DIAMOND AIRCRAFT INDUSTRIES

FLIGHT MANUAL

DA 20
KATANA

Category of Airworthiness	: UTILITY
Applicable Airworthiness Requirements	: AWM Chapter 523-VLA
Serial No.	:
Registration	:
Date of Issue	: July 28, 1994
Document No.	: DA202

This manual must be carried in the aircraft at all times! Scope and revision status can be found in the List of Effective Pages and in the Record of Revisions.

The pages identified as "DOT-appr." in the List of Effective Pages are approved by:

Signature	K.J. Mansfield
Authority	K.J. Mansfield Chief, Flight Test for Director, Airworthiness Transport Canada
Date of approval	28 July 1994

This airplane is to be operated in compliance with the information and limitations contained herein.

CHAPTER 1

GENERAL

1.1. INTRODUCTION

The Airplane Flight Manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of this airplane.

This Manual includes the material required by JAR-VLA and Transport Canada Airworthiness Manual (AWM) Chapter 523-VLA. It also contains supplemental data supplied by the airplane manufacturer which can be useful to the pilot.

The Flight Manual conforms to a standard equipped DA 20 KATANA. Any optional equipment installed on request of the customer (COMM, NAV, etc.) is not considered.

For the operation of optional equipment the Operation Manual of the respective vendor must be used.

For permissible accessories refer to the equipment list, Section 6.5.

1.2. CERTIFICATION BASIS

The DA 20 has been approved by Transport Canada in accordance with the Canadian Airworthiness Manual (AWM) Chapter 523-VLA. The Type Certificate No. A-191 has been issued on July 29th, 1994.

Category of Airworthiness: UTILITY

Noise Certification Basis: a) Canadian Airworthiness Manual Chapter 516

b) FAA Part 36

1.3. WARNINGS, CAUTIONS, AND NOTES

The following definitions apply to warnings, cautions, and notes used in the Flight Manual:

WARNING

means that the non-observation of the corresponding procedure leads to an immediate or important degradation of the flight safety.

