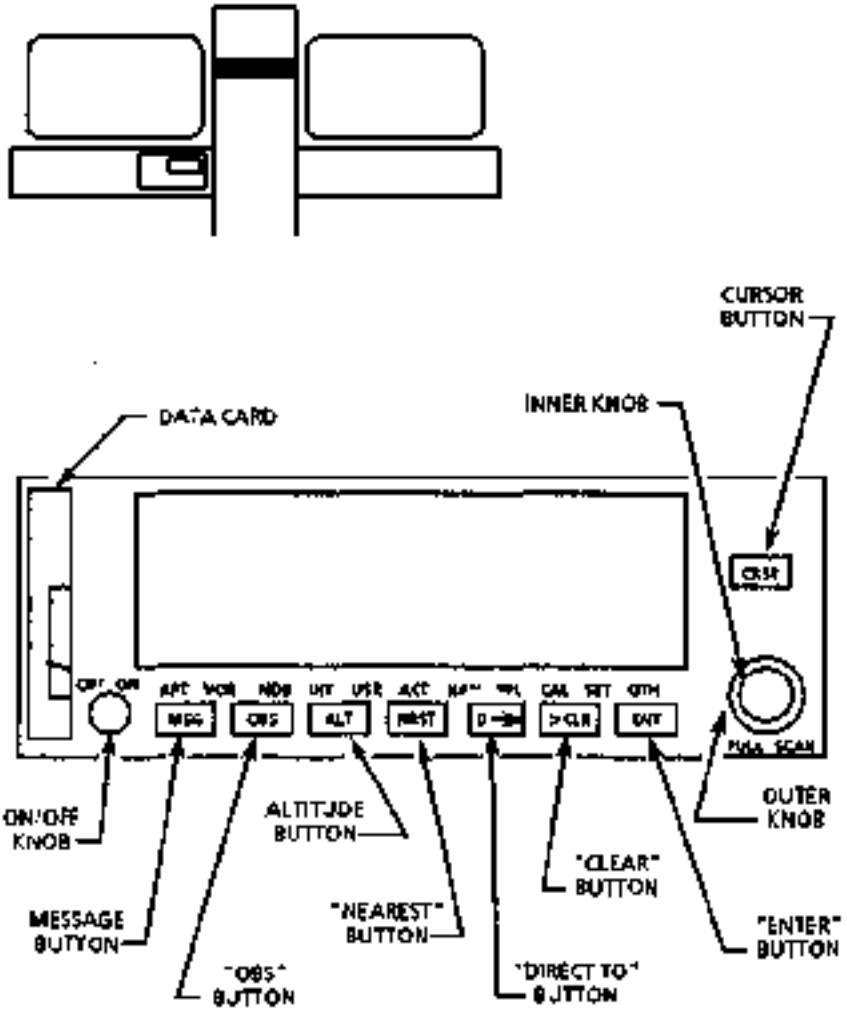

Figure 9.37.2 - Controls

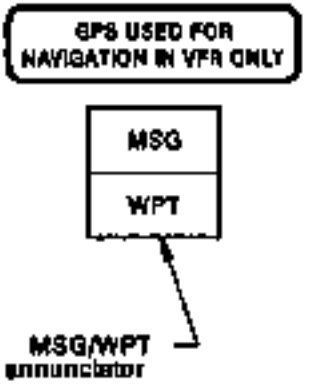

Figure 9.37.3 - GPS placard and annunciators

SUPPLEMENT

"BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH EHI 40 EHSI

This "BENDIX / KING" KLN90B GPS is part of the Option No. K923 00M "Radio/Navigation assy "BENDIX / KING" with EFIS EHI 40 "BENDIX / KING" system (EHSI only)"

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SECTION 1
GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB airplane is equipped with the option ""BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH EHI 40 EHSI".

The generalities hereafter supplement those of the standard airplane described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option ""BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH EHI 40 EHSI".

Using information provided by satellites ("BENDIX / KING" KLN90B is able to track up to 8 satellites at a time), GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means. It also uses data recorded in a data base (two different data bases are available : North American one or International one). The data base is housed in a cartridge plugged into the back of the KLN90B and is updated every 28 days by means of diskettes and a computer (a jack located on right lower panel PL25 provides a means of interfacing the KLN90B with the computer via an interface cable).

Each data base contains information about airports, communication frequencies, VORs, NDBs, intersections, SIDs, STARs, instrument approaches, flight service stations ...

There is also room for up to 250 user defined waypoints and 26 different flight plans.

CAUTION

IT IS STRONGLY ADVISED NOT TO LOAD USER WAYPOINTS IN DATA BASE IN TERMINAL AREA NAVIGATION DUE TO THE INCREASE OF WORK LOAD FOR THE PILOT

The KLN90B can be interfaced with "SHADIN" fuel flow system. It also receives altitude code from the encoding altimeter.

SECTION 2
LIMITATIONS

The limitations hereafter supplement those of the standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option ""BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH EHI 40 EHSI".

Data base updating must be verified before each flight.

NOTE :
The original KLN90B data base is in accordance with the WGS84 geodetic model

If the data base or the cartridge are not in accordance with WGS84 or NAD 83 geodetic model, and as there is no means of operation published, GPS navigation system must be disengaged in terminal area.

GPS "BENDIX / KING" KLN90B is not approved for navigation as a primary source.

GPS NOT APPROVED FOR NAV AS PRIMARY SOURCE

Figure 9.38.1 - GPS limitation placard

Navigation must be conducted with primary sources. In any case, GPS use is limited to the En route or terminal area of the flight.

The KLN90B fuel management pages use a fuel flow input of the "SHADIN" fuel flowmeter (if installed) and must not be used as a fuel management primary source.

"BENDIX / KING" KLN90B Pilot's Guide at its latest revision shall be readily available to the pilot

The use of GPS approach mode is prohibited.

USE OF GPS APPROACH MODE IS PROHIBITED

Figure 9.38.2 - GPS limitation placard

IFR navigation is restricted as follows :

- The system must utilize ORS level 20 or later.
- IFR en route and terminal area navigation is prohibited unless the pilot verifies the currency of the data base and verifies each selected waypoint for accuracy by reference to current approved data.

CAUTION

USE OF GPS APPROACH MODE IS PROHIBITED

SECTION 3
EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "**"BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH EHI 40 EHSI**".

NAV FLAG

If the NAV flag appears on the EHSI when it is interfaced with GPS KLN90B, this means that the GPS signal integrity has been lost.

1 - "NAV" push-knob of EHSI ..... **PRESS ONCE or TWICE**

Return to VOR or ADF navigation source and to remaining operational navigation equipment.

"MSG" ANNUNCIATOR ILLUMINATION

1 - "MSG" push-knob of KLN90B ..... **PRESS**

Check the message.

If the message mentions the loss of GPS system integrity (RAIM NOT AVAILABLE) or detects a too important position error (RAIM POSITION ERROR) :

2 - "NAV" push-knob of EHSI ..... **PRESS ONCE or TWICE**

Return to VOR or ADF navigation source and to remaining operational navigation equipment.

When the system integrity is restored, the return to GPS mode must be accompanied by the validation of the followed and desired track concordance by using primary sources of navigation.

SECTION 4
NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH EHI 40 EHSI".

Normal operating procedures of the KLN90B GPS recommended by "BENDIX / KING" manufacturer are outlined in the "BENDIX / KING" KLN90B Pilot's Guide at the latest revision and KLN90B Memory Jogger at the latest revision.

However, it is important to precise the following points for the use of KLN90B on TB :

SET UP CONDITIONS

- The system must utilize ORS level 20 or later in compliance with the Pilot's Guide.
- Verify if the data base is current. Verify data on the self test page.
- Verify that altitude data is valid to the KLN90B prior to flight.
- Set turn anticipation mode (SET / 6) to :
  - ENABLE (turn anticipation ENABLED) : recommended mode.
  - DISABLE (turn anticipation DISABLED) : not recommended mode.
- Check that the proper criteria are used for nearest airport selection (SET / 3).

The course deviation indicator sensitivity is adjustable with a maximum value which is the default value selected by the KLN90B. It is recommended not to change the default value which is ± 5 NM full scale.

NOTE :
Transmission on VHF 1 or 2 communication frequencies 121.15, 121.175, 121.20, 131.25, 131.275 and 131.30 MHz may adversely affect reception of the GPS signal. Transmissions in excess of 10 seconds may result in loss of GPS signal reception and WRN annunciator activation. Navigation will be restored within 5 seconds after the completion of the transmission. If UHF communication system is installed, the same behaviour can be observed on the first harmonic of the VHF frequencies, 242.30, 242.35, 242.40, 262.50, 262.55 and 262.60 MHz.

SYSTEM ANNUNCIATORS / SWITCHES / CONTROLS

EHSI presentation "NAV" push-knob

It may be used to select data for presentation on the pilot's EHSI ; either NAV data from NAV 1 or NAV 2 navigation receiver or GPS data from the KLN90B GPS or ADF data
"NAV" symbol is green, "GPS" symbol is blue, "ADF" symbol is yellow.

"MSG" message annunciator

CAUTION

"MSG" ANNUNCIATOR MAY BE PERMANENTLY ILLUMINATED IF THERE EXISTS A PERMANENT MESSAGE. WHEN A NEW MESSAGE APPEARS, "MSG" ANNUNCIATOR ONLY FLASHES. IN THIS CASE, RETURN TO NAVIGATION PRIMARY MEANS BY PRESSING ON "NAV" PUSH-KNOB

It will flash to alert the pilot of a situation that requires his attention. Press the "MSG" button on the KLN 90B GPS to view the message. (Appendix B of the KLN90B Pilot's Guide contains a list of all the messages likely to appear on the "Message" page and their meanings)
"MSG" annunciator is amber, "MSG" symbol is also displayed white on L.H side of the EHSI.

"WPT" Waypoint annunciator

WARNING

TURN ANTICIPATION IS AUTOMATICALLY DISABLED FOR WAYPOINTS USED IN "SID / STARS" WHERE OVERFLIGHT IS MANDATORY. FOR WAYPOINTS SHARED BETWEEN "SID / STARS" AND PUBLISHED ENROUTE SEGMENTS (REQUIRING OVERFLIGHT IN THE "SID / STARS"), PROPER SELECTION ON THE PRESENTED "WAYPOINT" PAGE IS NECESSARY TO PROVIDE ADEQUATE ROUTE PROTECTION ON THE "SID / STARS".

Prior to reaching a waypoint in the active flight plan, the KLN90B GPS will provide navigation along a curved path segment to ensure a smooth transition between two adjacent legs in the flight plan. This feature is called turn anticipation. Approximately 20 seconds prior to the beginning of the turn anticipation, the "WPT" annunciator will flash, going solid upon initiation of the turn, and extinguishing upon turn completion.
"WPT" annunciator is amber. "WPT" symbol is also displayed white on L.H. side of the EHSI.

GPS approach "GPS APR, ARM, ACTV" switch / annunciator

CAUTION

THE USE OF GPS KLN90B APPROACH MODE IS PROHIBITED

This switch / annunciator is used to select or deselect approach mode of the KLN90B. This operation mode is not certified.

GPS course "GPS CRS, OBS, LEG" switch / annunciator

This switch / annunciator is used to select the basic operation modes of the KLN90B, either a single waypoint with omnibearing course (OBS) selection through the waypoint (like a VOR) or automatic leg sequencing (LEG) between waypoints.
"GPS CRS" annunciator is white. "OBS" annunciator is amber. "LEG" annunciator is green.

NOTE :
Either LEG or OBS will illuminate during system self-test depending on switch position.

EN ROUTE-LEG mode

When using the en route-leg mode, GPS navigation data are differently presented on the EHSI according to the selected mode :

- display equivalent to an electromechanical HSI (track, deviation course, TO / FROM) in ARC or HSI modes,
- trace of the navigation in "MAP" mode. The active leg is blue, the following legs are white.

When crossing a waypoint, the track resetting on following navigation leg automatically occurs.

When turn anticipation is ENABLED, the "WPT" annunciator will flash, going solid upon initialization of the turn, and extinguishing upon turn completion.

When turn anticipation is DISABLED, the "WPT" annunciator will flash, until waypoint vertical line is crossed, then extinguishes.

The navigation course selecting knob "CRS" is inactive.

With the autopilot engaged on NAV mode, the EHSI automatic resetting, when crossing a waypoint, allows to the aircraft an automatic transition from leg to leg without pilot action.

EN ROUTE-OBS mode

When using the "ENROUTE-OBS" mode, the desired radial selection on the waypoint is made equally from the course selecting knob "CRS" of the EHSI or from the KLN90B control box. The recopy is quasi instantaneous.

FLIGHT DIRECTOR / AUTOPILOT COUPLED OPERATION

The EHSI can be coupled to KAP 100, KAP 150 or KFC 150 autopilots.

The NAV mode engagement on the autopilot mode controller arms the autopilot in navigation mode, using selected course and left / right steering information presented on the EHSI. It makes the FD appear in the case of the KFC 150 autopilot.

When AP is engaged on the mode controller, the autopilot is coupled to the EHSI and uses the information displayed (course and course deviation).

NOTE :
When the EHSI is selected on GPS navigation source, the RMI remains selected on NAV 1 source (VOR or RNAV).

"SID" PROCEDURE

NOTE :
"SID" procedure can only be loaded in the Active Flight Plan (FPL 0).

Prior to take-off - Select an appropriate "SID" from the **ACT 7** page. If necessary, select runway and transition point.

NOTE 1 :
Using right hand outer knob, select the ACT (Active Flight Plan waypoints) pages. Pull right hand inner knob out and scroll to the departure airport then push the inner knob in and select the ACT 7 page.
To delete or replace a "SID", select FPL 0 page. Place the cursor over the name of the procedure, press ENT to change it, or CLR then ENT to delete it.

NOTE 2 :
After "SID" loading in the Active Flight Plan, using right hand outer knob, select the ACT (Active Flight Plan waypoints) pages. To check position of the "SID" waypoints, pull this knob and scroll each waypoint of the departure procedure.

"STAR" PROCEDURE

NOTE :
"STAR" procedure can only be loaded in the Active Flight Plan (FPL 0).

Prior to arrival - Select an appropriate "STAR" from the ACT 7 page.

NOTE 1 :
Using right hand outer knob, select the ACT (Active Flight Plan waypoints) pages. Pull right hand inner knob out and scroll to the destination airport, then push the inner knob in and select the ACT 7 page.
To delete or replace a STAR, select FPL 0 page. Place the cursor over the name of the procedure, press ENT to change it, or CLR then ENT to delete it.

NOTE 2 :
After "STAR" loading in the Active Flight Plan, using right hand outer knob, select the ACT (Active Flight Plan waypoints) page. To check position of the "STAR" waypoints, pull this knob and scroll each waypoint of the arrival procedure.

SECTION 5
PERFORMANCE

Installation and operation of the ""BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH THE EHI 40 EHSI" do not change the performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

The weight and balance data of the ""BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH THE EHI 40 EHSI" are included in K923 00M option : refer to Supplement 31 - Section 6.

SECTION 7
DESCRIPTION

Normal operating procedures of the ""BENDIX / KING" KLN90B GPS NAVIGATION SYSTEM INTERFACED WITH EHI 40 EHSI" are described in the "BENDIX / KING" KLN90B Pilot's Guide at the latest revision.

CONTROLS - see Figure 9.38.3

Controlled by two sets of concentric knobs and two cursor buttons, the KLN90B can present a variety of information in a number of different page formats.

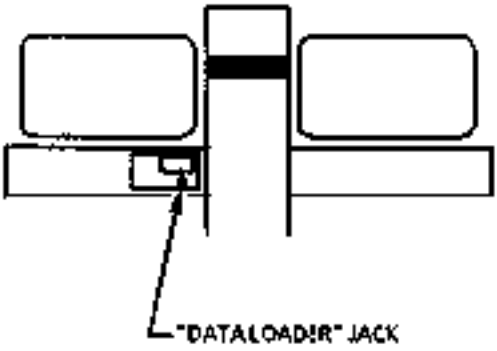
The various display types can be considered as chapters in a book, each chapter having as many as 26 numbered pages at once. With a few exceptions, each of these pages can be changed independently.

Generally the 2 concentric knobs and the cursor button to the left of the screen are used to select data on L.H. page, just as the right knobs and cursor on the right control the R.H. page.

The large outer knobs control the chapters and the small inner knobs turn the pages.

To change data in a page use the cursor function. This function is an area of inverse video on the screen brought up by depressing the cursor buttons.

Then rotate the outer knob to position the cursor and the inner knob to select the desired characters. Repeat this operation as many times as necessary and valid (ENT button).



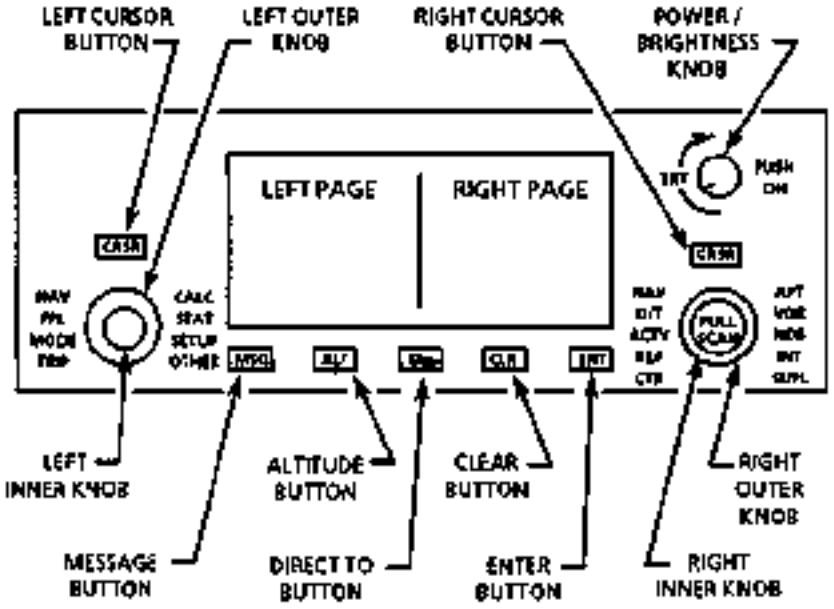


Figure 9.38.3 - Controls

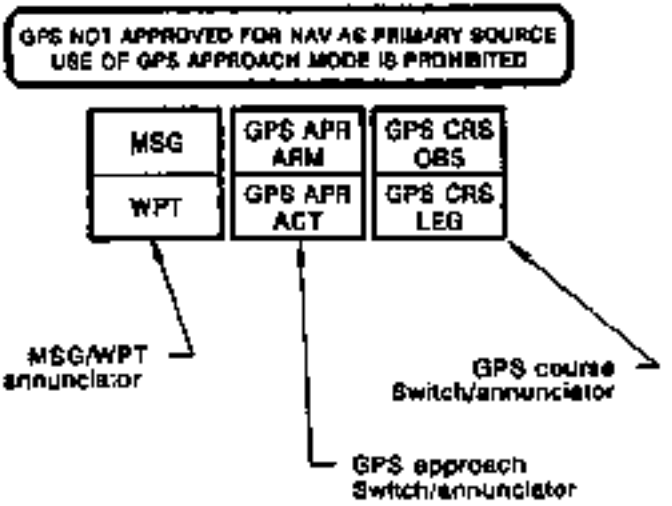


Figure 9.38.4 - GPS placard and annunciators

SUPPLEMENT

"GARMIN" 150 GPS NAVIGATION SYSTEM - "STAND ALONE"

OPTIONAL EQUIPMENT No. J925 00M

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SECTION 1
GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB aircraft is equipped with the option ""GARMIN" 150 GPS NAVIGATION SYSTEM - "STAND ALONE"".

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""GARMIN" 150 GPS NAVIGATION SYSTEM - "STAND ALONE"".

Using information provided by satellites ("GARMIN" 150 GPS is able to track up to 8 satellites at a time), GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means. It also uses data recorded in a data base (three different data bases are available : Americas, International and Worldwide). The data base is contained in a NavData card plugged into the front face of the "GARMIN" 150 GPS and is updated every 28 days by means of new cards.

Each data base contains information about airports, communication frequencies, VORs, NDBs, Intersections ...

There is also room for 1000 user defined waypoints and 20 reversible flight plans.

The "GARMIN" 150 GPS can be connected to a "SHADIN" or "ARNAV" fuel flowmeter.

SECTION 2
LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""GARMIN" 150 GPS NAVIGATION SYSTEM - "STAND ALONE""

Data base updating must be verified before each flight.

"GARMIN" 150 GPS can only be used as a navigation source in day VFR in sight of ground or water (the instruments required for navigation in VFR must be available onboard).

GPS USED ONLY FOR NAVIGATION IN DAY VFR IN SIGHT OF GROUND OR WATER

Figure 9.39.1 - GPS limitation placard

The GPS integrity is not ensured.

It is therefore the responsibility of the pilot to verify that its position is correct using the other available navigation sources.

"GARMIN" 150 GPS Pilot's Guide at its latest revision shall be readily available to the pilot.

SECTION 3
EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""GARMIN" 150 GPS NAVIGATION SYSTEM - "STAND ALONE"".

"MSG" ANNUNCIATOR ILLUMINATION

1 - "STAT" button ..... **PRESS**

Check the message.

If the message mentions the loss of GPS system or part of the system :

2 - Continue the VFR flight with the primary sources of navigation (VOR, ADF...) if they exist.

When the system is restored, the return to GPS mode must be accompanied by the validation of the followed and desired track concordance by using the other sources of navigation, if they exist.

SECTION 4
NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""GARMIN" 150 GPS NAVIGATION SYSTEM - "STAND ALONE"".

Normal operating procedures of the "GARMIN" 150 GPS are outlined in the "GARMIN" 150 GPS Pilot's Guide at the latest revision.

However, it is important to precise the following points for the use of "GARMIN" 150 GPS on TB :

SET UP CONDITIONS

- Verify if the data base is current.
- Check that the proper criteria are used for nearest airport selection.
- Check that the CDI sensitivity scale is set to ± 5 NM.
- Check that MAP DATUM is set to WGS 84 or as indicated on the used navigation charts.

COURSE DEVIATION INDICATOR

The course deviation indicator sensitivity is adjustable with a maximum value which is the default value selected by the "GARMIN" 150 GPS. It is recommended not to change the default value which is ± 5 NM full scale

NOTE :
Transmission on VHF 1 or 2 communication frequencies 121.15, 121.175, 121.20, 131.25, 131.275 and 131.30 MHz may adversely affect reception of the GPS signal. Transmissions in excess of 10 seconds may result in loss of GPS signal reception. Navigation will be restored within 5 seconds after the completion of the transmission. If UHF communication system is installed, the same behaviour can be observed on the first harmonic of the VHF frequencies, 242.30, 242.35, 242.40, 262.50, 262.55 and 262.60 MHz.

SYSTEM ANNUNCIATORS / SWITCHES / CONTROLS

"MSG" message annunciator

CAUTION

"MSG" ANNUNCIATOR MAY BE PERMANENTLY ILLUMINATED IF THERE EXISTS A PERMANENT MESSAGE. WHEN A NEW MESSAGE APPEARS, "MSG" ANNUNCIATOR ONLY FLASHES.

It will flash to alert the pilot of a situation that requires his attention. Press the "STAT" button on the "GARMIN" 150 GPS to view the message (Appendix C of the "GARMIN" 150 GPS Pilot's Guide contains a list of all the messages likely to appear on the "Message" page and their meanings).
"MSG" annunciator is amber.

"WPT" Waypoint annunciator

About 1 minute before reaching a waypoint, **"MSG"** and **"WPT"** warning lights come on and audio warning is ON for 15 seconds. The message "Approaching waypoint" can be displayed by pressing the "STAT" button.
"WPT" and **"MSG"** annunciators are amber.

SECTION 5
PERFORMANCE

Installation and operation of the ""GARMIN" 150 GPS NAVIGATION SYSTEM - "STAND ALONE"" do not change the performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	ITEM No.	OPTIONAL EQUIPMENT	WEIGHT lb	ARM in.
A	J925 00#/	"GARMIN" 150 GPS - "Stand Alone"	4.696	25.59

SECTION 7
DESCRIPTION

Normal operating procedures are described in the "GARMIN" 150 GPS Pilot's Guide at the latest revision.

CONTROLS - see Figure 9.39.2

The front panel consists of 3-line, 20-character LCD display and 10 keys. Information displayed on the LCD is commonly referred to as a page.

Access to the pages is made by the keys on the right and bottom of the LCD.

Item 1 - POWER / BRIGHTNESS KNOB - This knob controls unit power and screen brightness.

Item 2 - "DIRECT TO" KEY - The direct-to key performs an instant direct-to, allows to enter a waypoint and sets a direct course to the destination.

Item 3 - "NRST" KEY - The nearest key is used to obtain information on the 9 nearest airports, VORs, NDBs, intersections, user waypoints and 2 nearest FSSs. This key also accesses any active SUA information.

Item 4 - "SET" KEY - The set key allows to customize the settings on the "GARMIN" 150 GPS to pilot's preferance.

Item 5 - "RTE" KEY - The route key enables to create, edit, activate and invert routes. Search-and-rescue, parallel offset and closest point of approach are also performed using the route key.

Item 6 - "WPT" KEY - The waypoint key is used to view information such as runways, frequencies, position and comments on airports, VORs, NDBs, intersections and user waypoints.

Item 7 - "NAV" KEY - The navigation key is used to view navigation and position information. Planning operations are also performed using the "NAV" key.

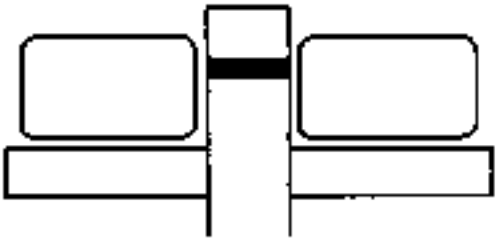
Item 8 - DOUBLE CONCENTRIC KNOB (INNER / OUTER) - The outer knob is used to advance through pages, advance the cursor or move through data fields. The inner knob is used to change data or scroll through information that cannot fit on the screen all at once

Item 9 - "ENT" KEY - The enter key is used to approve an operation or complete data entry. It is also used to confirm information, such as during power on.

Item 10 - "STAT" KEY - The status key is used to view receiver and satellite status, as well as system messages.

Item 11 - "CRSR" KEY - The cursor key is used to activate / deactivate the cursor. An active cursor is indicated by flashing characters on the screen. It is used to highlight fields for data entry, changing information or cycling through available options.

Item 12 - "CLR" KEY - The clear key is used to erase information or cancel an entry.



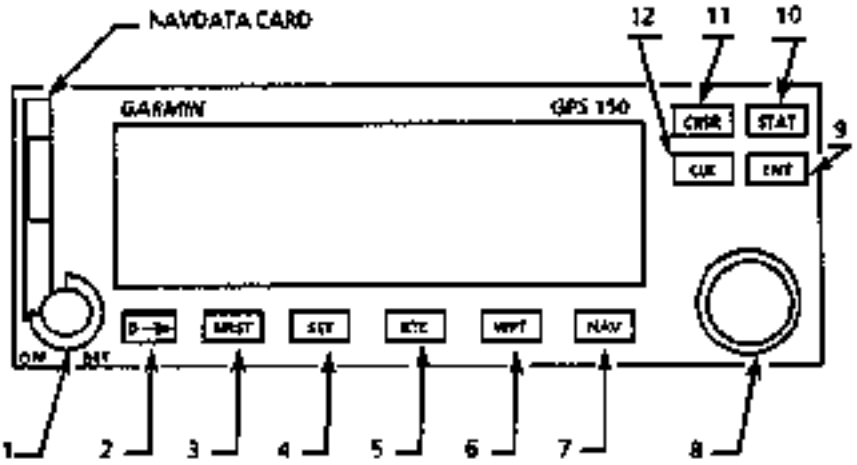


Figure 9.39.2 - Controls

ANNUNCIATORS - See Figure 9.39 3

The annunciators include 2 amber warning lights marked "MSG" and "WPT".

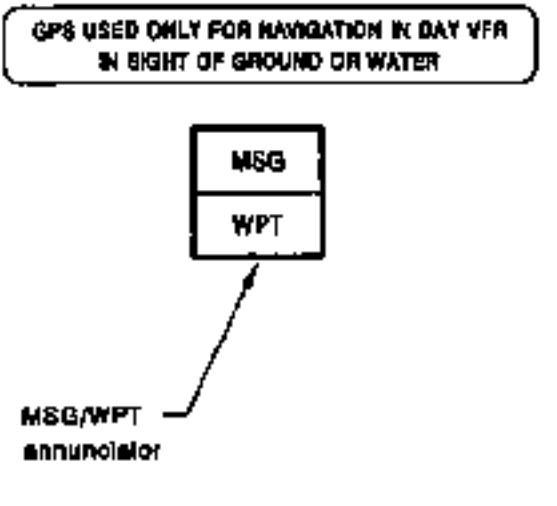


Figure 9.39.3 - GPS placard and annunciators

SUPPLEMENT

"BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A

OPTIONAL EQUIPMENT No. K926 00M

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SECTION 1
GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB aircraft is equipped with the option "BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KIS25A".

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KIS25A".

Using information provided by satellites ("BENDIX / KING" KLN89B is able to track up to 8 satellites at a time), GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means. It also uses data recorded in a data base (three different data bases are available : Americas, Atlantic, Pacific). The data base is housed in a card plugged into the front face of the KLN89B and is updated every 28 days by means of diskettes or by replacing the card.

Each data base contains information about airports, communication frequencies, VORs, NDBs, intersections, SIDs, STARs, instrument approaches, flight service stations ...

There is also room for 500 user defined waypoints and 25 different flight plans.

CAUTION

IT IS STRONGLY ADVISED NOT TO LOAD USER WAYPOINTS IN DATA BASE IN TERMINAL AREA NAVIGATION DUE TO THE INCREASE OF WORK LOAD FOR THE PILOT

The KLN89B can receive altitude code from the encoding altimeter and be interfaced with a fuel flowmeter.

SECTION 2
LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A".

Data base updating must be verified before each flight.

NOTE :
The original KLN89B data base is in accordance with the WGS84 geodetic model.

If the data base or the card are not in accordance with WGS84 or NAD 83 geodetic model, and as there is no means of operation published, GPS navigation system must be disengaged in terminal area.

Navigation must be controlled using primary sources. In any case, GPS use is limited to the En route or terminal area of the flight.

"BENDIX / KING" KLN89B Pilot's Guide at its latest revision shall be readily available to the pilot.

The use of GPS KLN89B approach mode is prohibited.

USE OF GPS APPROACH MODE IS PROHIBITED

Figure 9.40.1 - GPS limitation placard

IFR navigation is restricted as follows :

- IFR en route and terminal area navigation is prohibited unless the pilot verifies the currency of the data base and verifies each selected waypoint for accuracy by reference to the aeronautical documentation.

SECTION 3
EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A".

NAV FLAG

If the NAV flag appears on the HSI when it is interfaced with GPS KLN89B, this means that the GPS signal integrity has been lost.

1 - "NAV 1 / GPS" inverter ..... PRESS

Return to the NAV1 navigation source and to remaining operational navigation equipment.

"MSG" ANNUNCIATOR ILLUMINATION

1 - "MSG" push-knob of KLN89B ..... PRESS

Check the message.

If the message mentions the loss of GPS system integrity (RAIM NOT AVAILABLE) or detects a too important position error (RAIM POSITION ERROR) :

2 - "NAV 1 / GPS" inverter ..... PRESS

Return to the NAV1 navigation source and to remaining operational navigation equipment.

When the system integrity is restored, the return to GPS mode must be accompanied by the validation of the followed and desired track concordance by using primary sources of navigation.

SECTION 4
NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A".

Normal operating procedures of the KLN89B GPS recommended by "BENDIX / KING" manufacturer are outlined in the "BENDIX / KING" KLN89B Pilot's Guide at the latest revision and KLN89B Memory Jogger at the latest revision.

However, it is important to precise the following points for the use of KLN89B on TB :

SET UP CONDITIONS

- Verify if the data base is current. Verify data on the self test page.
- Verify that altitude data is valid for the KLN89B prior to flight.
- Set turn anticipation mode (SET / 4) to :
  - ENABLE (turn anticipation ENABLED) : recommended mode.
  - DISABLE (turn anticipation DISABLED) : not recommended mode.
- Check that the proper criteria are used for nearest airport selection (SET / 6).

COURSE DEVIATION INDICATOR

The course deviation indicator sensitivity is adjustable with a maximum value which is the default value selected by the KLN89B. It is recommended not to change the default value which is ± 5 NM full scale.

NOTE :
Transmission on VHF 1 or 2 communication frequencies 121.15, 121.175, 121.20, 131.25, 131.275 and 131.30 MHz may adversely affect reception of the GPS signal. Transmissions in excess of 10 seconds may result in loss of GPS signal reception and WRN annunciator activation. Navigation will be restored within 5 seconds after the completion of the transmission. If UHF communication system is installed, the same behaviour can be observed on the first harmonic of the VHF frequencies, 242.30, 242.35, 242.40, 262.50, 262.55 and 262.60 MHz.

SYSTEM ANNUNCIATORS / SWITCHES / CONTROLS

"NAV 1/GPS" Inverter

It may be used to select data for presentation on the pilot's HSI (L.H. instrument panel) ; either NAV data from NAV 1 navigation receiver or GPS data from the KLN89B GPS. The presentation on the HSI is also required for the autopilot connection.

"MSG" message annunciator

CAUTION

"MSG" ANNUNCIATOR MAY BE PERMANENTLY ILLUMINATED IF THERE EXISTS A PERMANENT MESSAGE WHEN A NEW MESSAGE APPEARS, "MSG" ANNUNCIATOR ONLY FLASHES. IN THIS CASE, RETURN TO NAVIGATION PRIMARY MEANS BY PRESSING ON "NAV 1/GPS" INVERTER

It will flash to alert the pilot of a situation that requires his attention. Press the "MSG" button on the KLN89B GPS to view the message. (Appendix B of the KLN89B Pilot's Guide contains a list of all the messages likely to appear on the "Message" page and their meanings). "MSG" annunciator is amber.

"WPT" Waypoint annunciator

WARNING

TURN ANTICIPATION IS AUTOMATICALLY DISABLED FOR WAYPOINTS WHERE OVERFLIGHT IS MANDATORY ("SID/STARS" FOR EXAMPLE). FOR WAYPOINTS SHARED BETWEEN "SID/STARS" AND PUBLISHED ENROUTE SEGMENTS (REQUIRING OVERFLIGHT IN THE "SID/STARS"), PROPER SELECTION ON THE PRESENTED "WAYPOINT" PAGE IS NECESSARY TO PROVIDE ADEQUATE ROUTE PROTECTION ON THE "SID/STARS".

Prior to reaching a waypoint in the active flight plan, the KLN89B GPS will provide navigation along a curved path segment to ensure a smooth transition between two adjacent legs in the flight plan. This feature is called turn anticipation. Approximately 20 seconds prior to the beginning of the turn anticipation, the "WPT" annunciator will flash, going solid upon initiation of the turn, and extinguishing upon turn completion.
"WPT" annunciator is amber.

GPS approach "GPS APR ARM / GPS APR ACTV" switch / annunciator

CAUTION

THE USE OF GPS KLN89B APPROACH MODE IS PROHIBITED

This switch / annunciator is used to select or deselect approach mode of the KLN89B. This operation mode is not certified and is, furthermore, inhibited by programming the maintenance pages.

"LEG" mode

The use of "LEG" mode is selected by the "OBS" button.

When the KLN89B is used with the TURN ANTICIPATION ENABLED, at the beginning of turn anticipation, WPT alert annunciator goes on steady, MSG annunciator begins flashing. At this time, the KLN89B will notify the pilot with a message on the Message Page of the new desired track. This message will not be given if the course change is less than 5°.

CAUTION

WHEN TURN ANTICIPATION IS DISABLED, WAYPOINT ALERTING OCCURS APPROXIMATELY 35 SECONDS PRIOR TO ACTUALLY REACHING THE WAYPOINT. "MSG" ANNUNCIATOR REMAINS OFF. THERE IS NO COURSE CHANGE MESSAGE DISPLAYED BY THE KLN89B

IT IS RECOMMENDED TO USE KLN89B WITH TURN ANTICIPATION ENABLED

When the KLN89B is used WITH TURN ANTICIPATION DISABLED, the "Super NAV 5" page allows a rapid visualisation of the airplane position in horizontal navigation with regards to the route and the waypoints. It is strongly recommended to use this page.

"OBS" mode (selected by the "OBS" button)

The "OBS" mode has to be selected as follows :

- press the "OBS" button to select the "LEG" mode, then the "OBS" mode,
- when selecting the "OBS" mode, the active "WPT" of the "LEG" mode is chosen as reference "WPT" for the "OBS" mode.

FLIGHT DIRECTOR / AUTOPILOT COUPLED OPERATION

The HSI may be coupled with KAP 150 or KFC 150 autopilot.

Engaging the "NAV" mode on the autopilot mode controller engages the autopilot in navigation mode by using the selected course and left / right steering information presented on the HSI. It makes FD appear.

When AP is engaged on the mode controller, the autopilot is coupled to the HSI.

WARNING

WHEN CROSSING A WAYPOINT :

- **IF THE AUTOPILOT IS ENGAGED ON NAV MODE USING GPS DATA, THE COURSE POINTER MUST BE ADJUSTED TO THE VALUE OF THE NEW DESIRED TRACK (FOR A COURSE CHANGE UPPER THAN 5°).**
- **IF NOT, THE FLIGHT DIRECTOR AND AUTOPILOT WILL STEER A DIVERGENT ROUTE AFTER THE WAYPOINT CROSSING (EN ROUTE-LEG MODE SELECTED).**

NOTE :
When the HSI is selected on GPS navigation source, the RMI (if installed) remains selected on NAV 1 source (VOR or RNAV).

"SID" PROCEDURE

NOTE :
"SID" procedure can only be loaded in the Active Flight Plan (FPL 0).

Prior to take-off - Select an appropriate "SID" from the ACT 7 page. If necessary, select runway and transition point.

NOTE 1 :
Using right hand outer knob, select the ACT (Active Flight Plan waypoints) pages. Pull right hand inner knob out and scroll to the departure airport then push the inner knob in and select the ACT 7 page
To delete or replace a "SID", select FPL 0 page. Place the cursor over the name of the procedure, press ENT to change it, or CLR then ENT to delete it.

NOTE 2 :
After "SID" loading in the Active Flight Plan, using right hand outer knob, select the ACT (Active Flight Plan waypoints) pages. To check position of the "SID" waypoints, pull this knob and scroll each waypoint of the departure procedure.

"STAR" PROCEDURE

NOTE :
"STAR" procedure can only be loaded in the Active Flight Plan (FPL 0).

Prior to arrival - Select an appropriate "STAR" from the **ACT 7 page**.

NOTE 1 :
Using right hand outer knob, select the ACT (Active Flight Plan waypoints) pages. Pull right hand inner knob out and scroll to the destination airport, then push the inner knob in and select the ACT 7 page.
To delete or replace a STAR, select FPL 0 page. Place the cursor over the name of the procedure, press ENT to change it, or CLR then ENT to delete it.

NOTE 2 :
After "STAR" loading in the Active Flight Plan, using right hand outer knob, select the ACT (Active Flight Plan waypoints) page. To check position of the "STAR" waypoints, pull this knob and scroll each waypoint of the arrival procedure.

SECTION 5
PERFORMANCE

Installation and operation of the ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KI525A" do not change the performance of the aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	ITEM No.	OPTIONAL EQUIPMENT	WEIGHT lb	ARM in.
A	K926 00BM	"BENDIX / KING" KLN89B GPS Interfaced with the HSI KI525A	5.576	22.83

SECTION 7
DESCRIPTION

Normal operating procedures of the ""BENDIX / KING" KLN89B GPS NAVIGATION SYSTEM INTERFACED WITH THE HSI KIS25A" are described in the "BENDIX / KING" KLN89B Pilot's Guide at the latest revision.

CONTROLS - see Figure 9.40.2

Controlled by one set including concentric knobs and one cursor button, the KLN89B can present a variety of information in a number of different page formats.

The various display types can be considered as chapters in a book, each chapter having some number of pages. With a few exceptions, each of these pages can be changed independently.

The large outer knob controls the chapters and the small inner knob turns the pages.

To change data in a page, use the cursor function. This function is an area that flashes on the screen brought up by depressing the cursor button.

Then rotate the outer knob to position the cursor and the inner knob to select the desired characters. Repeat this operation as many times as necessary and valid (ENT button).

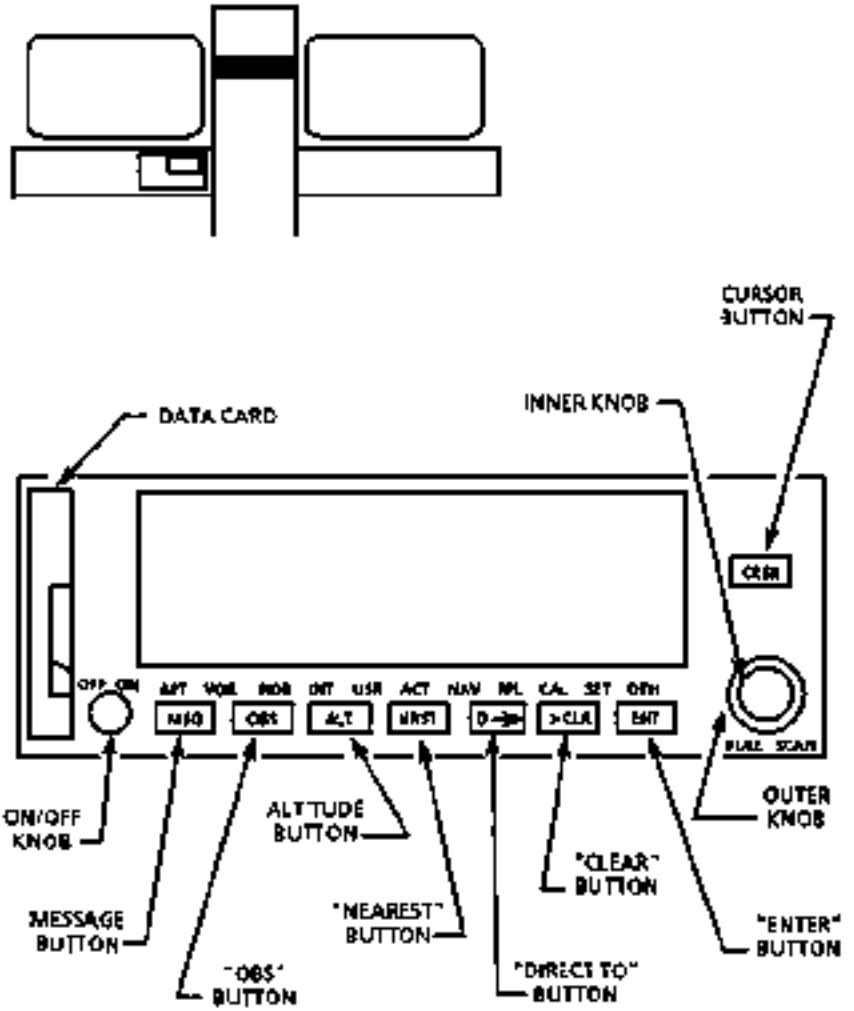
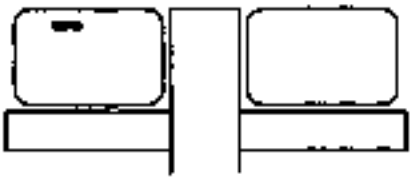


Figure 9.40.2 - Controls



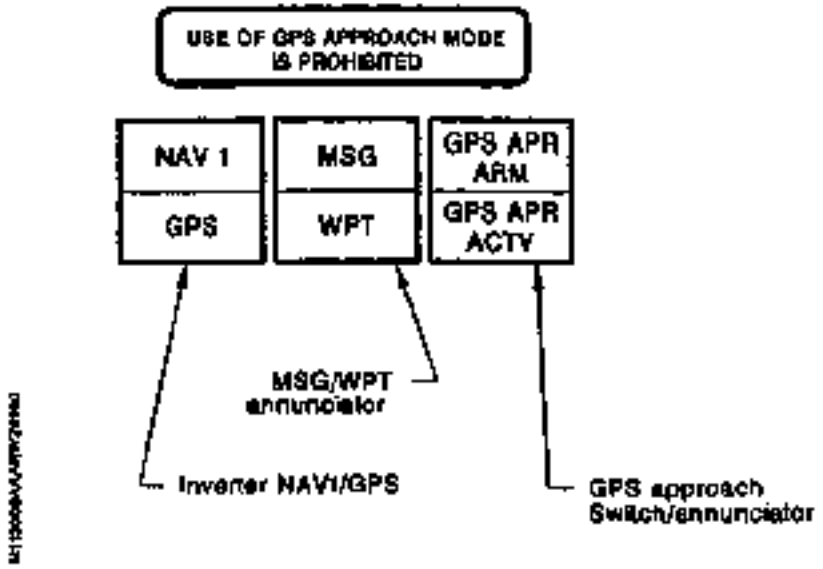


Figure 9.40.9 - GPS placard and annunciators

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SUPPLEMENT

"TKS" SYSTEM

TABLE OF CONTENTS

SECTION 1
GENERAL

This supplement must be included in the Pilot's Operating Handbook, when "T.K.S." Ice Protection Systems are installed in accordance with T.K.S. Mod N° 1391, 1460 and 1982.

SECTION 2
LIMITATIONS

Installation and operation of the "TKS" system do not change the basic limitations of the TB airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook.

CAUTION

FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED IN SPITE OF THE "TKS" SYSTEM INSTALLATION

DE-ICING FLUID

CAUTION

UNDER NO CIRCUMSTANCES ARE FLUIDS OTHER THAN THOSE LISTED BELOW TO BE USED IN THE "T.K.S." SYSTEM.

SOME FLUIDS CURRENTLY USED FOR GROUND DE-ICING PURPOSES CONTAIN THICKENING AGENTS WHICH MAY BLOCK THE POROUS PANELS. IF IT IS KNOWN OR SUSPECTED THAT SUCH A FLUID HAS BEEN PLACED IN THE TANK, DO NOT OPERATE THE SYSTEM, CONTACT "T.K.S." FOR INSTRUCTIONS

De-icing fluids must meet one of the following specifications : TKS R328 : TKS 80 ; AL-5 (DTD 406B).
In this case, they may be mixed in the aircraft tank in any proportions.
Fluids to DTD 406B are available under a number of proprietary names (e.g. Aeroshell Compound 07).

NOTE :
The system is intended to be operated continuously into unforeseen icing atmosphere at the ANTI-ICE flow rate. With DE-ICE selected, the rate of fluid flow is doubled.

With two-blade propeller

Maximum system endurance :

- With ANTI-ICE selected . . . . . 3 hours 20 minutes
- With DE-ICE selected . . . . . 1 hour 40 minutes

Endurance for a typical mission :

- With DE-ICE selected . . . . . 2 minutes in every 30 minutes
- With WINDSHIELD selected . . . . 5 seconds in every 10 minutes
- ENDURANCE . . . . . 2 hours 50 minutes

With three-blade propeller (OPT10 61-001 version B)

Maximum system endurance :

- With ANTI-ICE selected . . . . . 2 hours 50 minutes
- With DE-ICE selected . . . . . 1 hour 25 minutes

Endurance for a typical mission :

- With DE-ICE selected . . . . . 2 minutes in every 30 minutes
- With WINDSHIELD selected . . . . 5 seconds in every 10 minutes
- ENDURANCE . . . . . 2 hours 27 minutes

All

The following placards are to be fitted :

(1) On the outside of the tank filler door

TKS ICE PROTECTION TANK

USE ONLY THE FOLLOWING FLUIDS :

TKS 80 ; AL-5 (DTD 406B) ; TKS R326

(2) On the upper skin surface at the root end of each wing and stabilator (total 4 places)

"TKS" ICE PROTECTION

CAUTION
POROUS DE-ICING PANELS MAY BE
DAMAGED BY CERTAIN SOLVENTS
REFER TO SECTION 8 OF "T.K.S." SUPPLEMENT TO
PILOT'S OPERATING HANDBOOK

(3) Near the drain

TKS SYSTEM

Purge - Drain - Entleerung

SECTION 3

EMERGENCY PROCEDURES

These procedures supplement those of standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

CAUTION

FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED IN SPITE OF THE "TKS" SYSTEM INSTALLATION

If icing conditions are unintentionally encountered, follow instructions described in paragraph "ICING" of Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, as well as the procedure given hereafter :

"ANTI-ICE / DE-ICE"

airframe/propeller pump switch	As required
Wing inspection light	ON as required
"ALTERNATE AIR" (if installed)	FULLY PULLED
	if IOAT below + 39.3°F (+ 4°C) and visible moisture present
	Otherwise PUSHED

WINDSHIELD

To de-ice windshield, use windshield pump as required to maintain/restore vision. Apply fluid to windshield in short bursts of 3 to 5 seconds duration allowing sufficient time for airflow to spread fluid between applications.

Check operation : green indicator light.

Leave icing area as soon as possible.

After having left icing area :

"ANTI-ICE / DE-ICE"

airframe/propeller pump switch	OFF
Wing inspection light	OFF
"ALTERNATE AIR" (if installed)	PUSHED

SECTION 4
NORMAL PROCEDURES

These procedures supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

PREFLIGHT INSPECTIONS

COCKPIT

1 - Switches

Prime and / or inspect prior to flight :
'ANTI-ICE / DE-ICE" airframe;propeller pump switch — On ANTI-ICE or DE-ICE
Wing inspection light — ON

AIRFRAME INSPECTION

2 - Fluid tank

Quantity — Checkec
(Min . indicated : 1.7 U.S Gallons - 6.4 l)
Filler cap — SECURE
Filler door — CLOSED
Drain — Check closed and not leaking

3 - Porous panels

Condition and security — Checkec
Evidence of fluid flow — From all panels checkec
Wing inspection light — ON checkec

SWITCHES

All — OFF

BEFORE STARTING THE ENGINE

Fluid quantity indicator — CHECK QUANTITY SUFFICIENT FOR INTENDED FLIGHT AND PREVAILING CONDITIONS
(Min. indicated : 1.7 U.S Gallons - 6.4 l
if system is to be considered operational)
(See Sections 6 and 7 for weight and balance limitations and calibration of contents indicator)

System operation
and indicator lights — Select ANTI-ICE
CHECK THAT BOTH INDICATOR LIGHTS FLASH RED INITIALLY THEN CANCEL AS PRESSURE RISES. WITH GREEN 'ANTI-ICE ON' REMAINING ILLUMINATED
Select DE-ICE
CHECK THAT GREEN 'DE-ICE ON' IS ILLUMINATED

NOTE :
If a delay occurs between the selection of ANTI-ICE and DE-ICE, the indicator lamps may flash red for a short period until normal operating pressure is restored. This is acceptable provided that the flashing red indication is replaced by a steady green light within 30 seconds.

Pump switches — OFF

IN FLIGHT - GENERAL

Check that "ALTERNATE AIR" (if installed) is fully pulled whenever ice protection is on.

NOTE :
Pulling the "ALTERNATE AIR" control may cause the power rating to drop.