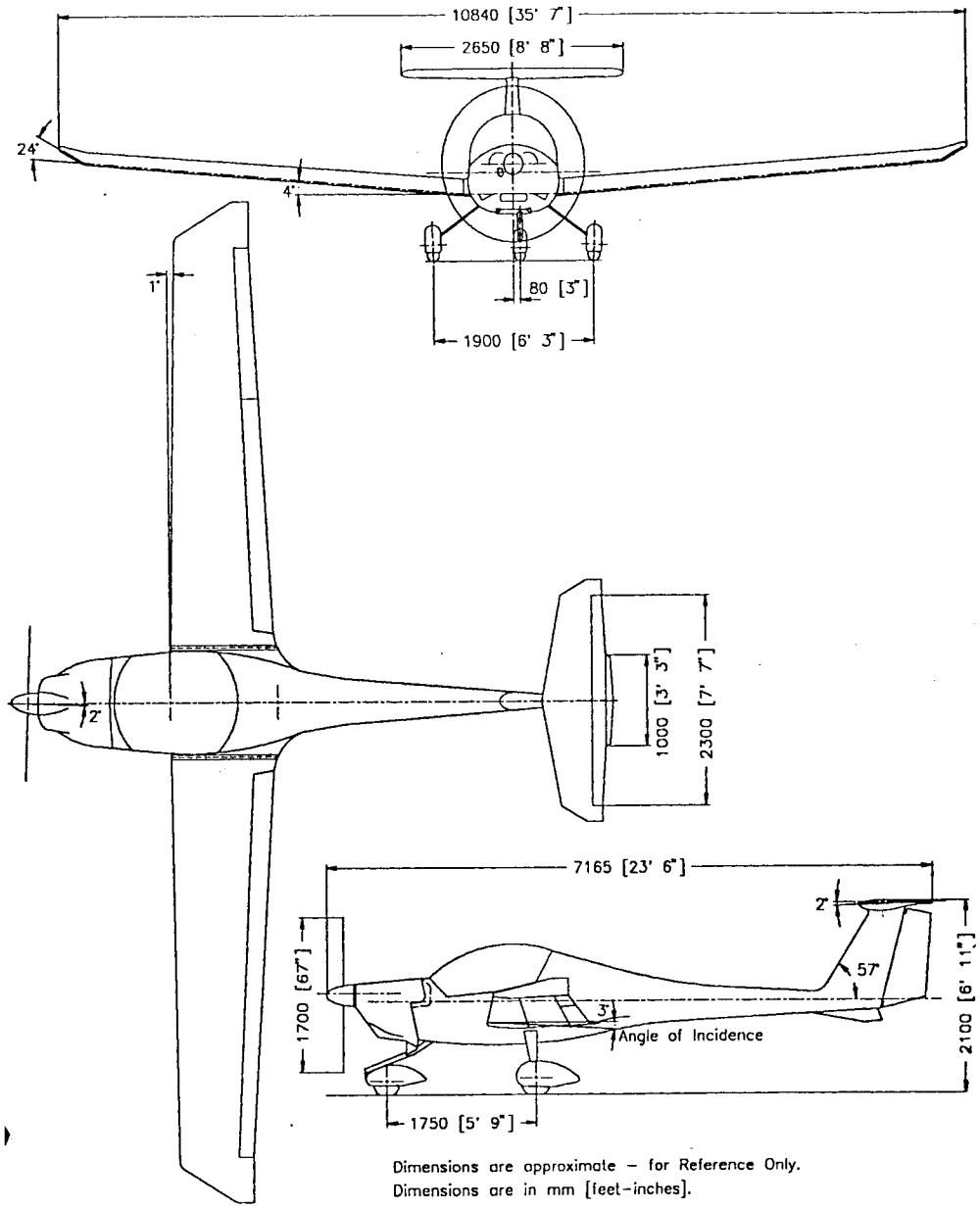
CAUTION

means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation of flight safety.

NOTE

draws the attention to any special item not directly related to safety but which is important or unusual.

1.4. THREE-VIEW-DRAWING OF AIRPLANE



Dimensions are approximate – for Reference Only.
Dimensions are in mm [feet-inches].

1.5. DIMENSIONS

1.5.1 Overall Dimensions

Span:	35 ft 6.7 in (10.84 m)
Length:	23 ft 6.0 in (7.17 m)
Height:	6 ft 11.0 in (2.11m)

1.5.2 Wing

Airfoil:	Wortmann FX 63-137/20 HOAC
Wing Area:	125 sq.ft. (11.6 m^2)
Mean Aerodynamic Chord (MAC):	3 ft 6.9 in (1.09 m)
Aspect Ratio:	10.0
Dihedral:	+4° nominal
Sweep of Leading Edge:	+1° nominal

1.5.3 Horizontal Stabilizer

Angle of Incidence :	-2.5° ±0.5°
Span:	8 ft 8 in (2.65 m)

1.5.4 Landing Gear

Track:		6 ft 2.8 in (1.90 m)	
Wheel Base:		5 ft 8.9 in (1.75 m)	
Tire Size:	Nose:	4.00-4 (TOST)	(S/N 10001 - 10050)
		5.00-4 (GOODYEAR)	(S/N 10051 and subsequent)
	Main:*	15 x 6.00-5 (GOODYEAR) or	
		5.00 x 5, 6 Ply (TSO C62)	
Tire Pressure:	Nose:	26 psi (1.8 bar)	
	Main:	33 psi (2.3 bar)	

* Main tires must be same brand, model and size.

1.6. ENGINE

Rotax 912, 4 Cylinder, 4 Stroke-Engine, horizontally opposed, liquid cooled cylinder heads, air-cooled cylinders.

Propeller drive via integrated reduction gear.

Reduction Ratio:	2.2727 : 1
Displacement:	73.9 cu.in. (1.211 liters)
Output Power:	80 hp (59.6 kW)
at	2550 RPM

1.7. PROPELLER

Two-bladed variable pitch propeller, manufactured by HOFFMANN,	model HO-V352F/170FQ
Constant speed, hydraulic pitch control	
Range of Pitch Angle:	10° - 35°
Diameter:	5 ft 6.9 in (1.70 m)

1.8. FUEL

Approved Fuel Grades:	AVGAS 100LL
Total Fuel Capacity:	20.1 US gal. (76 liters)
Usable Fuel:	19.5 US gal. (74 liters)
Unusable Fuel:	0.6 US gal. (2 liters)

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1.10. WEIGHT

Maximum Take-off Weight	: 1609 lbs (730 kg)
Maximum Landing Weight	: 1609 lbs (730 kg)
Empty Weight	: See Chapter 6
Maximum Weight in Baggage Compartment	: 44 lbs (20 kg) only if restraining devices available