SECTION 5

PERFORMANCE

Installation and operation of the "TKS" system do not change the performance of the TB airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in (m)
	30 - ICE AND RAIN PROTECTION			
A	Ice protection systems (28 VDC) Pre-MOD 151 (OPT10 0667 10M)	TKS	40.565 (18.40)	74.80 (1.90)
A	Ice protection systems (28 VDC) Post-MOD. '51 (OPT10 0667 15M)	TKS	40.565 (18.40)	74.80 (1.90)
A	Ice protection systems (28 VDC) Post-MOD. '51 and OPT10 61-001 version B (Three-blade propeller) (OPT10 0667 35M)	TKS	40.565 (18.40)	74.80 (1.90)

The fluid density is 9.2 lbs per U.S Gal. (1.1 kg/l).
There are no changes in weigh; and balance limits with the system fitted.
The contents indicator will underestimate the quantity of fluid on board except when the tank is full. For the purposes of weight and balance either determine the true weight of fluid from the table below, or add 0.9 U.S Gal. (3.4 litres) to the indicator reading. For system endurance purposes either the uncorrected display value is to be taken, or the correction table (See Figure 9.41.1) may be used. Correction data is also shown, in graphical form in Section 7 of this supplement).

Indicator reading U.S Gal.	True contents U.S Gal. (litres)	Weight lb (kg)	Arm in (m)	Moment lb in/1000 (m.kg)
0	0.7 (2.7) or less	6.4 (2.9)	109 (2.8)	0.70 (8.1)
0.5	1.2 (4.5)	11 (5)	109 (2.8)	1.20 (14)
1	1.7 (6.4)	15.6 (7.1)	109 (2.8)	1.71 (19.9)
2	2.8 (10.6)	25.7 (11.7)	109 (2.8)	2.81 (32.8)
3	3.8 (14.4)	35 (15.9)	109 (2.8)	3.81 (44.5)
4	4.7 (17.8)	43.2 (19.6)	109 (2.8)	4.72 (54.9)
5	5.5 (20.8)	50.6 (23)	109 (2.8)	5.52 (64.4)
6	6.3 (23.8)	58 (26.3)	109 (2.8)	6.32 (73.6)
7	7.0 (26.5)	64.4 (29.2)	109 (2.8)	7.02 (81.8)
7.7	7.5 to 7.8 (28.4 to 29.5)	69 (31.3) 71.8 (32.6)	109 (2.8) 109 (2.8)	7.52 (87.6) 7.83 (91.3)

Figure 9.41.1 - Weight and balance table, de-icing fluid
Airplane in level attitude on ground

SECTION 7
DESCRIPTION

This airplane is equipped with fluid (liquid) ice protection systems for the aerofoils, propeller and windshield. These systems are supplied with de-icing fluid from a single tank located below the floor of the baggage compartment.

With two-blade propeller

Maximum fluid consumption is :

- ANTI-ICE mode ..... 2.4 U.S Gal. / hr (9.1 l / hr)
- DE-ICE mode ..... 4.8 U.S Gal. / hr (18.2 l / hr)

With three-blade propeller (OPT10 61-001 version B)

Maximum fluid consumption is :

- ANTI-ICE mode ..... 2.6 U.S Gal. / hr (9.8 l / hr)
- DE-ICE mode ..... 5.2 U.S Gal. / hr (19.7 l / hr)

All

The tank is serviced through a filler located on the left hand side of the fuselage, to the rear of the baggage compartment door. The filler orifice is attached to the inside of a door and moves outward with the door as it is opened. Special containers are not required to accomplish filling.
Tank capacity is 7.8 U.S Gal. (29.6 litres). The unusable volume is 0.1 U.S Gal. (0.4 litre) with the airplane in the level attitude, increasing to 1.45 U.S Gal. (5.5 litres) in the climb attitude (measured at 10.5° nose up). Hence the usable quantities are 7.7 and 6.35 U.S Gal. (29.2 and 24.1 litres) respectively.
Fluid quantity is measured by a float operated sensor which transmits an electrical signal to the indicator located on the ice protection control panel. Errors exist over most of the range between the true tank contents and the value indicated. A correction table is provided in Section 6 and the data is shown graphically in Figure 9.41.2.
If the system is to be considered operational, a minimum of 2.5 U.S Gal. (9.4 litres) should be present in the tank before take-off. This is represented by an indicator reading of 1.7 U.S Gal. (6.4 litres).
A drain is provided, this is located beneath the right fuselage slightly aft of the wing leading edge and is used for priming of the feed pipeline in addition to tank drainage.

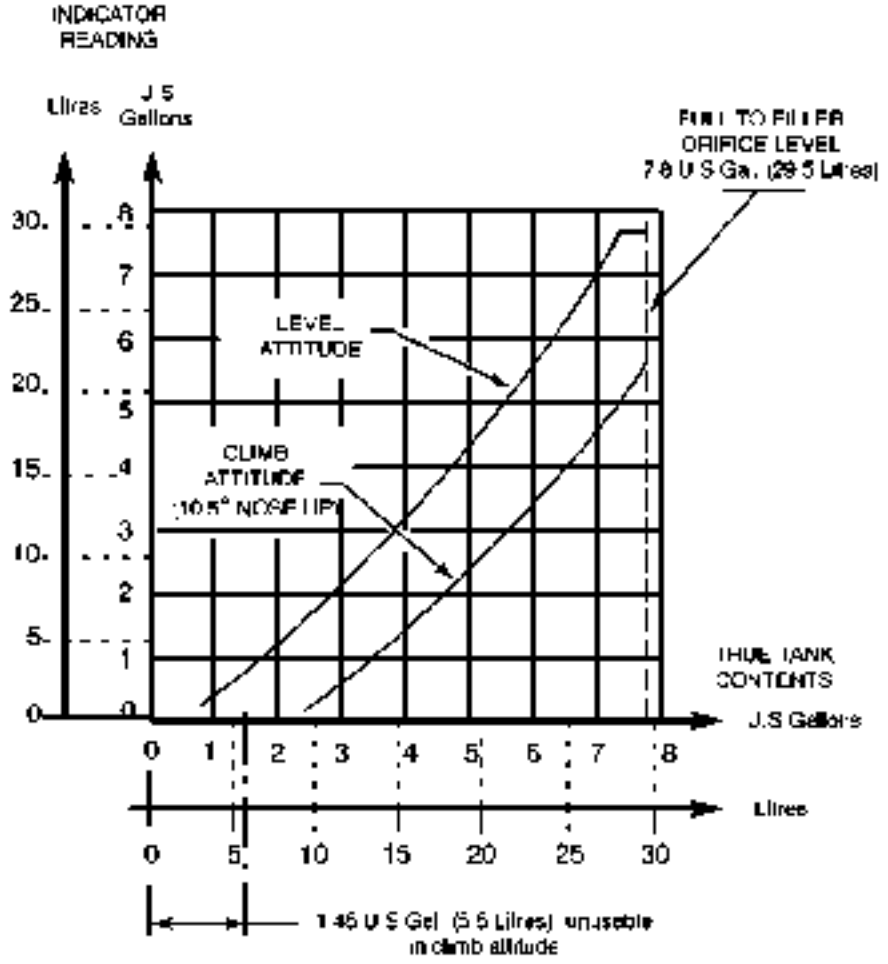

Figure 9.41.2 - FLUID QUANTITY INDICATOR CALIBRATION

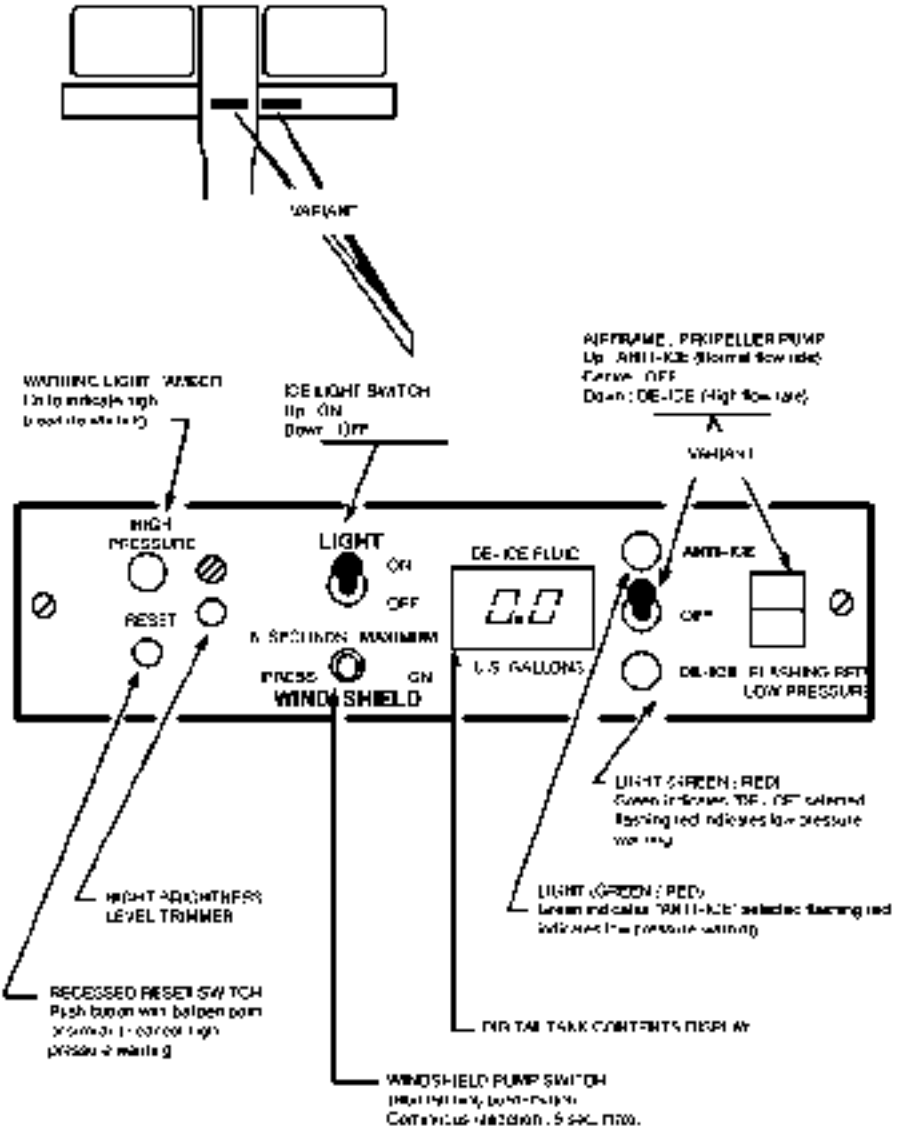

Figure 9.41.3 - CONTROL PANEL

The contents indicator display is shown in Figure 9.41.3 and reads the approximate fluid quantity in the tank in U.S Gallons. True quantity can be obtained by correcting the value shown as described above. This display has automatic dimming for night operations.

Three indicator lights :

- Two green/red indicator lights :
  - * illuminate steady green to indicate the selected condition of the airframe/propeller ice protection system . ANTI-ICE or DE-ICE
  - * in the event of low system pressure both lights flash red, with the light appropriate to the current pump selection alternating red/green in colour
- An amber indicator light :

  Illuminates when the pump delivery pressure exceeds normal limits. Illumination of this light indicates the possible need for filter element renewal.

  Note that once illuminated this light will remain on until the airplane circuit is switched off, unless it is reset by depressing the recessed "Reset" switch using a probe such as a pencil or ballpen.

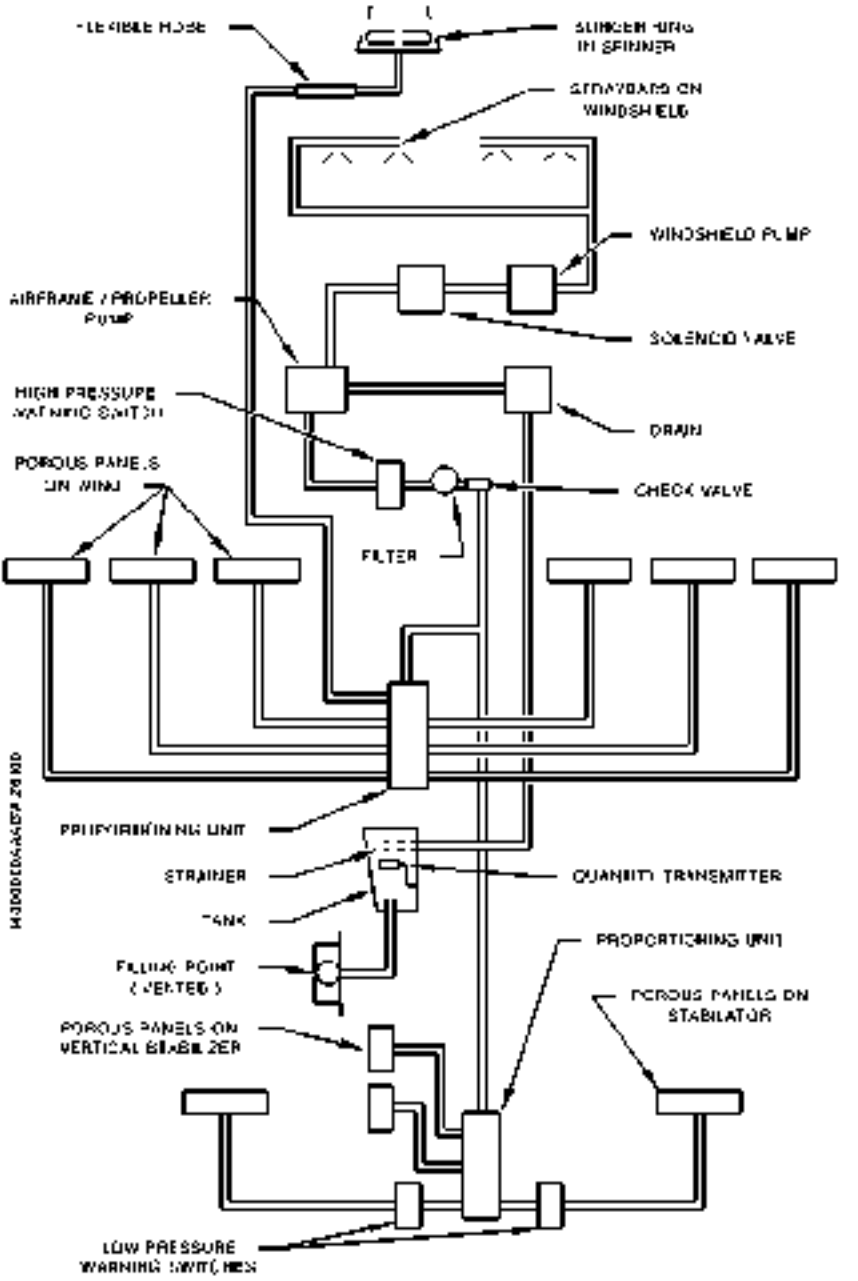

Figure 9.41.4 - SYSTEM SCHEMATIC

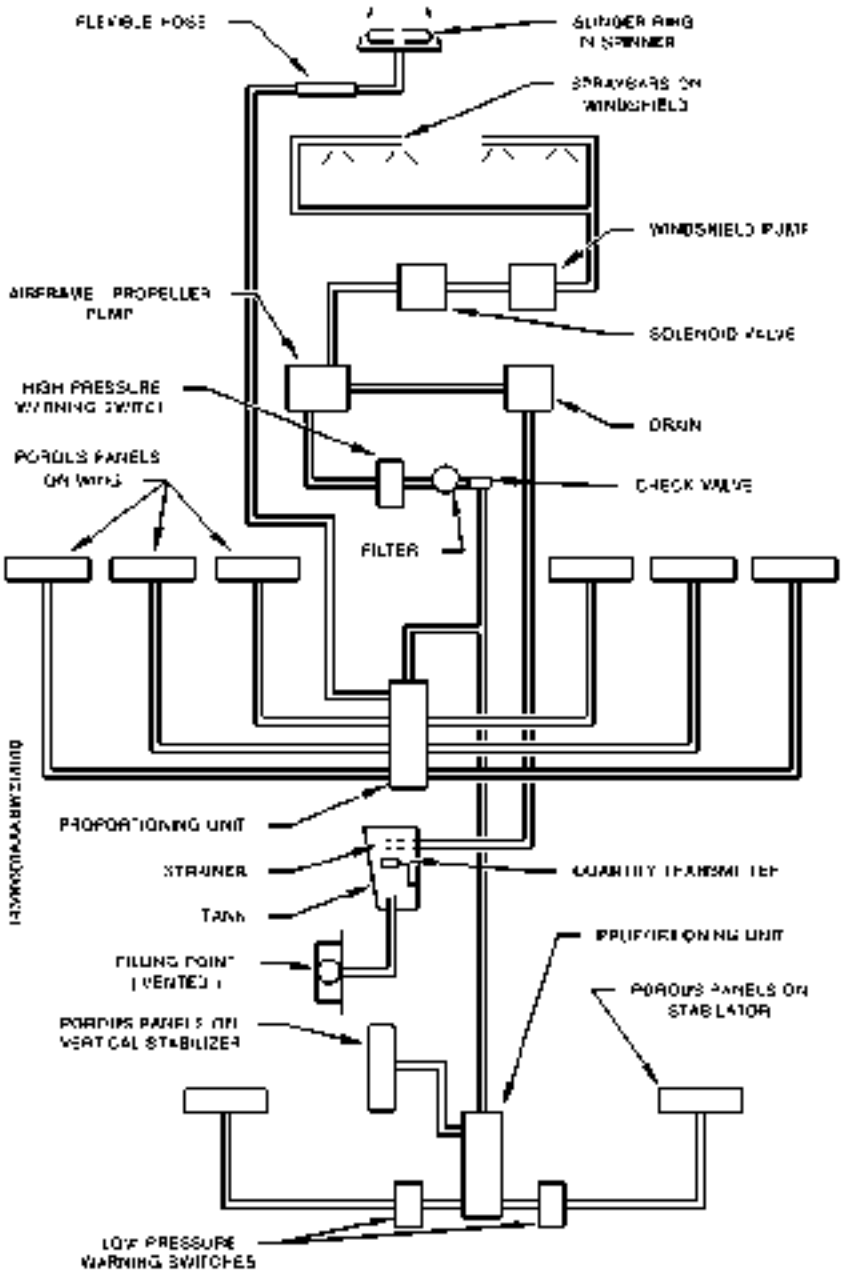

Figure 9.41.4A - SYSTEM SCHEMATIC

The fluid supply to the porous panels and propeller is provided by a two speed electrically driven pump. Propeller and aerofoil protection cannot be operated independently.

The supply for the windshield is provided by a separate intermittently rated pump. Figure 9.41.4 or 9.41.4A shows the fluid system schematic. Figure 9.41.5 shows the wiring schematic.

De-icing fluid from the pump passes through a filter and then through a spring loaded check valve which prevents flow when the pump is not operating.

A system of plastic tubing carries the fluid to proportioning units located in rear fuselage. The proportioning units divide the flow into the requirements of the individual regions fed from each proportioning unit outlet.

Porous panels are attached to the aerofoil leading edges. When the system is functioning, these panels exude fluid at a low steady rate. At the same time, a metered quantity of fluid is pumped via a slinger ring to the propeller blades.

The windshield pump has a second function which is to prime the airframe / propeller pump. When the windshield pump is operated the solenoid valve in series with this pump opens and fluid (and air if present) is drawn from the tank through the airframe / propeller pump.

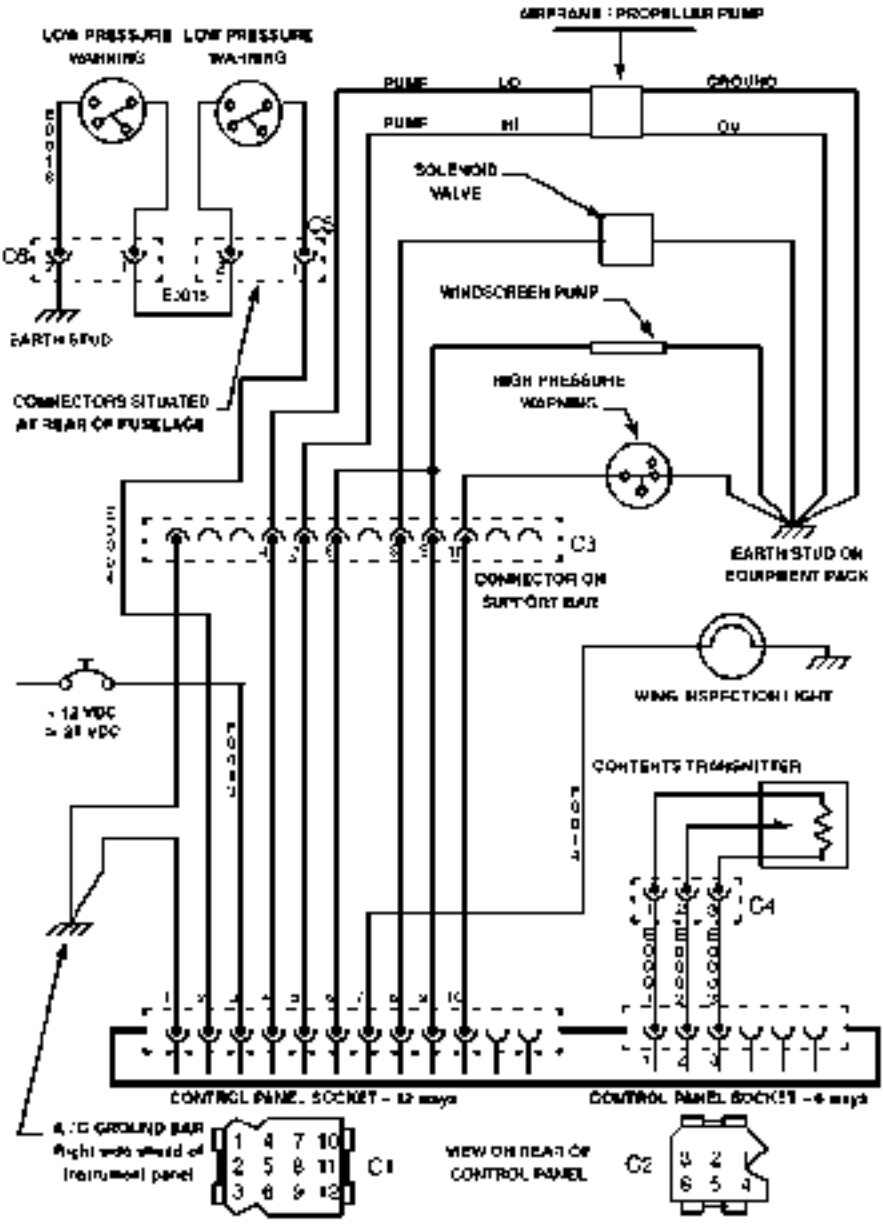

Figure 9.41.5 - WIRING SCHEMATIC

SECTION 8

HANDLING, SERVICING AND MAINTENANCE

PROLONGED OUT OF SERVICE CARE

During flyable storage

Ensure that the de-icing fluid tank contains at least the minimum recommended quantity of fluid (refer to Section 7) and that all system components are filled with fluid.

Operate airframe / propeller pump for at least two minutes at DE-ICE speed. intervals between operations should not exceed two months, for the first two years from new.

At the same time exercise the windshield pumps for several periods not exceeding 5 seconds each

The two month interval between operation may be increased to a period not exceeding six months, after the two year period unless any of the system plastic tubing has been renewed (see also § "Pump priming").

Re-check tank contents

NOTE :
Complete system priming after prolonged out of service may take as long as 15 to 20 minutes. Priming prior to each flight is recommended to maintain the system ready for immediate use and to facilitate insect removal from the leading edges.

SERVICING AND MAINTENANCE

- De-icing fluid tank

  It is located in the rear fuselage and is accessed through the baggage compartment bottom door

CAUTION

UNDER NO CIRCUMSTANCES ARE FLUIDS OTHER THAN THOSE LISTED TO BE USED IN THE "T.K.S." SYSTEM. SOME FLUIDS CURRENTLY USED FOR GROUND DE-ICING PURPOSES CONTAIN THICKENING AGENTS WHICH MAY BLOCK THE POROUS PANELS. IF IT IS KNOWN OR SUSPECTED THAT SUCH A FLUID HAS BEEN PLACED IN THE TANK, DO NOT OPERATE THE SYSTEM. CONTACT "T.K.S." FOR INSTRUCTIONS SEE SECTION "LIMITATIONS" FOR APPROVED DE-ICING FLUIDS

  The de-icing tank filler is located on the left hand side of the fuselage just aft of the baggage compartment door.

  To preclude the possibility of contamination, always clean the top of fluid containers before dispensing. If fluid is dispensed from bulk storage it is recommended that a clean vessel is maintained, solely for de-icing fluid.

  Secure the filler cap and filler door immediately after filling

- Drain

  A drain point is provided beneath the fuselage, on the right side slightly aft of the wing leading edge. This is provided for the purpose of draining the tank and should also be used to remove air from the pipeline between the tank and pump when refilling the system from empty

  In this case, fill or partially fill the tank and open the drain valve until air free fluid is discharged.

- Strainer

  Remove and clean the de-icing fluid strainer in the tank outlet at 12 monthly intervals or sooner if there are indications of foreign materials in the tank.

  The strainer is accessed either through the inspection panel situated on the lower fuselage skin below the forward end of the tank, or by tank removal.

  Flush the tank with clean water if foreign materials are evident in the bottom of the tank.

- Filter

  Illumination of the "High pressure" warning in flight (or during ground testing) indicates the need for filter element renewal, except that warnings arising from system operation in the DE-ICE mode and / or at abnormally low temperatures [below - 22° F (-30°C)] may be ignored.

- Pump priming

  The airframe / propeller pump may not be self priming and is ground primed by first opening the drain valve to remove any air in the supply pipeline from the tank, (reference paragraph 1 of this Section) then by operating windshield de-ice system to remove air from the remainder of the fluid feed pipelines and the body of the airframe / propeller pump. (In flight priming may be accomplished by operation of the windshield pump only - See Section 3).

- Stabilator balancing

  In the event of changes requiring checking and / or rebalancing of the stabilator this is to be carried out in accordance with SOCATA Maintenance Manual Chapters 51 and 55, except that due allowance is to be made for the weight of de-icing fluid in the porous panels attached to the stabilator leading edge. The de-icing fluid contained in the stabilator panels represents a moment of - 4.34 lbs.in/1000 (- 50 mm.kg).

The stabilator is to be balanced such that the moment is within the permitted limits with the porous panels both dry and filled with fluid.

In view of the difficulty of determining the quantity of fluid contained within the panels during the balancing operation, it is recommended that the stabilator is balanced with moments reduced by 4.34 lbs.in/1000 (50 mm.kg) at each limit.

[i.e. : SOCATA limits are - 13.2 lbs.in/1000 (- 150 mm.kg) to + 6.42 lbs.in/1000 (+ 74 mm.kg). It is recommended that the stabilator with "TKS" panels installed is balanced within the limits - 8.68 lbs.in/1000 (- 100 mm.kg) to + 2.08 lbs.in/1000 (+ 24 mm.kg)].

- Stall warning sensor

Maintenance functions relating to the stall warning sensor are to be made as detailed in SOCATA Maintenance Manual Chapter 27, except that for access to and / or removal of the unit it is first necessary to remove the left outer wing porous panel. This panel is secured with eight screws and may be withdrawn for access to the stall warning sensor following removal of those screws. It is not necessary to disconnect the feed tube to the panel although care is to be taken not to damage or kink the tube during the operation.

CLEANING

CAUTION

POROUS PANELS CONTAIN A PLASTIC MEMBRANE WHICH MAY BE DAMAGED BY CERTAIN SOLVENTS, PARTICULARLY METHYL-ETHYL-KETONE (MEK), ACETONE, LACQUER THINNER AND OTHER TYPES OF THINNERS AND SOLVENTS.
MASK PANELS WHEN PAINTING AIRCRAFT OR WHEN USING SOLVENTS FOR OTHER PURPOSES IN THE PROXIMITY OF THE POROUS PANELS

The porous panels may be washed with soap (or detergent) and water using a brush or lint free cloth. Only the following solvents are permitted for use on porous panels (refer also to the airplane manufacturers recommendations and instructions for cleaning the airplane exterior surfaces) :

- Water (with soaps or detergents)
- Approved de-icing fluids
- Aviation gasoline
- Aviation turbine fuel
- Isopropyl alcohol
- Ethyl alcohol
- Industrial methylated spirit

Cleaning of the porous panels will be greatly facilitated if the system is primed prior to each flight, especially if flight at low altitudes or in insect infested areas is anticipated.

OVERHAUL OR REPLACEMENT GUIDE

Overhaul or replacement of all components will be carried out depending on their condition.

SUPPLEMENT

"GARMIN" GNS 430 GPS NAVIGATION SYSTEM INTERFACED WITH GI 106A CDI

TABLE OF CONTENTS

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SECTION 1

GENERAL

Approved utilization type :

- Day/Night VFR

Certification rule :

- AC 20-138

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB aircraft is equipped with the option "'GARMIN' GNS 430 GPS NAVIGATION SYSTEM INTERFACED WITH GI 106A CDI" for a day/night VFR operation.

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "'GARMIN' GNS 430 GPS NAVIGATION SYSTEM INTERFACED WITH GI 106A CDI".

The GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means using information provided by satellites ("GARMIN" GNS 430 is able to track up to 12 satellites at a time). It also uses data recorded in a data base (two different data bases are available : North American one or International one). The data base is housed in a Nav data card plugged into the GNS 430 front face and is updated every 28 days by replacing the card.

Each data base contains information about airports, communication frequencies, VORs, NDBs, intersections, flight service stations ...

There is also room for up to 1000 user defined waypoints and 20 different flight plans.

The GNS 430 GPS receives altitude code from the encoding altimeter.

The GI 106A CDI may be coupled with the KAP 150 autopilot (if installed).

SECTION 2

LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook when the TB aircraft is equipped with the option "GARMIN" GNS 430 GPS NAVIGATION SYSTEM INTERFACED WITH GI 106A CDI".

Data base updating must be verified before each flight.

NOTE :
The GNS 430 genuine data base is referenced to WGS 84 geodetic datum.

GPS USED FOR NAVIGATION IN VFR ONLY

Figure 9.43.1 - GPS limitation placard

"GARMIN" GNS 430 Pilot's Guide, P/N 190-00140-00 Revision A or any applicable following edition, shall be readily available to the pilot whenever the operation of the GPS navigation system is predicted.

The GNS 430 GPS may replace the VOR or the ADF.

2.1 - CDI not coupled with KAP 150 autopilot

The system must utilize the following software versions or more recent ones :

Subsystem	Software
MAIN	2.16
GPS	2.03
COM	3.00
VOR/LOC	2.05
G/S	2.02

2.2 - CDI coupled with KAP 150 autopilot

The system must utilize the following software versions or more recent ones :

Subsystem	Software
MAIN	2.22
GPS	2.10
COM	4.01
VOR/LOC	3.01
G/S	2.03

SECTION 3

EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard aircraft described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "'GARMIN" GNS 430 GPS NAVIGATION SYSTEM INTERFACED WITH GI 106A CDI".

CDI NAV FLAG OR "INTEG" WARNING

Return to the VOR ou ADF navigation source and to remaining operational navigation equipment.

"CDI" push-button ..... VLOC

"MSG" ANNUNCIATOR ILLUMINATION

1 - "MSG" push-button of GPS ..... PRESS

Check the message.

"RAIM is not available", "Poor GPS Coverage", "Searching the sky" or "RAIM position warning" :

Return to VOR or ADF navigation source and to remaining operational navigation equipment.

2 - "CDI" push-button ..... VLOC

"MSG" ANNUNCIATOR ILLUMINATION (Cont'd)

If the message mentions an error of course deviation :

- OBS set to DTK value
  Return to VOR or ADF navigation source and to remaining operational navigation equipment.
  "CDI" push-button ..... **VLOC**
- OBS not set to DTK value
  Set the CDI to the value of DTK.
  - CDI coupled with autopilot : Check the correct interception of the segment, if the AP interface is used.

SECTION 4

NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard aircraft described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "GARMIN" GNS 430 GPS NAVIGATION SYSTEM INTERFACED WITH GI 106A CDI".

Normal operating procedures of the GPS recommended by the manufacturer are outlined in the "GARMIN" GNS 430 Pilot's Guide at the latest revision and Memory Jogger at the latest revision.

However, it is important to precise the following points for the GPS use on TB :

SET UP CONDITIONS

- Verify if the data base is current. Verify data on the self test page.
- Verify that altitude data is valid for the GPS prior to flight.

SYSTEM ANNUNCIATORS / SWITCHES / CONTROLS

"CDI" push-button

This push-button may be used to select data to be displayed on the CDI ; the NAV data come either from NAV 1 navigation receiver or from the GPS.

When pressed once, the push-button illuminates "**VLOC**" (white), pressed one more time illuminates "**GPS**" (green).

"MSG" message annunciator (amber)

CAUTION

"MSG" ANNUNCIATOR MAY BE PERMANENTLY ILLUMINATED IF THERE EXISTS A PERMANENT MESSAGE. WHEN A NEW MESSAGE APPEARS, "MSG" ANNUNCIATOR JUST FLASHES.

"**MSG**" **message annunciator** will flash to alert the pilot of a situation that requires his attention. Press the **"MSG" push-button** located on the GPS to view the message (Chapter 10 of "GARMIN" GNS 430 Pilot's Guide contains a list of all the messages likely to appear on the "Message" page and their meanings).

"WPT" Waypoint annunciator (amber)

This annunciator illuminates 10 seconds before warning "TURN TO XXX".

"APR" annunciator is not used.

"GPS" mode

When using the "GPS" mode, GPS navigation data (course deviation, TO/FROM) are presented on the CDI.

When crossing a waypoint, the track resetting on the following navigation leg must be hand-performed on the CDI.

Autopilot (if installed) coupled operation

The CDI may be coupled with KAP 150 autopilot.

The autopilot "NAV" mode uses left/right course deviation information and the CDI heading.

This information is related to the navigation source (VLOC or GPS) selected by the "CDI" push-button of the GPS.

When AP is engaged on the mode controller, the autopilot is then coupled with the CDI and uses displayed information (track and course deviation).

REMARK :
The change of steering source for the autopilot, when the latter is set to "NAV" side mode, implies a sequence of checks, some of which may be omitted or require a particular attention. Therefore it is strongly recommended to temporarily disengage the autopilot "NAV" mode before changing source.

SECTION 5

PERFORMANCE

Installation and operation of the "GARMIN" GNS 430 GPS NAVIGATION SYSTEM INTERFACED WITH GI 106A CDI do not change the performance of the TB aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6

WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in (m)
	23 – COMMUNICATIONS			
A	COM-NAV-GPS#1 GNS 430 interfaced with GI 106A CDI (OPT10 23003A)	GARMIN	9.700 (4.400)	24.80 (0.630)

SECTION 7

DESCRIPTION

Normal operating procedures of the "GARMIN" GNS 430 GPS NAVIGATION SYSTEM INTERFACED WITH GI 106A CDI are described in the "GARMIN" GNS 430 Pilot's Guide at the latest revision.

The option includes :

- one GNS 430 GPS installed in radio rack - see Figure 9.43.2,
- one GI 106A CDI on pilot's instrument panel,
- one "MSG/WPT" repeater on advisory panel

"GARMIN" GNS 430 GPS NAVIGATION SYSTEM INTERFACED WITH GI 106A CDI

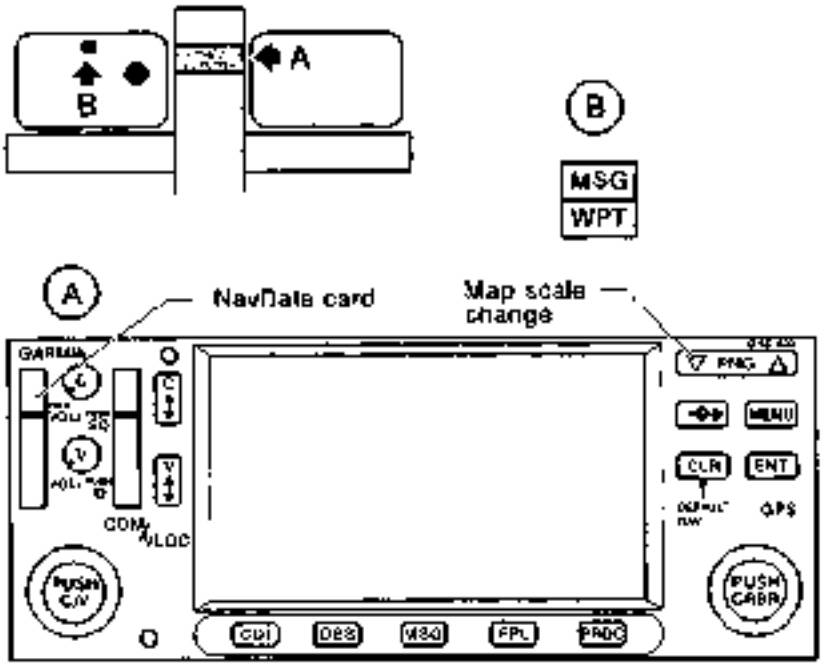

Figure 9.43.2 – "GARMIN" GNS 430 GPS SYSTEM

SUPPLEMENT

THREE-BLADE PROPELLER

TABLE OF CONTENTS

SECTION 1
GENERAL

This Supplement must be included in the Pilot's Operating Handbook, when the TB airplane is modified by the installation of a HARTZELL HC-C3YR-1RF/F7693F(B) propeller. A-2295-3(P) spinner.

SECTION 2
LIMITATIONS

The limitations hereafter supplement or supersede those of the standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook when the TB airplane is equipped with the option "THREE-BLADE PROPELLER".

POWERPLANT LIMITATIONS

Number of propellers : **1**

Propeller Manufacturer : **HARTZELL**

Propeller Model Number : HC-C3YR-1RF/F7693F(B)

Spinner Model Number : A-2295-3(P)

Number of blades : 3

Propeller Diameter :
Maximum : 78 inches (1.98 m)
Minimum : 76 inches (1.93 m)

Pitch :
High : 31.0 ± 1.0 degrees
Low : 13.0 ± 0.2 degrees

Measured at 30-inch station

SECTION 3

EMERGENCY PROCEDURES

The emergency procedures hereafter supplement or supersede those of the standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "THREE-BLADE PROPELLER".

ENGINE FAILURE IN FLIGHT : MAXIMUM GLIDE

Gliding distance is reduced by approximately 7 % with the 3-blade propeller installed.

SECTION 4

NORMAL PROCEDURES

Installation and operation of the three-blade propeller do not change the normal operating procedures of the TB airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook.

SECTION 5
PERFORMANCE

The performance of the three-blade propeller meets or exceeds the performance of the original two-blade propeller.

Acoustic limitations

ICAO requirements, Chapter 10 :

In compliance with ICAO rules, Chapter 10, the maximum noise level permissible corresponding to total maximum certification weight of 3086 lbs (1400 kg) is :

- 88 d B (A) for SOCATA Model TB 20 airplane,
- 88 d B (A) for SOCATA Model TB 21 airplane.

The noise level which was determined in conditions stated by above-mentioned rules for SOCATA Model TB 20 and TB 21 airplanes equipped with option OPT10 61001 "Thee-blade propeller" at a maximum continuous power of 2575 RPM is :

- 82 5 d B (A) for SOCATA Model TB 20 airplane,
- 81 8 d B (A) for SOCATA Model TB 21 airplane

FAR PART 36 requirements, Appendix G :

In compliance with FAR PART 36 rules, Appendix G, the maximum noise level permissible corresponding to total maximum certification weight of 3086 lbs (1400 kg) is :

- 83.7 d B (A) for SOCATA Model TB 20 airplane.
- 83 7 d B (A) for SOCATA Model TB 21 airplane

Tho noiso lovol which was determined in conditions stated by above-mentioned rules for SOCATA Model TB 20 and TB 21 airplanes equipped with option OPT10 61001 "Thee-blade propeller" at a maximum continuous power of 2575 RPM is :

- 78 6 d B (A) for SOCATA Model TB 20 airplane,
- 78 0 d B (A) for SOCATA Model TB 21 airplane

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement or supersede those given for the standard airplane in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in (m)
	61 - PROPELLER			
O	Three-blade propeller (OPT10 6100)	HARTZELL	Δ 14.650 (Δ 6.600)	47.60 (1.209)

SECTION 7
DESCRIPTION

The propeller is a 78-inch-diameter model, which features three aluminum blades. The general description, construction and function of the propeller are otherwise unchanged.

SECTION 8
AIRPLANE HANDLING, SERVICING AND MAINTENANCE

Refer to HARTZELL Manual 115 (Owner's Manual) for general propeller service information

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SUPPLEMENT

"HONEYWELL" KFC 225 AUTOMATIC FLIGHT CONTROL SYSTEM

TABLE OF CONTENTS

SECTION 1
GENERAL

This Supplement is provided to acquaint the pilot with the limitations as well as normal and emergency operating procedures of the "HONEYWELL" KFC 225 Automatic Flight Control System. The limitations presented are pertinent to the operation of the KFC 225 system as installed in the Socata TB20 and TB21 aircraft ; the Autopilot must be operated within the limitations herein specified.

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "'HONEYWELL" KFC 225 AUTOMATIC FLIGHT CONTROL SYSTEM".

The KFC 225 Automatic Flight Control System is certified in this aircraft with 2-axis autopilot control : pitch and roll.

The Automatic Flight Control System is installed according to block diagram shown on Figure 9.47.1.

The KFC 225 system provides the pilot with the following features : pitch attitude hold (PIT), vertical speed hold (VS), altitude hold preselect (ALT ARM), altitude capture (ALT CAP), altitude hold (ALT), altitude alerting, and go around (GA) in pitch ; roll attitude hold (ROL) heading hold (HDG), navigation course capture (NAV ARM), navigation course tracking (NAV), approach course capture (APR ARM), approach course tracking (APR), back course approach capture (REV ARM), and back course approach tracking (REV) in the roll axis. Control wheel steering (CWS) allows synching of the pitch axis modes (except glideslope) and manouvoring the aircraft by hand if desired.

The KFC 225 system has an electric pitch trim system that provides auto-trim during autopilot operation and manual electric trim (MET) for the pilot when the autopilot is not engaged. Trim faults are monitored and annunciated both visually and aurally.

An automatic preflight self-test begins with initial power application to the autopilot. A lockout device prevents autopilot engagement and MET operation until the system has successfully passed preflight self-test.

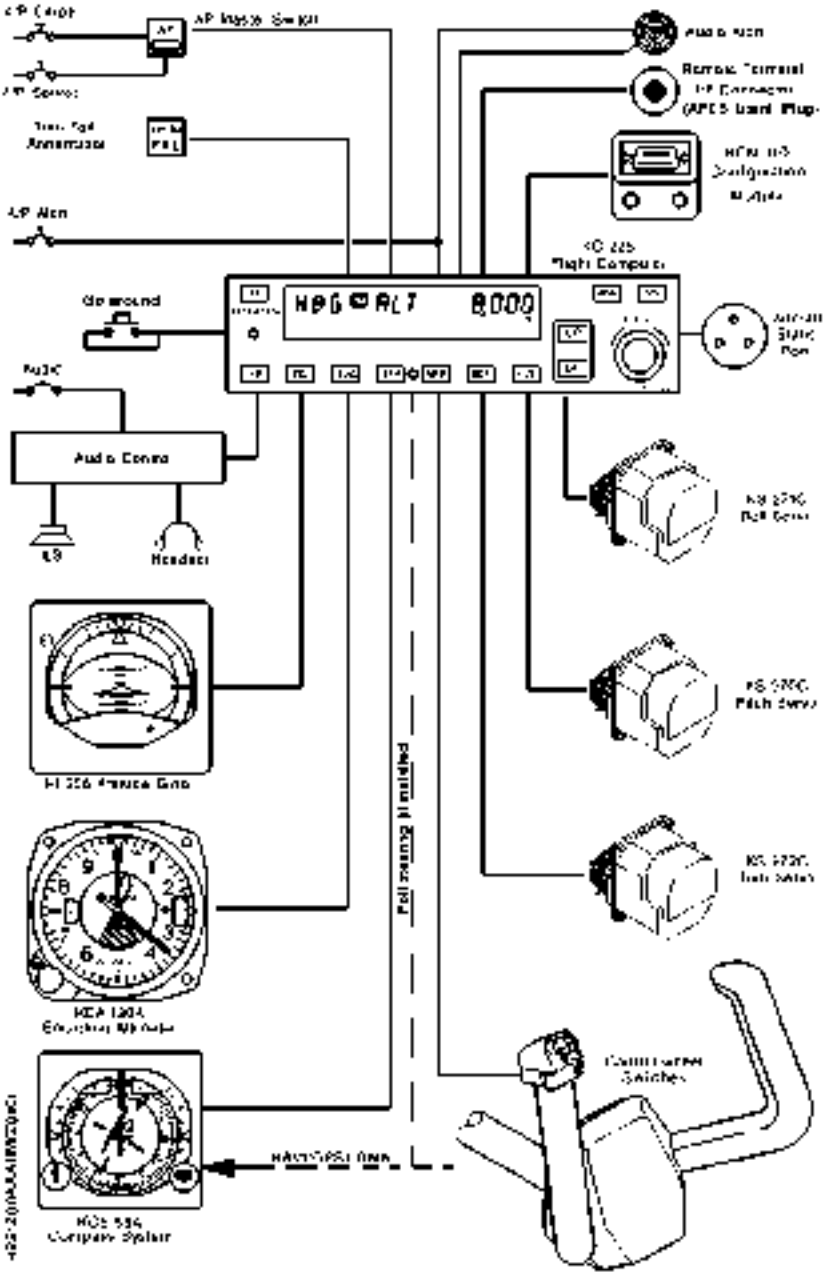

Figure 9.47.1 - KFC 225 System installation block diagram

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The following conditions will cause the Autopilot to automatically disengage :

A Electrical Power failure.

B Internal Auromatic Flight Control System failure

C. Roll rates in excess of 14° per second except when the CWS button is depressed.

D. Pitch rates in excess of 6° per second except when the CWS button is depressed.

F Pitch accelerations in excess of + 1.6 g or less than + 0.4 g will cause only the autopilot servo clutches to disengage (sustained accelerations will cause autopilot disengagement except when the CWS button is depressed).

The MAIN SWITCH supplies power to the aircraft bus bar. From the aircraft bus bar, power is switched by the A/P MASTER switch via the A/P CMPTR and A/P SERVOS pull-off type circuit breakers to the autopilot computer and servos. The A/P ALERT circuit breaker supplies power to the autopilot sonalert.

The aircraft MAIN SWITCH function is unchanged and can be used in conjunction with the ALTr FLD switch-breaker in an emergency to shut off electrical power to all automatic flight control systems while the problem is being isolated.

"HONEYWELL" KFC 225
AUTOMATIC FLIGHT CONTROL SYSTEM

The following circuit breakers are used to protect the following elements of the KFC 225 Automatic Flight Control System :

LABEL	FUNCTION
A/P CMPTR	Supplies power to the KC 225 Computer.
A/P SERVOS	Supplies power to the autopilot pitch, roll and pitch trim servos
A/P ALERT	Supplies sonalert power for autopilot disconnect tone.
HSI	Supplies power to the KCS 55A HSI system
AUDIO	Supplies power to the audio control box which transmits autopilot alerting to headphones and loud-speakers

NOTE :
An in-line fuse located in the fuse panel provides circuit protection for the Altitude Encoder.

The following voice messages will be annunciated as conditions warrant :

1. **"TRIM IN MOTION, TRIM IN MOTION..."** - Elevator trim running for more than 5 seconds
2. **"CHECK PITCH TRIM"** - An out of trim condition has existed for 16 seconds.

The system being configured for voice messaging, the following voice messages will be annunciated as conditions warrant :

1. **"ALTITUDE"** - 1000 feet before approaching selected altitude
2. **"LEAVING ALTITUDE"** - 200 feet away, departing selected altitude.
3. **"AUTOPILOT"** - Autopilot has disengaged, either through pilot action or automatically.

SECTION 2
LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "HONEYWELL" KFC 225 AUTOMATIC FLIGHT CONTROL SYSTEM".

A. The entire preflight test procedure outlined under Section 4, paragraph A. of this supplement, including steps 1. through 7., must be successfully completed prior to each flight. Use of the autopilot or manual electric trim system is prohibited prior to completion of these tests.

B. During autopilot operation, a pilot with seat belt fastened must be seated at the left pilot position.

C. The autopilot must be off during takeoff and landing.

D. The system is approved for Category I approach operation only (Approach mode selected).

E. Maximum fuel imbalance for autopilot operation : 20 Gallons (76 Liters).

F. Autopilot maximum airspeed limitation : 175 KIAS.

G. Autopilot coupled flap operation to and from the "Landing" (40°) position is prohibited below 1000 feet AGL.

H. Altitude Select captures below 800 feet AGL are prohibited.

I. The autopilot must be disengaged below 200 feet AGL during approach operations and below 800 feet AGL for all other phases of flight.

J. Overriding the autopilot to change pitch or roll attitude is prohibited (disengage the autopilot or press CWS while maneuvering).

K. The A/P SERVOS pull-off type circuit breaker must be pulled following any in-flight illumination of the red TRIM FAIL annunciator, but only after first completing the Emergency Procedures (Section 3) paragraph A. The manual electric trim and autopilot autotrim systems will be disabled with the circuit breaker pulled. The red TRIM FAIL annunciator will illuminate normally during preflight self-test. If the TRIM FAIL annunciator remains illuminated after preflight self-test, the A/P SERVOS pull-off type circuit breaker must be pulled.

L. Required placard on pilot's instrument panel

AUTOPILOT AND ELECTRIC TRIM PREFLIGHT TESTS MUST BE CONDUCTED PRIOR TO EACH FLIGHT

SECTION 3
EMERGENCY AND ABNORMAL PROCEDURES

The emergency and abnormal procedures hereafter supplement those of the standard aircraft described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "HONEYWELL" KFC 225 AUTOMATIC FLIGHT CONTROL SYSTEM".

EMERGENCY PROCEDURES

The fifth-step procedure listed under paragraph A. should be among the basic aircraft emergency procedures that are committed to memory. It is important that the pilot be proficient in accomplishing all five steps without reference to this Supplement.

A In case of Autopilot, Autopilot Trim, or Manual Electric Trim malfunction (accomplish items 1 and 2, simultaneously) :

1. Aircraft Control Wheel - **GRASP FIRMLY** and regain aircraft control.
2. **A/P DISC TRIM INTER** Switch - **PRESS** and **HOLD** throughout recovery until step 5. has been accomplished.
3. AIRCRAFT - **RETRIM** manually as needed
4. **AP MASTER** Switch - **OFF**.
5. **A/P SERVOS** pull-off type circuit breaker - **PULL**

NOTE :
*The **MAIN SWITCH** may be used as an alternate means of removing all power from the autopilot and electric trim systems. Turn the **MAIN SWITCH** back on as soon as possible to restore power to all other avionics equipment. Primary attitude, airspeed and altitude instruments will remain operational at all times.*

NOTE :
If the malfunction has been identified as a TRIM FAIL event, the flight director only may be used provided that the A/P CMPTR pull-off type circuit breaker remains set.

WARNING

DO NOT ATTEMPT TO RE-ENGAGE THE AUTOPILOT FOLLOWING AN AUTOPILOT, AUTOTRIM, OR MANUAL ELECTRIC TRIM MALFUNCTION UNTIL THE CAUSE FOR THE MALFUNCTION HAS BEEN CORRECTED

Maximum Altitude losses due to autopilot malfunction :

Configurator	Alt Loss
Cruise, Climb, Descent	250 ft
Maneuvering	100 ft
APPR	45 ft

B. **"CHECK PITCH TRIM"** - An out of trim condition has existed for 16 seconds.

1 Aircraft Control Wheel – **GRASP FIRMLY**, press **CWS** and check for an out of pitch trim condition. Manually retrim as required.

2 **CWS** button - **RELEASE**

3 **AUTOPILOT OPERATION CONTINUE** if satisfied that the out of trim condition was temporary. **DISCONTINUE** if evidence indicates a failure of the auto trim function.

C. Aircraft Stall (Autopilot coupled)

1. **AUTOPILOT DISENGAGE** and perform stall recovery.

D. Amplified Emergency Procedures

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action for an emergency situation.

1. An autopilot or autopilot trim malfunction may be recognized as an uncommanded deviation in the aircraft flight path or when there is abnormal control wheel or trim wheel motion. In some cases, and especially for autopilot trim, there may be little to no aircraft motion, yet the red **TRIM FAIL** annunciator may illuminate and an alert tone will sound.

The primary concern in reacting to an autopilot or autopilo: trim malfunction, or to an automatic disconnect of the autopilot, is in maintaining control of :he aircraft. Immecialely grasp the control wheel firmly and press and hold down :he **A/P DISC TRM INTER** switch throughout lhe recovery.
Fly the aircraft respecting flight envelope. Elevator trim should be used manually as needed lo relleve control forces.

2. Switch off the **AP MASTER** switch to remove all power from the Autopilot and Electric Pitch Trim systems and pull the **A/P SERVOS** pull-off type circuit breaker.

3. A manual electric trim malfunction may be recognized by the illumination of a red **TRIM FAIL** annunciator accompanied by an alert tone, or by unusual trim wheel motions with the autopilot disengaged without pilot actuation of the manual electric trim switch. As with an autopilot malfunction, the first concern following a manual electric trim malfunction is regaining control of the aircraft. Grasp the control wheel firmly and press and hold down the **A/P DISC TRM INTER** switch. Switch off the **AP MASTER** switch to remove all power from the Autopilot and Electric Pitch Trim systems. Pull the **A/P SERVOS** pull-off type circuit breaker.

4. Note that the emergency procedure for any malfunction is essentially the same - immediately grasp the control wheel firmly to regain aircraft control while pressing and holding the **A/P DISC TRM INTER** switch down, and manually retrim the aircraft as needed. After these steps have been accomplished, disable the autopilot and electric trim systems by switching off the **AP MASTER** switch. Then pull the **A/P SERVOS** pull-off type circuit breaker. As with any other aircraft emergency procedure, it is important that the steps of the Autopilot/Electric Trim Emergency Procedures, paragraph A., are committed to memory.

5. The KFC 225 autopilot incorporates pitch and roll monitors that detect abnormal aircraft movement; therefore, if the aircraft, for any reason, is moved rapidly in pitch or roll the monitors may disconnect the autopilot automatically.

6. It is important that all portions of the autopilot and electric trim system are preflight tested prior to each flight in accordance with the procedures published herein in order to assure their integrity and continued safe operation during flight.

WARNING

DO NOT ATTEMPT TO RE-ENGAGE THE AUTOPILOT OR TO USE THE MANUAL ELECTRIC TRIM SYSTEM FOLLOWING AN AUTOPILOT, AUTOTRIM OR MANUAL ELECTRIC TRIM MALFUNCTION UNTIL THE CAUSE FOR THE MALFUNCTION HAS BEEN CORRECTED

ABNORMAL PROCEDURES

A. A flashing PT auto trim annunciation with an up or down arrowhead in the display of the autopilot computer suggests a failure of the auto trim function.
Pilot actuation of CWS button may be necessary to relieve pitch servo loading.

1. FLASHING PT ANNUNCIATION - **OBSERVE** aircraft pitch behavior. If pitch behavior is satisfactory, wait 5–10 seconds for the annunciation to stop.
2. If annunciation continues, aircraft Control Wheel - **GRASP FIRMLY.** press CWS and check for an out of pitch trim condition. Manually retrim as required.
3. CWS Button - **RELEASE.**
4. **AUTOPILOT OPERATION** - **CONTINUE** if satisfied that the out of trim indication was temporary. **DISCONTINUE** if evidence indicates a failure of the auto trim function.

B. A red **P** or R annunciation on the face of the autopilot computer

1 A red **P** annunciation is an indication that the pitch axis of the autopilot has been disabled and the autopilot cannot be engaged.

NOTE :
If the red P lamp was the result of some abnormal accelerations on the aircraft, the annunciation should extinguish within approximately one minute and normal use of the autopilot will be re-established. This annunciation may be present during power up.

2. A red **R** annunciation is an indication that the roll axis of the autopilot has been disabled and the autopilot cannot be engaged.

C. A flashing mode annunciation on the display of the autopilot computer or on the remote mode annunciator is normally an indication of mode loss.

1. Flashing **HDG** - Indication of a failed heading input. **PRESS HDG** button to terminate flashing.

2 Flashing **NAV, APR,** or **REV** – Usually an indication of a flagged navigation source or an interruption of navigation signal. The autopilot will default to a roll hold mode. PRESS the **NAV, APR** or **REV** button to terminate flashing. Select a valid navigation source.

NOTE :
A flashing NAV, APR or REV annunciation can also be caused by a failed heading or course datum input.

3 Flashing **GS** - Indication of a flagged glideslope (or a fault in the KFC 225 pressure sensor). GS will rearm automatically if a valid GS signal is received.

NOTE :
*To continue tracking the localizer, use **VS** mode while observing the appropriate minimums for a non-precision approach (**VS** mode selection will terminate the flashing GS).*

NOTE :
*At the onset of mode annunciator flashing, the autopilot has already reverted to a default mode of operation, i.e., **ROL** and or **PIT** mode. An immediate attempt to re-engage the lost mode may be made if the navigation, glideslope or compass flag has cleared.*

D. Erratic altitude encoder operation.

1. Inaccurate or erratic altitude encoder output noted on the transponder or GPS altitude display.

or

2 Erroneous altitude alert operation.

If items 1. and/or 2. are noted – altitude arm and capture should not be used and the altitude alerts should be ignored.

E. Effects of other instrument losses upon autopilot operation :

1 Loss of the artificial horizon - will severely impact autopilot operation **DO NOT ENGAGE** autop lot into this situation

2 Loss of the turn coordinator – no effect on the autopilot.

3. Loss of the HSI – Heading, navigation and approach modes inoperative.

4 Loss of altitude encoding – preselect altitude captures and altitude alerting inoperative. Note a dashed altitude display will appear on the autopilot computer.

SECTION 4

NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard aircraft described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "'HONEYWELL" KFC 225 AUTOMATIC FLIGHT CONTROL SYSTEM".

A. **PREFLIGHT** (Perform prior to each flight)

1 **AP MASTER** switch – **ON**

2 **POWER APPLICATION AND SELF TEST - OBSERVE.** An approximate one minute self test is performed upon power application to the computer. This test is a sequence of internal checks that validate proper system operation prior to allowing normal operation. The sequence is indicated by "PFT" with an increasing number for the sequence steps. Successful completion of self–test is identified by all display segments being illuminated (Display Test), a momentary appearance of the flight director command bars and the disconnect tone sounding.

NOTE :
Following the preflight self test, the red P annunciation warning on the face of the autopilot may illuminate indicating that the pitch axis cannot be engaged. This condition should be temporary, lasting less than 30 seconds. The P will extinguish and normal operation will be available

WARNING

WHEN POWER IS FIRST APPLIED TO THE AUTOPILOT COMPUTER, THE SERVO CLUTCHES WILL ENGAGE MOMENTARILY DURING SELF TEST REQUIRING ADDITIONAL EFFORT TO CONTROL THE AIRCRAFT THROUGH THE ENGAGED CLUTCHES IF TAXIING OR FLYING

WARNING

IF THE TRIM FAIL ANNUNCIATOR STAYS ON, THE AUTOTRIM DID NOT PASS PREFLIGHT TEST. THE A/P SERVOS PULL-OFF TYPE CIRCUIT BREAKER MUST BE PULLED. THE AUTOPILOT AND MANUAL ELECTRIC TRIM CAN NOT BE USED

3. **MANUAL ELECTRIC TRIM - TEST** as follows :

   Command nose up trim using the manual electric trim switches and verify the ability to interrupt trim motion by pressing the **A/P DISC TRM INTER** switch. Repeat nose down.

4. **AUTOPILOT - ENGAGE** by pressing AP button.

5. **FLIGHT CONTROLS - MOVE** fore, aft, left & right to verify that the autopilot clutches can be overpowered.

6. **A/P DISC TRM INTER** Switch - **PRESS**. Verify that the pitch and yaw clutches disengage and that the autopilot disconnects. Note the aural disconnect tone.

7. **TRIM SET** to take off position manually

B. FLIGHT DIRECTOR OPERATION

The flight director modes of operation are the same as those used for autopilot operations except that the autopilot is not engaged and the pilot must maneuver the aircraft to satisfy the flight director commands. Note that the flight director will always be in view when the autopilot is engaged.

C. AUTOPILOT OPERATION

WARNING

THE PILOT IN COMMAND MUST CONTINUOUSLY MONITOR THE AUTOPILOT WHEN IT IS ENGAGED, AND BE PREPARED TO DISCONNECT THE AUTOPILOT AND TAKE IMMEDIATE CORRECTIVE ACTION IF AUTOPILOT OPERATION IS NOT AS EXPECTED OR IF AIRCRAFT CONTROL IS NOT MAINTAINED. CORRECTIVE ACTION MAY INCLUDE MANUAL CONTROL OF THE AIRCRAFT AND/OR PERFORMANCE OF REQUIRED EMERGENCY PROCEDURES.

DURING ALL AUTOPILOT COUPLED OPERATIONS THE PILOT IN COMMAND MUST USE PROPER AUTOPILOT COMMANDS AND USE THE APPROPRIATE COMBINATION OF ENGINE POWER, WING FLAPS, AND LANDING GEAR TO ENSURE THAT THE AIRCRAFT IS MAINTAINED BELOW 175 KIAS, AND DOES NOT EXCEED OTHER OPERATIONAL LIMITATIONS

1. Before takeoff

   a. **A/P DISC TRM INTER** Switch – **PRESS**.

   b. Flight Director – **ENGAGE** as desired (HDG and GA modes are common choices).

   c. Altitude Alert/Altitude preselect – **SET, ARM** as desired.

   NOTE :
   An aural and visual alert is annunciated 1000 ft prior to arrival at the selected altitude. After arriving at the selected altitude, another alert is annunciated if the aircraft deviates from the selected altitude by ± 200 ft. The aural alert is a series of 5 short tones. When voice messaging is enabled, the 5 short tones are followed by the voice message "ALTITUDE" or "LEAVING ALTITUDE".

2. Inflight Autopilot Engagement

   a. Elevator Trim - **VERIFY** or **SET** to place the aircraft in a trimmed condition prior to autopilot engagement

   b. **AP** Button – **PRESS**. If no other modes have been selected on the flight director, the autopilot will operate in the **ROL** and **PIT** modes. If other flight director modes have been selected, the autopilot will engage into the existing flight director modes.

   NOTE :
   Satisfy existing flight director commands manually prior to autopilot engagement to avoid undesirable pitch and roll transients

WARNING

DO NOT HELP THE AUTOPILOT OR HAND-FLY THE AIRCRAFT WITH THE AUTOPILOT ENGAGED AS THE AUTOPILOT WILL RUN THE PITCH TRIM TO OPPOSE CONTROL WHEEL MOVEMENT. A MISTRIM OF THE AIRCRAFT, WITH ACCOMPANYING LARGE ELEVATOR CONTROL FORCES, WILL RESULT IF THE PILOT MANIPULATES THE CONTROL WHEEL MANUALLY WHILE THE AUTOPILOT IS ENGAGED

3. Climb or Descent

   a. Choose pitch attitude hold (**PIT**) or vertical speed hold (**VS**) mode.

WARNING

WHEN OPERATING AT OR NEAR THE BEST RATE OF CLIMB AIRSPEED AND USING VERTICAL SPEED HOLD (VS), USE CAUTION TO AVOID SLOWING TO AN AIRSPEED ON THE BACK SIDE OF THE POWER CURVE WHERE A DECREASE IN AIRSPEED RESULTS IN A REDUCED RATE OF CLIMB. CONTINUED OPERATION ON THE BACK SIDE OF THE POWER CURVE IN VERTICAL SPEED HOLD MODE WILL RESULT IN A STALL.

WHEN OPERATING AT OR NEAR THE MAXIMUM AUTOPILOT SPEED, IT MAY BE NECESSARY TO REDUCE POWER IN ORDER TO MAINTAIN THE DESIRED RATE OF DESCENT AND NOT EXCEED THE MAXIMUM AUTOPILOT SPEED

   b. Using **CWS**

      1) **CWS** Button - **PRESS** and **DISPLAY** desired pitch attitude or vertical speed

      2) **CWS Button** - **RELEASE**. Autopilot will command the present attitude within the limits of ± 15° or the present vertical speed within the limits of ± 2000 ft/min.

   c. Using Vertical Trim

      1) **VERTICAL TRIM** Control - **PRESS** either the **UP** or **DN** button to modify aircraft attitude within the limits of ± 15° or modify vertical speed within the limits of ± 2000 ft/min

      2) **VERTICAL TRIM** Control - **RELEASE** when the desired attitude is achieved or the desired vertical speed command is displayed.

4. Altitude (ALT) Hold

   a. **ALT** Mode Selector Button - **PRESS**. Note **ALT** mode annunciator **ON**. Autopilot will maintain the baro corrected altitude present at the time of engagement.

   NOTE :
   In accordance with FAA recommendation (AC00-24B), use of basic "pitch attitude hold" mode is recommended during operation in severe turbulence.

   b. Preselected altitude captures with flight director engaged

      1) **ALTITUDE SELECT** knob - **ROTATE** until the desired altitude is displayed. Note **ARM** annunciation occurs automatically upon altitude selection when the flight director is engaged.

      2) Aircraft - **ESTABLISH** climb or descent necessary to intercept the selected altitude. Note **ALT CAP** annunciated during level off at the preselected altitude.

      3) ALTITUDE SELECT MODE (**ARM**) button - **PUSH** to alternately disarm or arm altitude capture.

   NOTE :
   Preselected altitude captures are not recommended on non-precision approaches to capture the MDA. A preselected altitude capture cannot be armed during glideslope operation.

   c. Altitude changes

      1) Using **CWS** (recommended for altitude changes greater than 100 ft).

         - **CWS** Button - **PRESS** and maneuver aircraft to desired altitude.

         - **CWS** Button - **RELEASE** when desired altitude is reached. The autopilot will maintain the altitude present at the time of release.

2) Using Vertical Trim (Recommended for altitude changes less than 100 ft).

- **VERTICAL TRIM** Control - **PRESS** and **HOLD** either the **UP** or **DN** button. Vertical Trim will command an altitude rate of change of about 500 fpm.
- **VERTICAL TRIM** Control - **RELEASE** when the desired altitude is reached. The autopilot will maintain the altitude present at the time of release.

NOTE :
*As an alternative, press either the **UP** or **DN** button with a succession of quick momentary presses programming either an increase or decrease in the altitude reference at the rate of 20 feet per button press.*

5. Heading Changes

a. Manual heading changes in **ROL** mode.

1) **CWS** Button - **PRESS** and **MANEUVER** aircraft to the desired heading.

2) **CWS** Button - **RELEASE** w/bank angle less than 6°. Autopilot will attempt to maintain the aircraft at wings level in the ROL mode.

3) **CWS** Button - **RELEASE** w/bank angle greater than 6°. Autopilot will maintain the bank angle present at the time of release (up to the **maximum bank** angle commanded by the autopilot).

NOTE
*Aircraft heading may change in **ROL** mode due to turbulence or attitude gyro precession.*

b. Heading Hold

1) Heading Selector Knob - **SET BUG** to desired heading.

2) **HDG** Mode Selector Button - **PRESS**. Note **HDG** mode annunciator **ON**. Autopilot will automatically turn the aircraft to the selected heading.

c. Command Turns (Heading Hold mode **ON**)

1) Heading Selector Knob - **MOVE BUG** to the desired heading. Autopilot will automatically turn the aircraft to the new selected heading.

6. **NAV** Coupling

a. Course Bearing Pointer – **SET** to desired course.

b. Heading Selector Knob – **SET BUG** to provide desired intercept angle and engage HDG mode.

c. **NAV** Mode Selector Button **PRESS**

1) If the Course Deviation Bar is greater than 2 to 3 dots from center the aircraft will continue in HDG mode (or ROL if HDG not selected) with **NAV ARM** annunciated ; when the computed capture point is reached HDG will disengage, the **ARM** annunciator will go out and the selected course will be automatically captured and tracked, **NAV** staying illuminated.

2) If the D-Bar is less than 2 to 3 dots from center the HDG mode will disengage upon selecting NAV mode , the **NAV** annunciator will illuminate and the capture/track sequence will automatically begin

NOTE :
When operating in the NAV or APR mode with VOR as the selected navigation sensor, changes in the selected course which result in a D-Bar deviation of greater than 50% may result in the autopilot not tracking the signal. It is recommended that the new course be manually captured using the heading bug and the NAV ARM or APR ARM mode.

7 Approach (APR) Coupling (to enable glideslope coupling on an ILS, and more precise course tracking on instrument approaches).

a. Course Bearing Pointer – **SET** to desired course.

b. Heading Selector Knob – **SET BUG** to provide desired intercept angle.

c. **APR** Mode Selector Button – **PRESS.**

1) If the Course Deviation Bar is greater than 2 to 3 dots from center , the aircraft will continue in HDG mode (or ROL if HDG not selected) with the **APR ARM** annunciated , when the computed capture point is reached **HDG** mode will disengage, the **ARM** annunciator will go out and the selected course will be automatically captured and tracked, **APR** staying illuminated.

2) If the D-Bar is less than 2 to 3 dots from center : the HDG mode will disengage upon selecting APR mode , the **APR** annunciator will illuminate and the capture/track sequence will automatically begin.

NOTE :
When operating in the NAV or APR mode with VOR as the selected navigation sensor, changes in the selected course which result in a D-Bar deviation of greater than 50% may result in the autopilot not tracking the signal. It is recommended that the new course be manually captured using the heading bug and the NAV ARM or APR ARM modes.

WARNING

EXTENSION OF "LANDING" (40°) FLAPS BELOW 1000 FEET AGL MAY RESULT IN A DANGEROUS GLIDESLOPE DEVIATION. WHEN "LANDING" (40°) FLAPS ARE DESIRED ON AN AUTOPILOT COUPLED PRECISION APPROACH, FINAL FLAP EXTENSION SHOULD BE CONDUCTED NEAR THE FINAL APPROACH FIX (FAF/FAP). "LANDING" (40°) FLAP RETRACTION IN THE EVENT OF A GO-AROUND MUST BE DONE WITH THE AUTOPILOT DISENGAGED

8. BC Approach Coupling (**REV**) (i.e., reverse localizer)

a Course Bearing Pointer – **SET** to the ILS front course inbound heading

b. Heading Selector Knob - **SET BUG** to provide the desired intercept angle and engage **HDG** mode.

c. **REV** Mode Selector Button - **PRESS.**

1) If the Course Deviation Bar is greater than 2 to 3 dots from center , the aircraft will continue in **HDG** mode (or ROL if HDG not selected) with **REV ARM** annunciated ; when the computed capture point is reached HDG mode will disengage, the **ARM** annunciator will go out and the selected course will be automatically captured and tracked, **REV** staying illuminated

2) If the D-Bar is less than 2 to 3 dots from center , the **HDG** mode will disengage upon selecting REV mode , the **REV** annunciator will illuminate and the capture/track sequence will automatically begin.

9 Glideslope Coupling

NOTE :
Glideslope coupling is inhibited when operating in NAV or REV modes. Glideslope arm and coupling occurs automatically in the APR mode when tracking a localizer.

a. **APR** Mode - **ENGAGED.** Note **GS ARM** annunciated.

NOTE :
Autopilot can capture glideslope from above or below the beam Establish a glideslope intercept in ALT, PIT or VS

b At Glideslope centering - note **ARM** annunciator goes out and GS becomes the active pitch mode

WARNING

EXTENSION OF "LANDING" (40) FLAPS BELOW 1000 FEET AGL MAY RESULT IN A DANGEROUS GLIDESLOPE DEVIATION. WHEN "LANDING" (40°) FLAPS ARE DESIRED ON AN AUTOPILOT COUPLED PRECISION APPROACH, FINAL FLAP EXTENSION SHOULD BE CONDUCTED NEAR THE FINAL APPROACH FIX (FAF/FAP). "LANDING" (40°) FLAP RETRACTION IN THE EVENT OF A GO-AROUND MUST BE DONE WITH THE AUTOPILOT DISENGAGED.

10. Missed Approach

    a. **GA button – PRESS** to disengage the autopilot and obtain a fly-up and wings level flight director command.

    b. **MISSED APPROACH – EXECUTE**. Utilize flight director modes as desired.

    NOTE :
    If tracking the ILS course outbound as part of the missed approach procedure is desired, use the NAV mode to prevent inadvertent GS coupling.

    c. **AUTOPILOT** – After aircraft is in trim, **ENGAGE** as desired.

11. Before Landing

    a. **A/P DISC TRM INTER** Switch – **PRESS** to disengage autopilot.

    NOTE :
    If the 'AP DISC Disengages F/D' is not configured, pitch and roll axis may be disengaged, leaving only flight director, at approach minimums via a momentary press of the manual electric trim switch.

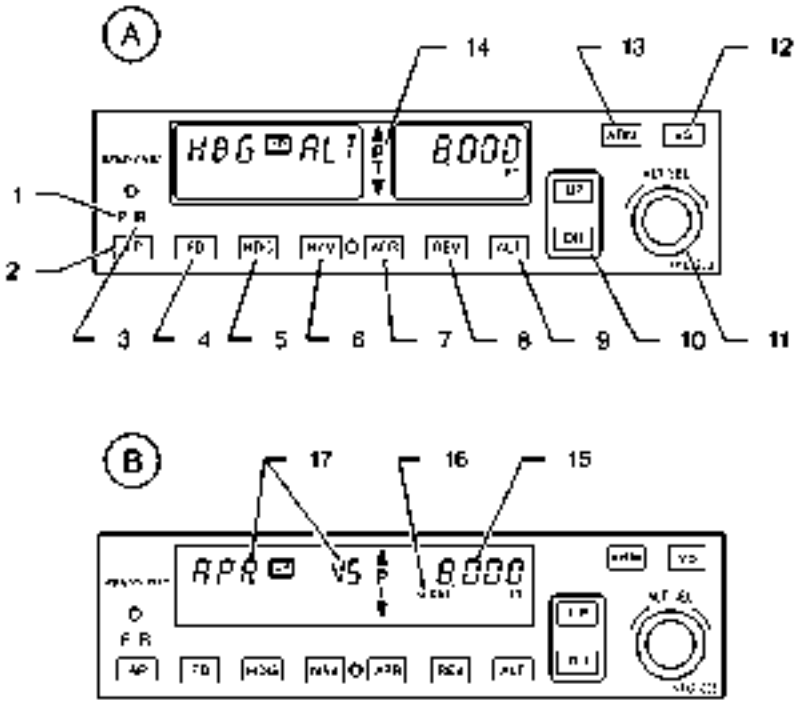
12. Lateral clearance

    For the conditions hereafter .

Navigation source	Pilot's action
NAV1	(a) Switching between VOR frequency and ILS frequency or (b) Selection of "GPS1" navigation source
GPS1	Selection of "NAV1" navigation source

The KFC 225 autopilot induces cancelling of NAV, APR or REV upper modes (ARM or active) and returns to basic modes : pitch attitude hold (PIT) and roll attitude hold (ROL).

D. SYSTEM CONTROLS AND DISPLAYS



A – Two-axis FCC with altitude preselect and alerting
B – KFC 225 Front Panel
C – TRIM FAIL Annunciator
D – AP Master Switch (located at the bottom of central console)

Figure 9.47.2 - System controls and displays

Item 1 – PITCH AXIS, (P) ANNUNCIATOR – When illuminated, indicates failure of the pitch axis and will lead to disengagement of the autopilot (will also illuminate during short term vertical accelerations in excess of + 1.6 g or less than + 0.4 g which may not cause autopilot disengagement).

Item 2 - AUTOPILOT ENGAGE/DISENGAGE (AP) BUTTON – When pressed, engages the flight director and autopilot if all logic conditions are met. If the flight director is not already engaged, the system will engage into the basic wings level (ROL) and pitch (PIT) attitude hold modes. The pitch attitude maintained will be the pitch attitude present at the moment of AP button press. When pressed again, will disengage the autopilot.

Item 3 - ROLL AXIS (R) ANNUNCIATOR - When illuminated, indicates failure of the roll axis and will disengage the autopilot.

Item 4 - FLIGHT DIRECTOR (FD) MODE SELECTOR BUTTON – When pressed will engage the flight director into the basic roll (ROL) mode which functions as a wing leveler, and into the pitch attitude (PIT) hold mode. The pitch attitude maintained will be the pitch attitude present at the moment of FD button press. When pressed again (and the autopilot is not engaged) will disengage the flight director.

Item 5 - HEADING (HDG) MODE SELECTOR BUTTON – When pressed, will engage the Heading mode, which commands the aircraft to turn to and maintain the heading selected by the heading bug on the HSI. A new heading may be selected at any time and will result in the aircraft turning to the new heading. Button can also be used to toggle between HDG and ROL modes. This button will engage the flight director.

Item 6 - NAVIGATION (NAV) MODE SELECTOR BUTTON – When pressed, will arm the navigation mode. The mode provides automatic beam capture and tracking of VOR, LOC or GPS as selected for presentation on the HSI. NAV mode is recommended for en route navigation tracking. If pressed when NAV mode is either armed or coupled, will disengage the mode. This button will engage the flight director.

Item 7 - APPROACH (APR) MODE SELECTOR BUTTON - When pressed, will arm the Approach mode. This mode provides automatic beam capture and tracking of VOR, GPS, LOC, and Glideslope (GS) on an ILS, as selected for presentation on the HSI. APR ARM will annunciate. If pressed when APR mode is either armed or coupled, will disengage the mode. This button will engage the flight director.

Item 8 - BACK COURSE APPROACH (REV) MODE SELECTOR BUTTON - When pressed, will select the back course approach mode. This mode functions similarly to the approach mode except that the autopilot response to LOC signals is reversed and glideslope is inhibited. This button will engage the flight director.

Item 9 - ALTITUDE HOLD (ALT) MODE SELECT BUTTON - When pressed, will engage the Altitude Hold mode. The altitude maintained is the altitude at the moment the ALT button is pressed. If the ALT button is pressed with an established VS rate present, there will be approximately a 10% (of VS rate) overshoot, with the aircraft returned positively to the selected altitude. If pressed when ALT hold mode is engaged, will disengage the mode, defaulting to PIT mode. This button will engage the flight director.

Item 10 - VERTICAL TRIM (UP/DN) BUTTONS - The response of these buttons is dependent upon the vertical mode present when pressed. If PIT mode is active, successive button presses will move the pitch attitude hold reference either up or down by 0.5° per press, or at the rate of 0.8° per second if held continuously. If VS mode is active, the initial button press will bring up the commanded vertical speed in the display. Subsequent immediate button presses will increment the vertical speed command either up or down at the rate of 100 ft/min per button press, or at the rate of approximately 300 ft/min per second if held continuously. If ALT mode is active, successive button presses will move the altitude hold reference altitude either up or down by 20 feet per press, or if held continuously will command the aircraft up or down at the rate of 500 ft/min, synchronizing the altitude hold reference to the actual aircraft altitude upon button release (Note that neither the pitch attitude nor the altitude hold reference is displayed. The display will continue to show the altitude alerter reference).

Item 11 – ROTARY KNOBS – Used to set the altitude alerter/altitude preselect reference altitude. When the flight director is engaged, will automatically arm a preselect altitude hold capture.

Item 12 – VERTICAL SPEED (VS) MODE SELECTOR BUTTON – When pressed will engage the vertical speed hold mode. The vertical speed maintained is the vertical speed present at the moment the VS button is pressed. The vertical speed command reference will initially be displayed in place of the altitude alert annunciation, defaulting back in 3 seconds to the altitude alerter value. Pressing either the UP or DN button will again cause the vertical speed command reference to be displayed while causing it to increase or decrease. Vertical speed can be commanded to a maximum of a 2000-ft/min climb down to a maximum of a 2000-ft/min descent. When the VS button is pressed again, it will disengage the vertical speed mode. This button will engage the flight director.

Item 13 – ALTITUDE ARM (ARM) BUTTON – When pressed will toggle altitude arming on or off. When ALT ARM is annunciated, the automatic flight control system will capture the altitude displayed in the Altitude Alerter/Vertical Speed Display (provided the aircraft is climbing or descending to the displayed altitude). ALT ARM mode is engaged automatically whenever the selected altitude is changed via the rotary knobs. Note that the alerter functions are independent of the arming process thus providing full time alerting, even when the flight director is disengaged. This button will engage the flight director.

Item 14 – PITCH TRIM (PT) ANNUNCIATION – A flashing PT with an accompanying arrowhead is an indication that the request for auto trim has lasted longer than 10 seconds. A solid PT without an arrowhead is an indication of a pitch trim fault. A trim runaway will generate the solid PT annunciation, a remote TRIM FAIL (See Item 18) annunciation and a continuous alert tone. Refer to the EMERGENCY PROCEDURES for proper response to a pitch trim fault.

Item 15 – ALTITUDE ALERTER/VERTICAL SPEED DISPLAY – Normally displays the altitude alerter selected altitude. The display indicates the reference vertical speed in FPM for 3 seconds after the CWS button or the UP or DN button is pressed and the VS mode is engaged.

Item 16 – ALTITUDE ALERT (**ALERT**) ANNUNCIATION – Illuminates as a solid alert in the region of from 1000 to 200 feet from the selected altitude if the aircraft was previously outside of this region. Flashes (1) for two seconds the first time the aircraft crosses the selected altitude and (2) flashes continuously in the 200 to 1000 feet region if the aircraft was previously inside of this region (i.e. at the selected altitude). Associated with the visual alerting is an aural alert (5 short tones) which occurs 1000 feet from the selected altitude upon approaching the altitude and 200 feet from the selected altitude on leaving the altitude.

Item 17 – PITCH AND ROLL MODE AND AUTOPILOT ANNUNCIATIONS - Displays the active flight director pitch modes (PIT, VS, ALT ARM, ALT CAP, ALT, GS ARM, GS, GA) and roll modes (ROL, HDG, NAV ARM, NAV, APR ARM, APR, REV ARM, REV). Displays when the autopilot (AP) is engaged. Also displayed will be a flashing AP annunciation (5 seconds) at each autopilot disconnect accompanied by an aural tone (for 2 seconds).

Item 18 – **TRIM FAIL** ANNUNCIATION - Illuminates whenever the automated pre-flight self-test detects a pitch trim fault or a continuous monitoring system detects a pitch trim fault in flight (located on the advisory panel. The annunciator is red in color). Refer to the EMERGENCY PROCEDURES (Section 3) for proper response to a pitch trim fault.

E. PILOT'S CONTROL WHEEL SWITCHES

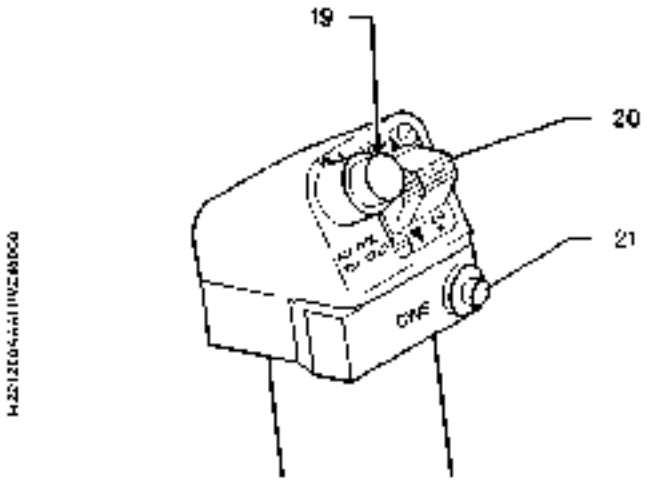


Figure 9 47.3 – Pilot's control wheel switches

Item 19 – AUTOPILOT DISCONNECT (A/P DISC TRIM INTER) SWITCH - When pressed will disengage the autopilot and interrupt electric trim power (The switch is red in color) (May also disengage the flight director depending on how the system is configured).

Item 20 – MANUAL ELECTRIC TRIM SWITCHES – When both switches are pressed in the same direction, will activate pitch trim in the selected direction. If only one switch is moved, the trim system will not operate. If one switch fails or is moved and held for 3 seconds, the trim monitoring system will detect a switch failure resulting in a PT annunciation on the autopilot display and the disabling of the electric trim system. Use of manual electric trim during autopilot operation will disengage the autopilot.

Item 21 – CONTROL WHEEL STEERING (CWS) MODE BUTTON – When pressed and held, disengages the pitch, roll, yaw, and pitch trim clutches allowing the pilot to maneuver the aircraft by hand. Pressing the CWS button will also sync the automatic flight control system PIT, ROL, ALT or VS commands to the actual attitude, attitude or vertical speed present at the time the button is released. ROL will maintain wings level if CWS is released at less than 6° bank angle.

F OTHER CONTROLS

GO AROUND (GA) MODE BUTTON – When pressed will engage the flight director in a pitch up attitude of 6° and wings level (ROL mode). GA will disengage the autopilot, and cancel all armed modes including an armed altitude preselect. Lateral modes such as HDG or NAV ARM may subsequently be added. The autopilot may subsequently be engayed. Modification to the commanded pitch attitude such as through the UP/DN button or CWS, etc. will cancel GA and revert to pitch altitude hold (located on the central pedestal above throttle).

OMNI BEARING SELECT KNOB – Selects the desired course to be tracked by the autopilot (located on the HSI).

HEADING SELECT KNOB – Positions the heading bug on the compass card (located on the HSI).

SECTION 5

PERFORMANCE

Installation and operation of the "HONEYWELL" KFC 225 AUTOMATIC FLIGHT CONTROL SYSTEM do not change the performance of the TB aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6

WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A L O	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in. (m)
	22 - AUTOPILOT			
A	Automatic flight control system KFC 225 (OPT10 22001A)	HONEYWELL	28.110 (12.753)	65.75 (1.670)
A	Automatic flight control system KFC 225 (OPT10 22001C)	HONEYWELL	28.110 (12.753)	65.75 (1.670)

SUPPLEMENT

"HONEYWELL" KLN 94 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS

TABLE OF CONTENTS

"HONEYWELL" KLN 94 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED WITH
ELECTROMECHANICAL INSTRUMENTS

SECTION 1

GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB airplane is equipped with the option "'HONEYWELL" KLN 94 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS".

Approved utilization types :

- IFR in continental and Terminal Enroute areas as additional source,
- B-RNAV.

Certification rules :

- AMJ 20X2 Section 4,
- AC 20-138

The generalities hereafter supplement those of the standard airplane described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "'HONEYWELL' KLN 94 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS".

This supplement does not constitute an operational utilization authorization.

The GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means using information provided by satellites (the KLN 94 system is able to track up to 8 satellites at a time). It also uses data recorded in a data base. The data base is housed in a Navdata card to be inserted in the front face and is updated every 28 days by replacing the card.

Each data base contains information about airports, communication frequencies, VORs, NDBs, Intersections, SIDs, STARs, instrument approaches, flight service stations .

There is also room for up to 500 user defined waypoints and 25 different flight plans.

SECTION 2

LIMITATIONS

2.1 - General

The limitations hereafter supplement those of the standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option ""HONEYWELL" KLN 94 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS"

"HONEYWELL" KLN 94 Pilot's Guide, P/N 006-18207-000 Revision 0 dated 09/00 or any applicable following edition, shall be readily available to the pilot, each time the GPS navigation system is used.

The system must utilize the ORS 01 software version or a more recent one.

Data base updating must be verified before each flight

The navigation sources required for the anticipated flight shall be serviceable and allow an immediate crossed check on available ground aids or shall allow to return to primary navigation sources in case of GPS navigation loss.

Use of GPS as a navigation source is **PROHIBITED**, unless the pilot verifies the currency of the data base and the coordinates of each selected waypoint.

For every navigation into areas reserved for B-RNAV, the pilot must be provided with a predicted availability of RAIM on the route, if the constellation disposes of less than 29 satellites.

The check of navigation system information consistency must be regularly performed during the flight .

- when reaching each waypoint or before reaching the position report point of the ATC,
- before leaving a published route and then every 15 minutes during this type of operation (function "Direct To").

The check of position information consistency may be performed by comparing this position with the one determined by the primary radionavigation sources.

2.2 - SID/STAR

The use of SIDs and STARs stored in GPS data base is **PROHIBITED.**

The use of user waypoints on SID/STAR is **PROHIBITED.**

2.3 - Instrument approach (Non precision approach)

Use of the GPS is **PROHIBITED.**

GPS 1
APPROVED FOR B-RNAV
SID/STAR AND APPROACH MODE PROHIBITED

Figure 9 48.1 - GPS limitation placard

SECTION 3

EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "HONEYWELL" KLN 94 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS".

HSI NAV FLAG

Return to remaining operational navigation equipment.

"NAV1/GPS1" push-button NAV1

"MSG" ANNUNCIATOR ILLUMINATION

1 - "MSG" push-button of GPS ..... PRESS

Check the message.

"Bad Satellite Geometry", Nav Super Flag Failure", "RAIM position error", "RAIM not available", "Searching the sky" or "No GPS Receiver Data" :

Return to VOR or ADF navigation source and to remaining operational navigation equipment.

"NAV1/GPS1" push-button NAV1

"MSG" ANNUNCIATOR ILLUMINATION (Cont'd)

*If the message mentions an error of course deviation (**"Adj Nav CRS to XXX"** or **"GPS course is xxx°"**) :*

- OBS set to DTK value
  Return to VOR or ADF navigation source and to remaining operational navigation equipment.
  "NAV1/GPS1" push-button **NAV1**
- OBS not set to DTK value
  Set the OBS to the value of DTK. Check the correct interception of the segment, if the AP interface is used.

WHEN IN B-RNAV VERIFY THE IFR PROCEDURE APPLICABLE TO EACH ONE OF THESE NEW SITUATIONS WITH THE AIR TRAFFIC CONTROL :

- **OUT OF B-RNAV AREA : IT IS PROHIBITED TO ENTER THE B-RNAV AREA.**
- **IN B-RNAV AREA : INFORM THE AIR TRAFFIC CONTROL TO INDICATE THE LOSS OF B-RNAV CAPABILITY.**

When the system integrity is restored, the return to GPS mode must be accompanied by the validation of the followed and desired track concordance by using primary sources of navigation.

SECTION 4

NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option ""HONEYWELL" KLN 94 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS".

Normal operating proceedures of the GPS recommended by the manufacturer are outlined in the "HONEYWELL" KLN 94 Pilot's Guide at the latest revision and Memory Jogger at the latest revision.

However, it is important to precise the following points for the GPS use on TB :

SET UP CONDITIONS

- Verify if the data base is current. Verify date on the self test page.
- Verify that altitude data is valid for the GPS prior to flight.
- In case of B-RNAV use :

  During the preflight planning phase, the availability of GPS integrity (RAIM) shall be confirmed for the intended flight (route and time).

  B-RNAV flight dispatch shall not be made in the event of a continuous loss of RAIM for more than 5 minutes predicted in any part of the intended flight

  With 23 or more satellites available, the predicted availability of RAIM is valid for 7 days.

  When less than 23 satellites are available, the predicted availability of RAIM shall be confirmed short before each flight.

***"HONEYWELL" KLN 94 GPS* (B-RNAV)**
NAVIGATION SYSTEM INTERFACED WITH
ELECTROMECHANICAL INSTRUMENTS

SYSTEM ANNUNCIATORS / SWITCHES / CONTROLS

"NAV1/GPS1" push-button

This push-button may be used to select data to be displayed on the pilot's HSI ; the NAV data come either from NAV1 navigation receiver or from the GPS1.

When pressed once, the push-button illuminates **"NAV1"** (green), pressed one more time illuminates **"GPS1"** (blue).

"MSG" message annunciator (amber)

CAUTION

"MSG" ANNUNCIATOR MAY BE PERMANENTLY ILLUMINATED IF THERE EXISTS A PERMANENT MESSAGE. WHEN A NEW MESSAGE APPEARS, "MSG" ANNUNCIATOR JUST FLASHES

"MSG" message annunciator will flash to alert the pilot of a situation that requires his attention. Press the **"MSG" push-button** located on the GPS to view the message (Appendix B of "HONEYWELL" KLN 94 Pilot's Guide contains a list of all the messages likely to appear on the "Message" page and their meanings).

"WPT" Waypoint annunciator (amber)

This annunciator flashes approximately 20 seconds before warning "NEXT DTK".

"APR" annunciator is not used.

"TERM" annunciator is not used.

"GPS" mode

When using the "GPS" mode, GPS navigation data (course deviation, TO/FROM) are presented on the HSI.

When crossing a waypoint, the track resetting on the following navigation leg must be hand-performed on the HSI.

Autopilot coupled operation

The GPS may be coupled with the autopilot via the HSI, which receives the information relative to the navigation source (VOR1 or GPS) selected by the "NAV1/GPS1" push-button.

When AP is engaged on the mode controller, the autopilot is then coupled with the HSI and uses displayed information (track and course deviation).

Autopilot with flight director

Engaging the "NAV" mode on the autopilot mode controller will activate the FD on the ADI. The FD uses selected course and left/right steering information displayed on the HSI.

GPS use in Terminal area

The CDI full scale must be set by hand to ± 1 Nm.

"HONEYWELL" KLN 94 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED WITH
ELECTROMECHANICAL INSTRUMENTS

SECTION 5

PERFORMANCE

The installation and the operation of the "HONEYWELL" KLN 94 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS do not change the basic performance of the airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6

WEIGHT AND BALANCE

Information hereafter supplement the one given for the standard airplane in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in (m)
	34 - NAVIGATION			
A	GPS (B-RNAV) KLN 94 interfaced with electromechanical instruments (OPT10 34391A)	HONEYWELL	6.952 (2.700)	25.98 (0.66)

SECTION 7

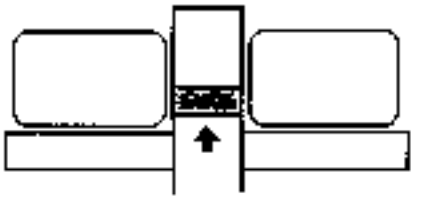
DESCRIPTION

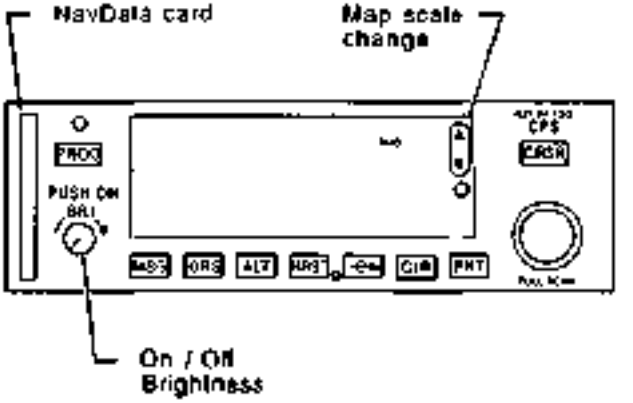
Normal operating procedures of the "HONEYWELL" KLN 94 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS are described in the "HONEYWELL" KLN 94 Pilot's Guide at the latest revision.

GPS system consists of :

- one KLN 94 GPS - see Figure 9.48.2 :
  This GPS may be a navigation source for the autopilot. Course deviation information is then displayed on the HSI.
- one repeater/control unit integrated to the advisory panel - see Figure 9.48.3 :
  This instrument allows to select the navigation source for the autopilot (NAV1 or GPS1). It is used also to duplicate the MSG, WPT warnings and to recopy GPS TERM and APR data.

"HONEYWELL" KLN 94 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED WITH
ELECTROMECHANICAL INSTRUMENTS





MSG - Message viewing

OBS - OBS/Leg mode selection

ALT - Altitude functions

NRST - Nearest VOR, NDB, Airports, interceptions, User defined waypoints

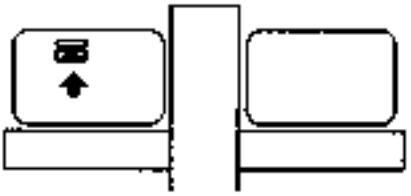
"Direct TO"

PROC - Procedure

CLR - Clear

ENT - Enter

Figure 9.48.2 - "HONEYWELL" KLN 94 GPS SYSTEM



GPS 1
APPROVED FOR B-RNAV
SIDSTAR AND APPROACH MODE PROHIBITED

NAV1	MSG	TERM
GPS1	WPT	APR

NAV1
GPS1

- NAV1/GPS1 push-button

Annunciators :

- NAV1 : NAV1 navigation source
- GPS1 : GPS1 navigation source
- MSG, WPT : Repeater of GPS, MSG, WPT warnings
- TERM, APR : Repeater of TERM, APR data (not used)

Figure 9.48.3 - Repeater/control unit and GPS placard

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SUPPLEMENT

"HONEYWELL" KMD 550 MULTI-FUNCTION DISPLAY

TABLE OF CONTENTS

SECTION 1

GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB aircraft is equipped with the option "HONEYWELL" KMD 550 MULTI-FUNCTION DISPLAY".

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "HONEYWELL" KMD 550 MULTI-FUNCTION DISPLAY".

The KMD 550 is a multi-function display screen which allows to display topographical type information (rivers, roads, ...), aeronautical type information (VOR, Airport, NDB, ...), as well as information issued from a WX 500 stormscope and/or the active flight plan issued from a GPS.

Aeronautical items of information are stored in a data card. This data base is updated every 28 days by replacing the data card.

SECTION 2

LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "HONEYWELL" KMD 550 MULTI-FUNCTION DISPLAY".

KMD 550/850 Multi-function Display Pilot's Guide, P/N 006-18222-0000, Revision 0 dated Oct/2000 or any applicable following edition, shall be readily available to the pilot.

The KMD 550 may be used only as an aid to navigation, if :

- navigation is based on other approved instruments,
- the KMD 550 data base is current and compatible with the flight,
- KMD 550 and associated GPS data bases cover the same geographical areas.

CAUTION

KMD 550 TOPOGRAPHICAL DATA MUST NOT BE USED FOR TERRAIN AND/OR OBSTACLES AVOIDANCE

SECTION 3

EMERGENCY PROCEDURES

Installation and operation of the "HONEYWELL" KMD 550 multi-function display do not change the emergency procedures described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

SECTION 4

NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard aircraft described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "'HONEYWELL" KMD 550 MULTI-FUNCTION DISPLAY".

KMD normal operating procedures recommended by the manufacturer are outlined in the KMD 550/850 Multi-function Display Pilot's Guide. P/N 006-18222-0000, Revision 0 dated Oct/2000 or any applicable following edition.

CAUTION

DISPLAY ON STORMSCOPE PAGE IS ALWAYS SET IN "TRACK UP".

DISPLAY ON "MAP" PAGE IS SET EITHER IN "NORTH UP" OR IN "TRACK UP".

WHEN DISPLAY ON "MAP" PAGE IS SET IN "NORTH UP", THE PILOT MUST BEWARE OF THE INTERPRETATION OF DISPLAYED DATA DURING THE SWITCHING FROM A "MAP" DISPLAY TO A "WX" DISPLAY

SECTION 5

PERFORMANCE

Installation and operation of the "HONEYWELL" KMD 550 multi-function display do not change the performance of the TB aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6

WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in. (m)
	34 - NAVIGATION			
A	Multi-function display KMD 550 (OPT10 34304A)	HONEYWELL	6.614 (3.00)	21.65 (0.55)

SECTION 7

DESCRIPTION

1 - Brightness control
2 - Data card
3 - LCD display
4 - Available function
5 - ON/OFF control
6 - Selected function indicators
7 - Function select keys
8 - Control knobs (inner and outer)
9 - Power key labels
10 - Soft labels
11 - Joystick
12 - Power keys
13 - Fault indicator

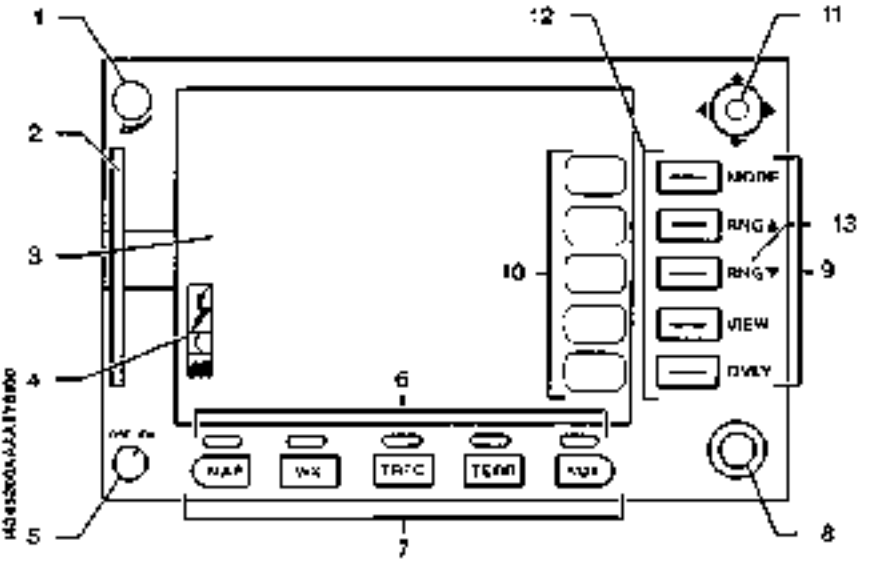

Figure 9.49.1 - KMD 550 Multi-function display (front view)

SUPPLEMENT

"SHADIN" MICROFLO-L™ DIGITAL FUEL MANAGEMENT SYSTEM

TABLE OF CONTENTS

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SECTION 1

GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation of the TB airplane equipped with the option "'SHADIN" MICROFLO-L™ DIGITAL FUEL MANAGEMENT SYSTEM".

The Digital Fuel Management System displays fuel flow, fuel on board, fuel used, endurance and fuel necessary to reach a navigation point.

The system can be connected to GPS receivers (KLN 94, GNS 430, ...) to transmit the fuel management data.

SECTION 2

LIMITATIONS

Installation and operation of the "'SHADIN" MICROFLO-L™ DIGITAL FUEL MANAGEMENT SYSTEM" do not change the limitations of the TB airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook

The Digital Fuel Management System shall not be used as a substitute to either the fuel gages or the analog fuel flowmeter.

THE DIGITAL FUEL FLOW TOTALIZER SHALL SERVE AS SUBSTITUTE TO NEITHER THE FUEL GAGES, NOR THE ANALOG FUEL FLOWMETER. THE LATTER INSTRUMENTS SHALL ALWAYS BE CONSULTED IN PRIORITY FOR FLIGHT OPERATION.

Figure 9.50.1 - Fuel management system placard

SECTION 3

EMERGENCY PROCEDURES

Installation and operation of the "SHADIN" MICROFLO-L™ DIGITAL FUEL MANAGEMENT SYSTEM" do not change the emergency procedures of the TB airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook.

SECTION 4

NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "SHADIN" MICROFLO-L™ DIGITAL FUEL MANAGEMENT SYSTEM".

Normal operating procedures of the "SHADIN" MICROFLO-L™ digital fuel management system recommended by the manufacturer are outlined in the "MICROFLO-L™ digital Fuel Management System Operating Manual", P/N OP 91204-39B, at the latest revision or any applicable following edition.

BEFORE STARTING ENGINE

Fuel flowmeter/totalizer ONBD fuel recorded

SECTION 5

PERFORMANCE

Installation and operation of the "SHADIN" MICROFLO-L™ DIGITAL FUEL MANAGEMENT SYSTEM do not change the performance of the TB airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6
WEIGHT AND BALANCE

Information hereafter supplement those given for the standard airplane in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or D	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in. (m)
	73 - FUEL SYSTEM AND CONTROLS			
A	Digital fuel management system MICROFLO-L™ (OPT10 73001A) (TB 20)	SHADIN	1.157 (0.525)	33.46 (0.850)
A	Digital fuel management system MICROFLO-L™ (OPT10 73001B) (TB 21)	SHADIN	1.157 (0.525)	33.46 (0.850)
A	Digital fuel management system MICROFLO-L™ (OPT10 73001C) (TB 200)	SHADIN	1.157 (0.525)	33.46 (0.850)

SECTION 7

DESCRIPTION

The digital fuel management system indicator is installed at the lower part of the R.H. instrument panel. It helps the pilot to manage fuel during the flight.

The fuel flow is continuously displayed on L.H. side of the screen.

All data selected by the pilot ("Fuel to dest.", "Endurance", "Nm Gal", "F. at dest.", etc...) are displayed on R.H. side of the screen.

7.1 - Fuel tanks full

Move the "ADD/FULL" toggle switch to the FULL position and hold.

Press the "ENTER/TEST" button

Release the "ADD/FULL" toggle switch so it returns to the center position.

To verify, move the "USED/REM" toggle switch to the REM position. Total usable fuel will be displayed.

7.2 - Partial fuel added

Add the amount of fuel from the refueling meter to the amount of fuel remaining. Enter the total using the following steps :

1 - Move "USED/REM" toggle switch to REM position and hold.

2 - Press and hold "ENTER/TEST" button to increment fuel remaining until figure to be entered is reached ; then release button.

3 - Release the "USED/REM" toggle switch. The displayed figure is entered into memory as fuel remaining on the board.

4 - If the required figure is exceeded, follow the procedure in this Supplement, chapter 7.3 "Correcting fuel on board entry error".

7.3 - Correcting fuel on board entry error

In case an error has been made by exceeding the correct amount in entering the number of total usable fuel, move the "USED/REM" toggle switch to the USED position and simultaneously press and hold "ENTER/TEST" button. Fuel used will be reset and the fuel remaining figure will appear and pause in the display window for four (4) seconds. The figure will decrement (the longer you press, the faster the decrementing). When the correct figure is reached, release both the "USED/REM" toggle switch and the "ENTER/TEST" button. To avoid repeating the four-second pause before decrementing, hold the "USED/REM" toggle switch in the USED position and use the "ENTER/TEST" button to control the decrementing.

1) Brightness control
2) Auto-test
3) Selection of data to be displayed on R.H. side of the screen

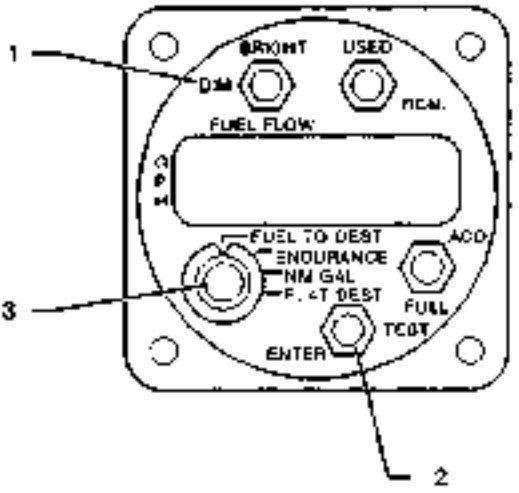

Figure 9.50.2 - MICROFLO-L™ digital fuel management system

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SUPPLEMENT

"GARMIN" GNS 430 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS (GPS # 1 : B-RNAV / GPS # 2 : IFR)

TABLE OF CONTENTS

"GARMIN" GNS 430 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED WITH
ELECTROMECHANICAL INSTRUMENTS

SECTION 1

GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB airplane is equipped with the option "'GARMIN' GNS 430 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS (GPS # 1 : B-RNAV / GPS # 2 : IFR)".

Approved utilization types :

(a) GPS # 1, Interfaced with HSI (Option OPT10 23-006A)

- IFR in continental and Terminal Enroute areas as additional source,
- B-RNAV,
- Non precision approaches (GPS, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV)

(b) GPS # 2, Interfaced with CDI (Option OPT10 23-004A) (if installed)

- IFR in continental and Terminal Enroute areas as additional source.

Conformity means :

- ACJ 20X4 and ACJ 20X5
- AC 20-138.

The generalities hereafter supplement those of the standard airplane described in Section 1 'General' of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "'GARMIN' GNS 430 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS (GPS # 1 B-RNAV / GPS # 2 IFR)".

This supplement does not constitute an operational utilization authorization

The GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means using information provided by satellites (the GNS 430 system is able to track up to 12 satellites at a time). It also uses data recorded in a data base. The data base is housed in a Navdata card to be inserted in the front face and is updated every 28 days by replacing the card.

Each data base contains information about airports, communication frequencies, VORs, NDBs, Intersections, SIDs, STARs, instrument approaches, flight service stations ...

There is also room for up to 1000 user defined waypoints and 20 different flight plans.

"GARMIN" GNS 430 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED WITH
ELECTROMECHANICAL INSTRUMENTS

SECTION 2

LIMITATIONS

2.1 - General

The limitations hereafter supplement those of the standard airplane described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "GARMIN" GNS 430 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS (GPS # 1 B-RNAV / GPS # 2 IFR)".

"GARMIN" GNS 430 Pilot's Guide, P/N 190-00140-00 Revision A dated 12/98 or any applicable following edition, shall be readily available to the pilot each time the GPS navigation system is used.

The system must utilize the following software versions or more recent ones :

Subsystem	Software
MAIN	2.22
GPS	2.10

Data base updating must be verified before each flight.

The navigation sources required for the anticipated flight shall be serviceable and allow an immediate crossed check on available ground aids or shall allow to return to primary navigation sources in case of GPS navigation loss.

Use of GPS as a navigation source is **PROHIBITED**, unless the pilot verifies the currency of the data base and the coordinates of each selected waypoint.

Procedures during flight preparation

During flight preparation, the pilot must get information about GPS constellation, via aeronautical data (consultation of GPS NOTAM).

When less than 24 satellites are available (or less than 29 if equipment uses pressure altitude information), the pilot must make sure that RAIM function is available on the projected route and for the flight period in B-RNAV areas.

RAIM function prediction can be done using prediction software integrated into GNS 430 or any other approved software such as the one provided for the users by EUROCONTROL on INTERNET.

If a loss of RAIM function is predicted on the chosen route for a period of more than 5 minutes, the flight cannot be done. In that case, the flight will either be postponed or another route will be chosen. The prediction software must then be used again.

Preflight procedures

During preflight checks, it is necessary to verify data base validity (updating of the last AIRAC cycle).

The onboard equipment must be initialized in compliance with manufacturer procedures (refer to "GARMIN GNS 430 Pilot's Guide").

In case a pre-programmed or an already stored flight plan is used, an accurate check of the waypoints is also required.

General in-flight procedures

Before entering a B-RNAV area, the pilot must make sure that RAIM function is available.

Flight plan activation, WPT and LEG changes as well as any modification of initialization data must be done in compliance with equipment User's Manual.

For every navigation into areas reserved for B-RNAV, the pilot must be provided with a predicted availability of RAIM on the route if the constellation disposes of less than 29 satellites.

The check of navigation system information consistency must be regularly performed during the flight :

- when reaching each waypoint or before reaching the position report point of the ATC.
- before leaving a published route and then every 15 minutes during this type of operation (function "Direct To").

"GARMIN" GNS 430 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED WITH
ELECTROMECHANICAL INSTRUMENTS

The check of position information consistency may be performed by comparing this position with the one determined by the primary radionavigation sources.

2.2 - SID/STAR

The use of SIDs and STARs stored in GPS data base is only authorized, if the pilot has checked that GPS procedure corresponds to the one given in the official documentation (coordinates of various points and paths between points).

2.3 - Instrument approach (Non precision approach)

2.3.1 - GPS # 1

CAUTION

KAP 150 AUTOPILOT (if installed) COUPLED OPERATION IS PROHIBITED

Use of the GPS to perform an instrument approach is possible, as long as this use is approved by the air navigation local authority for the approach in question.

Instrument approaches performed with the GPS must be achieved according to approved approach procedures given in the GPS data base. The data base must be kept up to date and base data accuracy checked with regard to the official documentation, preferably before the flight.

(a) Instrument approaches must be performed in GPS approach mode and the RAIM must be available at the final approach fix (FAF).

(b) Precision approaches (ILS, LOC, LOC-BC, MLS ...) must not be performed with the GPS.

(c) If a landing is required on a diversion field, an other means than GPS must be available to perform approach to this field. Required on board equipment must be serviceable and ground aids must be operational.

Instrument approaches can only be performed, as long as used point coordinates are referenced with regard to WGS 84 system or an equivalent system.

2.3.2 - GPS # 2

Use of the GPS approach mode is **PROHIBITED**

GPS 2
APPROACH MODE PROHIBITED

Figure 9.51.1 - GPS # 2 (if installed) limitation placard

SECTION 3

EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "GARMIN" GNS 430 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS (GPS # 1 : B-RNAV / GPS # 2 : IFR)".

3.1 - GPS # 1, interfaced with HSI (Option OPT10 23-006A)

HSI NAV FLAG OR "INTEG" WARNING
Return to VOR or ADF navigation source and to remaining operational navigation equipment. 'NAV1/GPS1' push-button NAV1

"MSG" ANNUNCIATOR ILLUMINATION
In navigation with GPS associated to the warning : "MSG" push-button of associated GPS ..... **PRESS** Check the message *NOTE :* *A single "stand-alone" GPS certified as B-RNAV navigation means is required to fly in B-RNAV areas.*

"MSG" ANNUNCIATOR ILLUMINATION (Cont'd)

In case of loss of RAIM function, *the navigation information remains available but its integrity is no longer controlled.*

- If RAIM loss occurs out of B-RNAV area, the aircraft must not enter B-RNAV area.
- If RAIM loss occurs in B-RNAV area, GPS navigation can be continued as long as cross checkings done with conventional means (VOR, DME, NDB and dead reckoning elements) enable making sure that B-RNAV accuracy criteria are observed. When this condition is not met, the Air Traffic Control must be contacted to return to conventional navigation.

If GPS navigation information is lost or declared not valid, use the other available navigation means. If this occurs during instrument approach final phase, a go-around must be made, except if the other approved radio means to perform approach are displayed and available.

3.2 - GPS # 2, interfaced with CDI (Option OPT1023-004A) (if installed)

CDI NAV FLAG OR "INTEG" WARNING

Return to VOR or ADF navigation source and to remaining operational navigation equipment.

"CDI" push-button . . . . . **VLOC**

"MSG" ANNUNCIATOR ILLUMINATION

1 - "MSG" push-button of GPS . . . . . **PRESS**

Check the message.

"RAIM is not available", "Poor GPS Coverage", "Searching the sky" or "RAIM position warning" :

Return to VOR or ADF navigation source and to remaining operational navigation equipment

"CDI" push-button . . . . . **VLOC**

If the message mentions an error of course deviation :

- OBS set to DTK value
  Return to VOR or ADF navigation source and to remaining operational navigation equipment.
  "CDI" push-button . . . . . **VLOC**
- OBS not set to DTK value
  Set the OBS to the value of DTK.

SECTION 4

NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook. when the TB airplane is equipped with the option ""GARMIN" GNS 430 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS (GPS # 1 : B-RNAV / GPS # 2 : IFR)".

Normal operating procedures of the GPS recommended by the manufacturer are outlined in the "GARMIN" GNS 430 Pilot's Guide at the latest revision and Memory Jogger at the latest revision

However, it is important to precise the following points for the GPS use on TB :

SET UP CONDITIONS

- Verify if the data base is current Verify data on the self test page
- Verify that altitude data is valid for the GPS prior to flight.
- In case of B-RNAV use :

  During the preflight planning phase, the availability of GPS integrity (RAIM) shall be confirmed for the intended flight (route and time).

  B-RNAV flight dispatch shall not be made in the event of a continuous loss of RAIM for more than 5 minutes predicted in any part of the intended flight.

  When less than 24 satellites are available (or less than 23 if equipment uses pressure altitude information), the pilot must make sure that RAIM function is available on the projected route and for the flight period in B-RNAV areas.

  When 23 or more satellites are available, the prediction of satellite position is valid for 7 days. Their predicted availability is ensured for 48 hours by EUROCONTROL.

  When less than 23 satellites are available, the predicted availability of RAIM shall be confirmed short before each flight

"GARMIN" GNS 430 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED WITH
ELECTROMECHANICAL INSTRUMENTS

SYSTEM ANNUNCIATORS / SWITCHES / CONTROLS

"NAV1/GPS1" push-button

This push-button may be used to select data to be displayed on the pilot's HSI ; the NAV data come either from NAV1 navigation receiver or from the GPS # 1.

When pressed once, the push-button illuminates **NAV1** (white or green), pressed one more time **illuminates GPS1** (green or blue).

"GPS CRS OBS/GPS CRS LEG" push-button

This push-button may be used to select GPS # 1 navigation mode (LEG or OBS mode).

When pressed once, the push-button illuminates **GPS CRS OBS** (amber). pressed one more time **illuminates GPS CRS LEG** (green).

"MSG" message annunciator (amber)

CAUTION

"MSG" ANNUNCIATOR MAY BE PERMANENTLY ILLUMINATED IF THERE EXISTS A PERMANENT MESSAGE WHEN A NEW MESSAGE APPEARS, "MSG" ANNUNCIATOR JUST FLASHES

This annunciator is associated with the **GPS # 1**

"MSG" message annunciator will flash to alert the pilot of a situation that requires his attention. Press the **"MSG" push-button** located on the GPS # 1 to view the message (Chapter 10 of "GARMIN" GNS 430 Pilot's Guide contains a list of all the messages likely to appear on the "Message" page and their meanings).

"WPT" Waypoint annunciator (amber)

This annunciator is associated with the **GPS # 1**

This annunciator illuminates approximately 10 seconds before "TURN TO XXX" warning.

"APR" annunciator is a duplicate of the GPS # 1 "APR" information

"TERM" annunciator is a duplicate of the GPS # 1 "TERM" information

"GPS" mode of the GPS # 1

When using the "GPS" mode, GPS # 1 navigation data (course deviation, TO/FROM) are presented on the HSI.

"CDI" push-button of GPS # 2 (if installed)

This push-button may be used to select data to be displayed on the CDI ; the NAV data come either from NAV2 navigation receiver or from the GPS # 2.

When pressed once, the push-button illuminates **"VLOC"** (white) on the CDI pressed one more time illuminates **"GPS"** (green) on the CDI

"GPS" mode of the GPS # 2 (if installed)

When using the "GPS" mode, GPS # 2 navigation data (course deviation, TO/FROM) are presented on the CDI.

When crossing a waypoint, the track resetting on the following navigation leg must be hand-performed on the CDI

GPS flight plan

In the active flight plan, addition of a STAR or an approach is always made at the end of the flight plan. In the scope of these additions, the pilot must pay attention not to duplicate points

Coupled operation with KFC 225 autopilot (option OPT10 22-001) (if installed)

GPS # 1 may be coupled with the autopilot via the HSI, which receives the information relative to the navigation source (VOR1 or GPS # 1) selected by the "NAV1/GPS1" push-button.

When crossing a waypoint, the airplane turns automatically, while a "TURN TO" warning appears. This warning disappears during the turn. The pilot must then manually adjust the course indicator on the HSI. Approximately 1 minute later, after the warning disappearing, if the pilot has not adjusted manually the course indicator to the correct heading, a warning remembers him that.

When the AP "NAV" mode is engaged on the mode controller, the autopilot is then coupled with the HSI and uses displayed information (track and course deviation).

Engaging the "NAV" mode on the autopilot mode controller will activate the FD on the ADI. The FD uses selected course and left/right steering information displayed on the HSI.

Coupling with autopilot during a non precision approach must be made in "NAV" mode, except in the following cases :
- holding pattern,
- landing pattern turn,
- interrupted approach,

which have to be made in "HDG" mode.

For memory, the approach particular point name in the GARMIN system are as follows :

- IA = IAF
- FA = FAF ou FAP
- MA = MAP
- MH = MAHP

When the GPS suspends the linked navigator (GPS "SUSP" annunciator), the autopilot continues using heading and "GPS CRS OBS" annunciator (amber) illuminates.

NOTE :
The KFC 225 autopilot has a "Lateral clearance" function ; refer to Section 4 "Normal procedures" of the Supplement "HONEYWELL KFC 225 automatic flight control system" located in Section 9 "Supplements" of this Manual.

Coupled operation with KAP 150 autopilot (option OPT10 G569) (if installed)

CAUTION

KAP 150 AUTOPILOT COUPLED OPERATION IN APPROACH MODE IS PROHIBITED

Only GPS # 1 may be coupled with the autopilot via the HSI, which receives the information relative to the navigation source (VOR1 or GPS # 1) selected by the "NAV1/GPS1" push-button.

When crossing a waypoint, the track resetting on the following navigation leg must be hand-performed on the HSI.

When the AP "NAV" mode is engaged on the mode controller, the autopilot is then coupled with the HSI and uses displayed information (track and course deviation).

REMARK :
The change of steering source for the autopilot when the latter is set to "NAV" side mode, implies a sequence of checks, some of which may be omitted or require a particular attention. Therefore it is strongly recommended to temporarily disengage the autopilot "NAV" mode before changing source.

"GARMIN" GNS 430 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED WITH
ELECTROMECHANICAL INSTRUMENTS

SECTION 5

PERFORMANCE

The installation and the operation of the "GARMIN" GNS 430 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS (GPS # 1 : B-RNAV / GPS # 2 : IFR) do not change the basic performance of the TB airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6

WEIGHT AND BALANCE

Information hereafter supplement the one given for the standard airplane in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in (m)
	23 - COMMUNICATIONS			
A	COM-NAV-GPS # 1 GNS 430 (B-RNAV) interfaced with electromechanical instruments (OPT10 23006A)	GARMIN	8.157 (3.700)	25.59 (0.65)
A	COM-NAV-GPS # 2 GNS 430 interfaced with electromechanical instruments (OPT10 23004A)	GARMIN	9.700 (4.400)	25.20 (0.64)

SECTION 7

DESCRIPTION

Normal operating procedures of the "GARMIN" GNS 430 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS (GPS # 1 : B-RNAV / GPS # 2 : IFR) are described in the "GARMIN" GNS 430 Pilot's Guide at the latest revision.

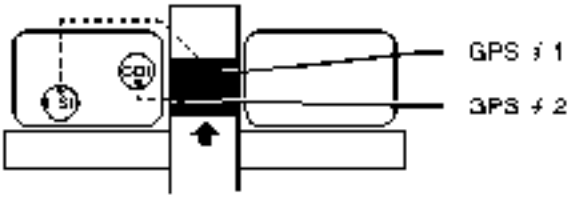
GPS # 1 system consists of :

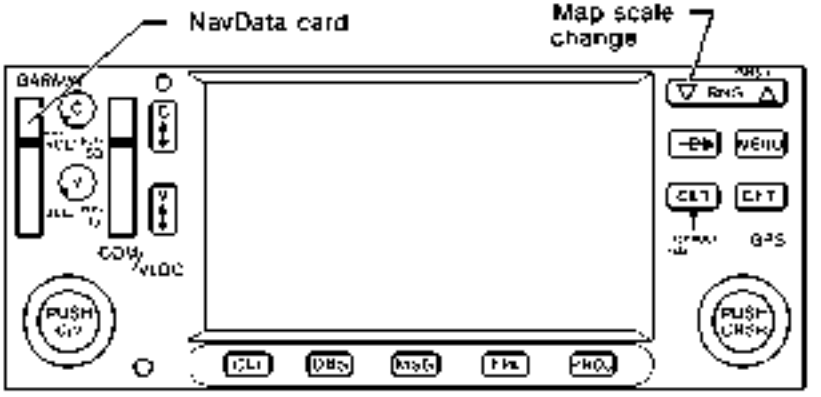
- one "GNS 430" GPS - see Figure 9.51.2
  This GPS may be a navigation source for the autopilot. Course deviation information is then displayed on the HSI.
- one repeater/control unit - see Figure 9.51.3 :
  This instrument allows to select the navigation source for the autopilot (NAV1 or GPS1). It is also used to duplicate the MSG, WPT warnings and to recopy GPS TERM, APR information.

GPS # 2 system (if installed) consists of :

- one "GNS 430" GPS – see Figure 9.51.2 :
  This GPS may be a navigation source for the GI 106A CDI.
- one GI 106A CDI.

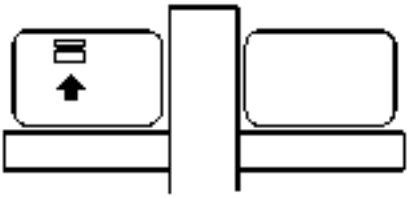
"GARMIN" GNS 430 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED WITH
ELECTROMECHANICAL INSTRUMENTS

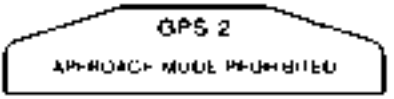




- COM volume
- VOR volume
- Selection of VOR/VHF frequencies
- Selection of group pages
- Group selection
  - NAV
  - WPT
  - AUX
  - NRST
- Navigation source (VLOC/GPS) selection
- OBS/Leg mode selection
- Message viewing
- Create
  - Edit
  - Activate
- Procedures
  - Arrival
  - Departure
  - Approach
- "Direct TO"

Figure 9.51.2 - "GARMIN" GNS 430 GPS SYSTEM





NAV1	MSG	TERM	GPS CRS OBS
GPS1	WPT	APR	GPS CRS LEG

- NAV1/GPS1 push-button

- GPS CRS OBS/GPS CRS LEG push-button

Annunciators

- NAV1 : NAV1 navigation source
- GPS1 : GPS1 navigation source

MSG, WPT : Repeater of GPS MSG, WPT warnings

TERM, APR : Repeater of TERM, APR data

Figure 9.51.3 - Repeater/control unit and GPS placard

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SUPPLEMENT

"HONEYWELL" KLN 94 GPS NAVIGATION SYSTEM - STAND ALONE

TABLE OF CONTENTS

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SECTION 1
GENERAL

Approved utilization type :

- Day VFR in sight of ground or water

Certification rule :

- AC 20-138

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB aircraft is equipped with the option "HONEYWELL" KLN 94 GPS NAVIGATION SYSTEM – STAND ALONE".

The generalities hereafter supplement those of the standard aircraft described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "HONEYWELL" KLN 94 GPS NAVIGATION SYSTEM – STAND ALONE".

The GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means using information provided by satellites (the KLN 94 system is able to track up to 8 satellites at a time). It also uses data recorded in a data base. The data base is housed in a Navdata card to be inserted in the front face and is updated every 28 days by replacing the card.

Each data base contains information about airports, communication frequencies, VORs, NDBs, intersections, flight service stations ...

There is also room for up to 500 user defined waypoints and 25 different flight plans.

The KLN 94 GPS receives altitude code from the encoding altimeter.

SECTION 2

LIMITATIONS

The limitations hereafter supplement those of the standard aircraft described in Section 2 "Limitations" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "HONEYWELL" KLN 94 GPS NAVIGATION SYSTEM - STAND ALONE".

Data base updating must be verified before each flight.

NOTE :
The KLN 94 genuine data base is referenced to WGS 84 geodetic datum.

GPS USED ONLY FOR NAVIGATION IN DAY VFR IN SIGHT OF GROUND OR WATER

Figure 9.52.1 - GPS limitation placard

"HONEYWELL" KLN 94 Pilot's Guide, P/N 006-18207-000 Revision 0 dated 09/00 or any applicable following edition, shall be readily available to the pilot whenever the operation of the GPS navigation system is predicted.

The system must utilize the ORS 02 software version or a more recent one.

SECTION 3

EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard aircraft described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "HONEYWELL" KLN 94 GPS NAVIGATION SYSTEM - STAND ALONE".

"MSG" ANNUNCIATOR ILLUMINATION

"MSG" push-button of GPS ..... **PRESS**

Check the message.

"Bad Satellite Geometry", Nav Super Flag Failure", "RAIM position error", "RAIM not available", "Searching the sky" or "No GPS Receiver Data" :

Return to VOR or ADF navigation source and to remaining operational navigation equipment.

When the system integrity is restored, the return to GPS mode must be accompanied by the validation of the followed and desired track concordance by using primary sources of navigation.

SECTION 4

NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard aircraft described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB aircraft is equipped with the option "HONEYWELL" KLN 94 GPS NAVIGATION SYSTEM - STAND ALONE".

Normal operating procedures of the GPS recommended by the manufacturer are outlined in the "HONEYWELL" KLN 94 Pilot's Guide at the latest revision and Memory Jogger at the latest revision.

However, it is important to precise the following points for the GPS use on TB :

SET UP CONDITIONS

- Verify if the data base is current. Verify data on the self test page
- Verify that altitude data is valid for the GPS prior to flight.

SYSTEM ANNUNCIATORS

"MSG" message annunciator (amber)

CAUTION

"MSG" ANNUNCIATOR MAY BE PERMANENTLY ILLUMINATED IF THERE EXISTS A PERMANENT MESSAGE. WHEN A NEW MESSAGE APPEARS, "MSG" ANNUNCIATOR JUST FLASHES.

"MSG" message annunciator will flash to alert the pilot of a situation that requires his attention. Press the **"MSG" push-button** located on the GPS to view the message (Appendix B of "HONEYWELL" KLN 94 Pilot's Guide contains a list of all the messages likely to appear on the "Message" page and their meanings).

"WPT" Waypoint annunciator (amber)

This annunciator flashes approximately 20 seconds before warning "NEXT DTK".

SECTION 5

PERFORMANCE

Installation and operation of the "HONEYWELL" KLN 94 GPS NAVIGATION SYSTEM – STAND ALONE do not change the performance of the TB aircraft described in Section 5 "Performance" of the basic Pilot's Operating Handbook.

SECTION 6

WEIGHT AND BALANCE

Information hereafter supplement those given for the standard aircraft in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT	EQUIPMENT SUPPLIER	WEIGHT per unit lb (kg)	ARM in. (m)
	34 – NAVIGATION			
A	GPS KLN 94 Stand alone (OPT 19 34306A)	HONEYWELL	4.850 (2.200)	28.74 (0.73)

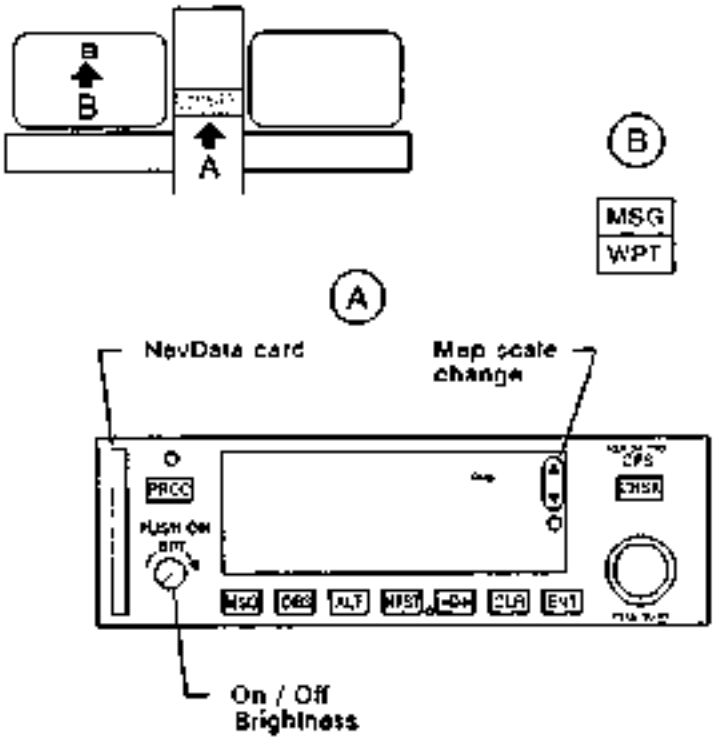
SECTION 7

DESCRIPTION

Normal operating procedures of the "HONEYWELL" KLN 94 GPS NAVIGATION SYSTEM - STAND ALONE are described in the "HONEYWELL" KLN 94 Pilot's Guide at the latest revision.

The option includes :

- one KLN 94 GPS installed in radio rack - see Figure 9.52.2.
- one "MSG/WPT" repeater on advisory panel.



MSG · Message viewing

OBS · OBS/Leg mode selection

ALT · Altitude functions

NRST · Nearest VOR, NDB, Airports, interceptions, User defined waypoints

-D+ "Direct TO"

PROC · Procedure

CLR · Clear

ENT · Enter

Figure 9.52.2 - "HONEYWELL" KLN 94 GPS SYSTEM

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SUPPLEMENT

"GARMIN" GNS 530 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL INSTRUMENTS (GPS # 1 : B-RNAV)

TABLE OF CONTENTS

"GARMIN" GNS 530 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED
WITH ELECTROMECHANICAL HSI

SECTION 1

GENERAL

This supplement is intended to inform the pilot about the equipment limitations, description and operations necessary to the operation when the TB airplane is equipped with the option "'GARMIN' GNS 530 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL HSI (GPS # 1 : B-RNAV)".

Approved utilization types :

- IFR in continental and Terminal Enroute areas as additional source.
- B-RNAV,
- Non precision approaches (GPS, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV)

Conformity means :

- AC J 20X4 and AC J 20X5
- AC 20-138.

The generalities hereafter supplement those of the standard airplane described in Section 1 "General" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "'GARMIN' GNS 530 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL HSI (GPS # 1 : B-RNAV)".

This supplement does not constitute an operational utilization authorization.

The GPS is an automatic tridimensional (latitude, longitude, altitude) location and navigation means using information provided by satellites (the GNS 530 system is able to track up to 12 satellites at a time). It also uses data recorded in a data base. The data base is housed in a Navdata card to be inserted in the front face and is updated every 28 days by replacing the card.

Each data base contains information about airports, communication frequencies, VORs, NDBs, intersections, SIDs, STARs, instrument approaches, flight service stations .

There is also room for up to 1000 user defined waypoints and 20 different flight plans.

SECTION 2

LIMITATIONS

2.1 - General

The limitations hereafter supplement those of the standard airplane described in Section 2 'Limitations' of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "GARMIN" GNS 530 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL HSI (GPS # 1 : B-RNAV)"

"GARMIN" GNS 530 Pilot's Guide, P/N 190-00181-00 Revision A dated 04/00 or any applicable following edition, shall be readily available to the pilot each time the GPS navigation system is used.

The system must utilize the following software versions or more recent ones :

Subsystem	Software
MAIN	2.08
GPS	2.10

Data base updating must be verified before each flight.

The navigation sources required for the anticipated flight shall be serviceable and allow an immediate crossed check on available ground aids or shall allow to return to primary navigation sources in case of GPS navigation loss.

Use of GPS as a navigation source is **PROHIBITED**, unless the pilot verifies the currency of the data base and the coordinates of each selected waypoint.

"GARMIN" GNS 530 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED
WITH ***ELECTROMECHANICAL HSI***

Procedures during flight preparation

During flight preparation, the pilot must: get information about GPS constellation, via aeronautical data (consultation of GPS NOTAM).

When less than 24 satellites are available (or less than 23 if equipment uses pressure altitude information), the pilot must make sure that RAIM function is available on the projected route and for the flight period in B-RNAV areas.

RAIM function prediction can be done using prediction software integrated into GNS 530 or any other approved software such as the one provided for the users by EUROCONTROL on INTERNET.

If a loss of RAIM function is predicted on the chosen route for a period of more than 5 minutes, the flight cannot be done. In that case, the flight will either be postponed or another route will be chosen. The prediction software must then be used again.

Preflight procedures

During preflight checks, it is necessary to verify data base validity (updating of the last AIRAC cycle).

The onboard equipment must be initialized in compliance with manufacturer procedures (refer to "GARMIN GNS 530 Pilot's Guide").

In case a pre-programmed or an already stored flight plan is used, an accurate check of the waypoints is also required.

General in-flight procedures

Before entering a B-RNAV area, the pilot must make sure that RAIM function is available.

Flight plan activation, WPT and LEG changes as well as any modification of initialization data must be done in compliance with equipment User's Manual.

For every navigation into areas reserved for B-RNAV, the pilot must be provided with a predicted availability of RAIM on the route, if the constellation disposes of less than 23 satellites.

The check of navigation system information consistency must be regularly performed during the flight :

- when reaching each waypoint or before reaching the position report point of the ATC,
- before leaving a published route and then every 15 minutes during this type of operation (function "Direct To").

The check of position information consistency may be performed by comparing this position with the one determined by the primary radionavigation sources.

2.2 - SID/STAR

The use of SIDs and STARs stored in GPS data base is only authorized, if the pilot has checked that GPS procedure corresponds to the one given in the official documentation (coordinates of various points and paths between points).

2.3 - Instrument approach (Non precision approach)

CAUTION

KAP 150 AUTOPILOT (if installed) COUPLED OPERATION IS PROHIBITED

Use of the GPS to perform an instrument approach is possible, as long as this use is approved by the air navigation local authority for the approach in question.

Instrument approaches performed with the GPS must be achieved according to approved approach procedures given in the GPS data base. The data base must be kept up to date and base data accuracy checked with regard to the official documentation, preferably before the flight.

(a) Instrument approaches must be performed in GPS approach mode and the RAIM must be available at the final approach fix (FAF).

(b) Precision approaches (ILS, LOC, LOC-BC, MLS ...) must not be performed with the GPS.

(c) If a landing is required on a diversion field, an other means than GPS must be available to perform approach to this field. Required on board equipment must be serviceable and ground aics must be operational.

Instrument approaches can only be performed, as long as used point coordinates are referenced with regard to WGS 84 system or an equivalent system.

SECTION 3

EMERGENCY PROCEDURES

The emergency procedures hereafter supplement those of the standard airplane described in Section 3 "Emergency procedures" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option "GARMIN" GNS 530 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL HSI (GPS # 1 : B-RNAV)".

HSI NAV FLAG OR "INTEG" WARNING

Return to VOR or ADF navigation source and to remaining operational navigation equipment

'NAV1/GPS1' push-button **NAV1**

"MSG" ANNUNCIATOR ILLUMINATION

In navigation with GPS associated to the warning :

"MSG" push-button of associated GPS . . . . . **PRESS**

Check the message.

NOTE :
A single "stand-alone" GPS certified as B-RNAV navigation means is required to fly in B-RNAV areas.

"MSG" ANNUNCIATOR ILLUMINATION (Cont'd)

In case of loss of RAIM function, *the navigation information remains available but its integrity is no longer controlled.*

- If RAIM loss occurs out of B-RNAV area, the aircraft must not enter B-RNAV area.
- If RAIM loss occurs in B-RNAV area, GPS navigation can be continued as long as cross checkings done with conventional means (VOR, DME, NDB and dead reckoning elements) enable making sure that B-RNAV accuracy criteria are observed. When this condition is not met, the Air Traffic Control must be contacted to return to conventional navigation.

If GPS navigation information is lost or declared not valid, use the other available navigation means. If this occurs during instrument approach final phase, a go-around must be made, except if the other approved radio means to perform approach are displayed and available.

"GARMIN" GNS 530 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED
WITH *ELECTROMECHANICAL HSI*

SECTION 4

NORMAL PROCEDURES

The normal procedures hereafter supplement those of the standard airplane described in Section 4 "Normal procedures" of the basic Pilot's Operating Handbook, when the TB airplane is equipped with the option ""GARMIN" GNS 530 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL HSI (GPS # 1 : B-RNAV)".

Normal operating procedures of the GPS recommended by the manufacturer are outlined in the "GARMIN" GNS 530 Pilot's Guide at the latest revision and Memory Jogger at the latest revision.

However, it is important to precise the following points for the GPS use on TB :

SET UP CONDITIONS

- Verify if the data base is current. Verify data on the self test page.
- Verify that altitude data is valid for the GPS prior to flight.
- In case of B-RNAV use :

  During the preflight planning phase, the availability of GPS integrity (RAIM) shall be confirmed for the intended flight (route and time).

  B-RNAV flight dispatch shall not be made in the event of a continuous loss of RAIM for more than 5 minutes predicted in any part of the intended flight.

  When less than 24 satellites are available (or less than 23 if equipment uses pressure altitude information), the pilot must make sure that RAIM function is available on the projected route and for the flight period in B-RNAV areas.

  When 23 or more satellites are available, the prediction of satellite position is valid for 7 days. Their predicted availability is ensured for 48 hours by EUROCONTROL.

  When less than 23 satellites are available, the predicted availability of RAIM shall be confirmed short before each flight.

SYSTEM ANNUNCIATORS / SWITCHES / CONTROLS

"NAV1/GPS1" push-button

This push-button may be used to select data to be displayed on the pilot's HSI : the NAV data come either from NAV1 navigation receiver or from the GPS # 1.

When pressed once, the push-button illuminates **NAV1** (white). pressed one more time illuminates **GPS1** (green).

"GPS CRS OBS/GPS CRS LEG" push-button

This push-button may be used to select GPS navigation mode (LEG or OBS mode).

When pressed once, the push-button illuminates **GPS CRS OBS** (amber). pressed one more time illuminates **GPS CRS LEG** (green).

"MSG" message annunciator (amber)

CAUTION

"MSG" ANNUNCIATOR MAY BE PERMANENTLY ILLUMINATED IF THERE EXISTS A PERMANENT MESSAGE. WHEN A NEW MESSAGE APPEARS, "MSG" ANNUNCIATOR JUST FLASHES

This annunciator is associated with the **GPS # 1.**

"MSG" message annunciator will flash to alert the pilot of a situation that requires his attention. Press the **"MSG" push-button** located on the GPS # 1 to view the message (Chapter 12 of "GARMIN" GNS 530 Pilot's Guide contains a list of all the messages likely to appear on the "Message" page and their meanings).

"WPT" Waypoint annunciator (amber)

This annunciator is associated with the **GPS # 1.**

This annunciator illuminates approximately 10 seconds before "TURN TO XXX" warning.

"APR" annunciator is a duplicate of the GPS # 1 "APR" information

"TERM" annunciator is a duplicate of the GPS # 1 "TERM" information

"GPS" mode of the GPS # 1

When using the "GPS" mode, GPS # 1 navigation data (course deviation, TO/FROM) are presented on the HSI.

"GARMIN" GNS 530 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED
WITH *ELECTROMECHANICAL HSI*

GPS flight plan

In the active flight plan, addition of a STAR or an approach is always made at the end of the flight plan. In the scope of these additions, the pilot must pay attention not to duplicate points.

KFC 225 autopilot (if installed) coupled operation (option OPT1022-001)

GPS # 1 may be coupled with the autopilot via the HSI, which receives the information relative to the navigation source (VOR1 or GPS # 1) selected by the "NAV1/GPS1" push-button.

When crossing a waypoint, the airplane turns automatically, while a "TURN TO" warning appears. This warning disappears during the turn. The pilot must then manually adjust the course indicator on the HSI. Approximately 1 minute later, after the warning disappearing, if the pilot has not adjusted manually the course indicator to the correct heading, a warning remembers him that.

When the AP "NAV" mode is engaged on the mode controller, the autopilot is then coupled with the HSI and uses displayed information (track and course deviation).

Engaging the "NAV" mode on the autopilot mode controller will activate the FD on the ADI. The FD uses selected course and left/right steering information displayed on the HSI.

Coupling with autopilot during a non precision approach must be made in "NAV" mode, except in the following cases :
- holding pattern,
- landing pattern turn,
- interrupted approach,

which have to be made in "HDG" mode.

For memory, the approach particular point name in the GARMIN system is as follows :

- IA = IAF
- FA = FAF ou FAP
- MA = MAP
- MH = MAHP

When the GPS suspends the linked navigation (GPS "SUSP" annunciator), the autopilot continues using heading and "GPS CRS OBS" annunciator (amber) illuminates.

NOTE :
The KFC 225 autopilot has a "Lateral clearance" function : refer to Section 4 "Normal procedures" of the Supplement "HONEYWELL KFC 225 automatic flight control system" located in Section 9 "Supplements" of this Manual.

"GARMIN" GNS 530 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED
WITH *ELECTROMECHANICAL HSI*

Coupled operation with KAP 150 autopilot (option OPT10 G669) (if installed)

CAUTION

KAP 150 AUTOPILOT COUPLED OPERATION IN APPROACH MODE IS PROHIBITED

Only GPS # 1 may be coupled with the autopilot via the HSI, which receives the information relative to the navigation source (VOR1 or GPS # 1) selected by the "NAV1/GPS1" push-button.

When crossing a waypoint, the track resetting on the following navigation leg must be hand-performed on the HSI.

When the AP "NAV" mode is engaged on the mode controller, the autopilot is then coupled with the HSI and uses displayed information (track and course deviation).

REMARK :
The change of steering source for the autopilot, when the latter is set to "NAV" side mode, implies a sequence of checks, some of which may be omitted or require a particular attention. Therefore it is strongly recommended to temporarily disengage the autopilot "NAV" mode before changing source.

SECTION 5

PERFORMANCE

The installation and the operation of the "GARMIN" GNS 530 GPS (B-RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL HSI (GPS # 1 : B-RNAV) do not change the basic performance of the TB airplane described in Section 5 "Performance" of the basic Pilot's Operating Handbook..

SECTION 6

WEIGHT AND BALANCE

Information hereafter supplement the one given for the standard airplane in Section 6 "Weight and balance" of the basic Pilot's Operating Handbook.

A or O	OPTIONAL EQUIPMENT		EQUIPMENT SUPPLIER	WEIGHT per Unit lb (kg)	ARM in. (m)
	23 - COMMUNICATIONS				
A	COM-NAV-GPS # 1 (B-RNAV) interfaced with electromechanical HSI (OPT1023007A)	GNS 530	GARMIN	10.141 (4.630)	23.23 (0.59)

"GARMIN" GNS 530 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED
WITH ***ELECTROMECHANICAL HSI***

SECTION 7

DESCRIPTION

Normal operating procedures of the "GARMIN" GNS 530 GPS (B–RNAV) NAVIGATION SYSTEM INTERFACED WITH ELECTROMECHANICAL HSI (GPS # 1 : B-RNAV) are described in the "GARMIN" GNS 530 Pilot's Guide at the latest revision.

GPS # 1 system consists of :

- one "GNS 530" GPS - see Figure 9.53.1
  This GPS may be a navigation source for the autopilot. Course deviation information is then displayed on the HSI
- one repeater/control unit – see Figure 9.53.2 :
  This instrument allows to select the navigation source for the autopilot (NAV1 or GPS1) and GPS navigation mode (OBS or LEG). It is also used to duplicate the MSG, WPT warnings and to recopy GPS TERM, APR information.

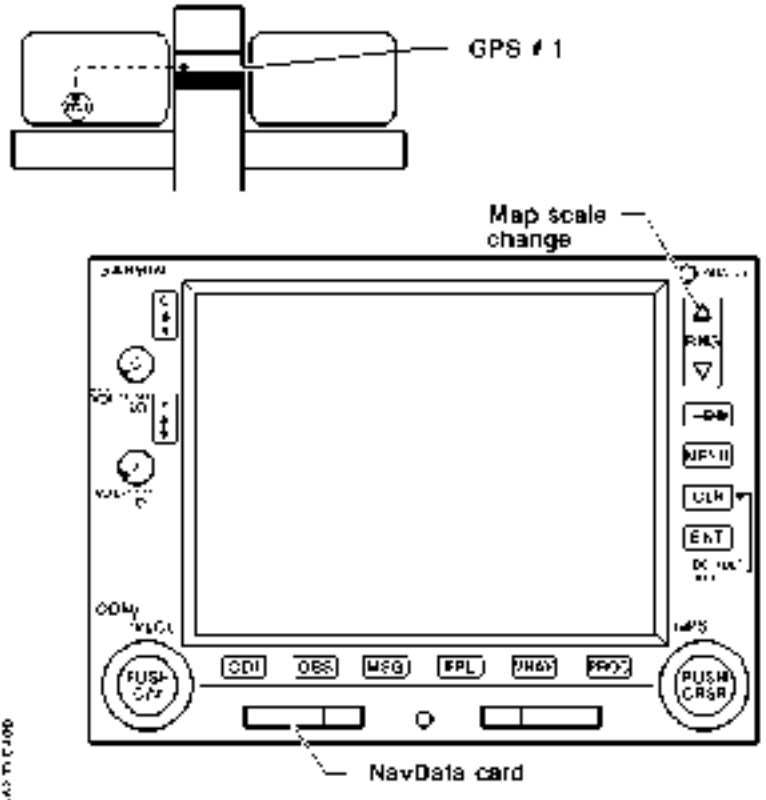
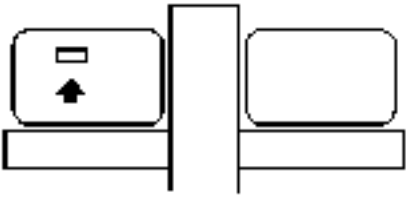
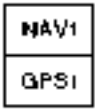


Figure 9.53.1 - "GARMIN" GNS 530 GPS SYSTEM

"GARMIN" GNS 530 GPS (B-RNAV)
NAVIGATION SYSTEM INTERFACED
WITH ***ELECTROMECHANICAL HSI***



NAV1	MSG	TERM	GPS CRS OBS
GPS1	WPT	APR	GPS CRS LEG



NAV1/GPS1 push button

GPS CRS OBS/GPS CRS LEG push button

Annunciators :

NAV1 NAV1 navigation source

GPS1 GPS1 navigation source

MSG, WPT . Repeater of GPS, MSG, WPT warnings

TERM, APR Repeater of TERM, APR data

Figure 9.53.2 - Repeater/control unit and GPS placard

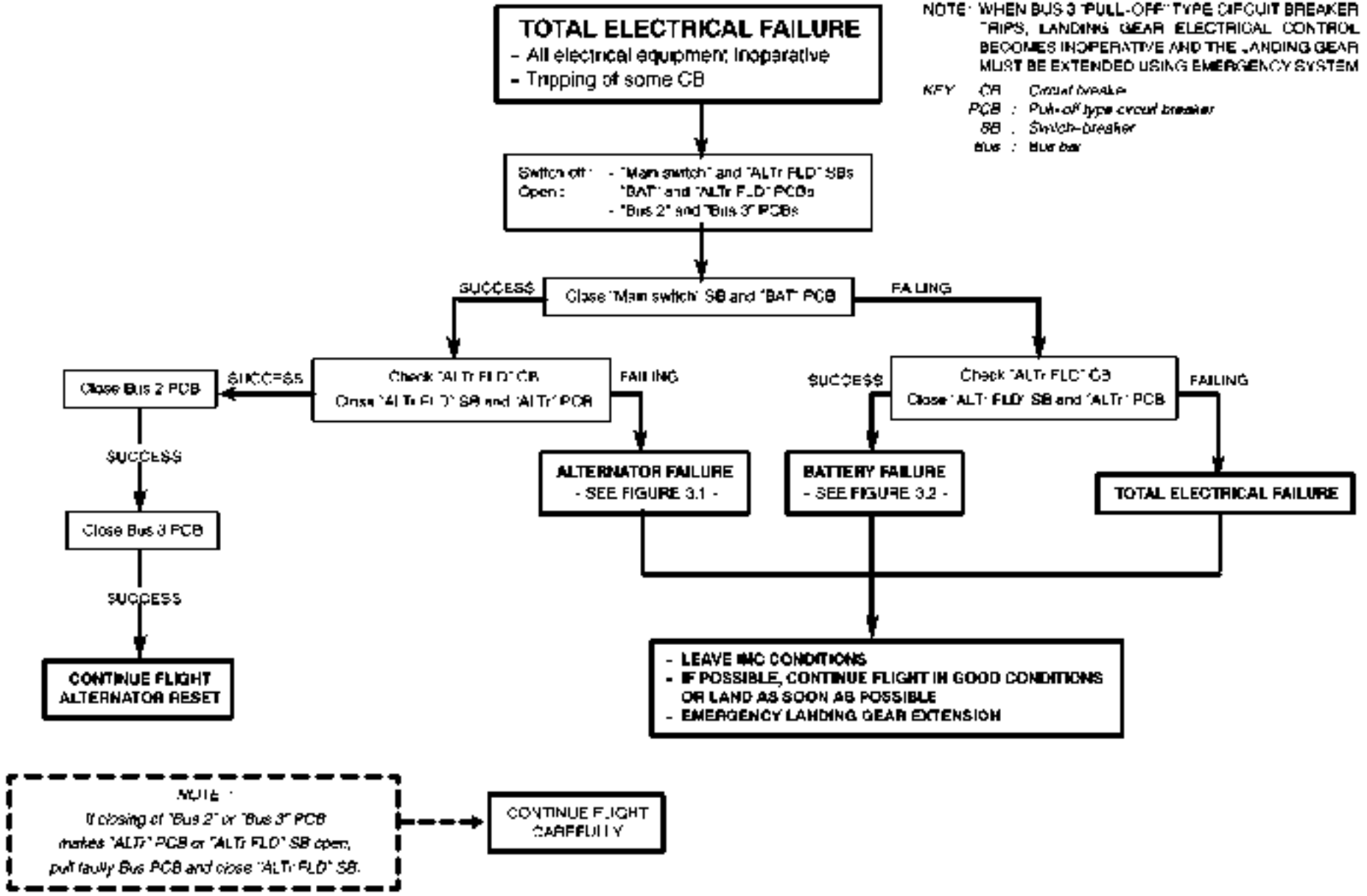


Figure 3.3 - TOTAL ELECTRICAL FAILURE DIAGRAM

AIRSPEED INDICATING SYSTEM FAILURE

In case of erroneous indications in flight .

Pitot heating (if installed)	ON
Alternate static source (if installed)	PULL

In case of alternate static source utilization, open air outlets and/or actuate cabin air selector flow lever to open position. Then, airspeed indicator and altimeter errors are not significant.

For IAS and pressure altitude, see altimeter and airspeed indicator correction tables in "Performance" Section.

If erroneous indications persist, carry out a precautionary approach maintaining an adequate airspeed margin above stall warning activation speed.

Recommended parameters :

Propeller	FULL FORWARD
Manifold pressure	AS REQUIRED (Approach : 17 in Hg)

LANDING WITHOUT FLAPS (Flaps locked, retracted)

"FLAPS" circuit breaker	OPEN
Flaps control	ACTUATED

If the procedure is not successfull, perform the same operations as for a normal landing and maintain a 90 KIAS approach speed.

Plan a landing distance increased by approximately 60 %.

SAMPLE WEIGHT AND BALANCE RECORD

CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT AND BALANCE

AIRPLANE MODEL			SERIAL NUMBER						PAGE NUMBER	
DATE	ITEM No		DESCRIPTION OF EQUIPEMENT OR MODIFICATION	WEIGHT CHANGE						RUNNING BASIC EMPTYWEIGHT	
				ADDED (+)			REMOVED (-)				
	IN	OUT		WEIGHT lb	ARM in	MOMENT lb.in/1000	WEIGHT lb	ARM in	MOMENT lb.in/1000	WEIGHT lb	MOMENT lb.in/1000
			As delivered								

Figure 6.2 - SAMPLE WEIGHT AND BALANCE RECORD

	SAMPLE AIRPLANE			YOUR AIRPLANE			Ref on chart Figure 6-6
	Weight lb	Lever arm in	Moment lb.in / 1000	Weight lb	Lever arm in	Moment lb.in / 1000	
Empty weight	1666		70.64				A(1)
Pilot (Without Opt. 0800)	170	45.38	7.71				A(2)
Pilot (With Opt. 0800)	/	47.44	/				
Front passenger (Without Opt. 0800)	170	45.38	7.71				
Front passenger (With Opt. 0800)	/	47.44	/				
Rear seat passengers	340	80.00	27.20				B(1)
Fuel (66 U.S Gal.)	397	42.70	16.95				B(2)
Baggage	110	102.54	11.20				
TOTAL WEIGHT AND MOMENT	3053		141.50				M

Figure 6.3 - SAMPLE LOADING