Wing Loading

At Maximum Take-off Weight	: 12.86 lbs/sq.ft. (62.80 kg/m^2)
Performance Load at Max. Take-off Weight	: 20.1 lbs/hp (12.24 kg/kW)

2.4. POWER PLANT LIMITATIONS

2.4.1. Engine

(a) Engine Manufacturer : Bombardier Rotax, Gunskirchen/Austria

(b) Engine Type Designation : 912 A3 (up to aircraft S/N 10092, inclusive)

: 912 F3 (aircraft S/N 10093 and subsequent)

NOTE

The propeller is driven by the engine via a reduction gear with a ratio of 2.2727:1. The RPM indicator indicates the propeller speed. For that reason, all speed references within this manual - contrary to the engine manual - are propeller speeds.

(c) Engine Operating Limitations

Max. T/O Power (5 min.)	: 80 hp / 59.6 kW
Max. Permissible T/O RPM	: 2550 RPM
Max. Continuous Power	: 78 hp / 58 kW
Max. Permissible Continuous RPM	: 2420 RPM

(d) Oil Pressure

Minimum	: 22 psi (1.5 bar)
Maximum	: 73 psi (5.0 bar)
Max. in case of Cold-start (short-term)	: 102 psi (7.0 bar)

(e) Fuel Pressure

Minimum	: 2 psi (0.15 bar)
Maximum	: 6 psi (0.40 bar)

(f) Oil Temperature

Minimum	: 122°F (50°C)
Maximum	: 284°F (140°C)

(g) Cylinder Head Temperature

Maximum : 302°F (150°C)

(h) Fuel Specifications

Approved Fuel Grades : AVGAS 100LL

(i) Oil Grades : Name-Brand Automotive Oil

(also see Page 1-6)

2.4.2. Propeller

(a) Propeller Manufacturer : Hoffmann Propeller, Rosenheim/Germany

(b) Propeller Type : HO-V352F/170FQ

(c) Propeller Diameter : 5 ft 6.9 in (1.70 m)

(d) Propeller Pitch (at 3/4 radius) : 10° - 35°

(e) Propeller Speed Limitations

Max. T/O RPM (max. 5 min.)	: 2550 RPM
Max. Continuous RPM	: 2420 RPM

2.5. POWERPLANT INSTRUMENT MARKINGS

Powerplant instrument markings and their color code significance are shown below:

Instrument	Red Line = Lower Limit	Green Arc = Normal Operating Range	Yellow Arc = Caution Range	Red Line = Upper Limit
Tachometer	-	950 - 2420 RPM	2420 - 2550 RPM	2550 RPM
Oil Temperature Indicator	122° F 50° C	122- 284° F 50 - 140° C	-	284° F 140° C
Cylinder Head Temperature Indicator	-	-	-	302° F 150° C
Oil Pressure Indicator	22 psi 1.5 bar	22 - 73 psi 1.5 - 5 bar	73 - 102 psi 5 - 7 bar	102 psi 7 bar

2.6. MISCELLANEOUS INSTRUMENT MARKINGS

Instrument	Red Line = Lower Limit	Green Arc = Normal Operating Range	Yellow Arc = Caution Range	Red Line = Upper Limit
Voltmeter	8-11 Volts	12.5 - 16 Volts	11 - 12.5 Volts	16.1 Volts

2.7. WEIGHT

Maximum permissible weight : 1609 lbs (730 kg)

Maximum permissible weight in the baggage compartment : 44 lbs (20 kg) only permissible with baggage harness

WARNING

Exceeding the weight limitations may lead to overloading of the airplane, as well as degrading of the handling characteristics and flight performance.

2.8. CENTER OF GRAVITY

The reference datum (RD) for the center of gravity (CG) calculation is tangent to the leading edge of the wing at the root rib. This plane is vertical when the fuselage is horizontal. Procedures for horizontal alignment, as well as particulars with regard to the empty weight center of gravity, refer to Chapter 6.

Most forward CG (all weights) : 9.84 in (250 mm) aft of RD

Most rearward CG (all weights) : 15.35 in (390 mm) aft of RD

WARNING

Exceeding the center of gravity limitations reduces the maneuverability and stability of the airplane.

The procedure used to determine the center of gravity is described in Chapter 6.

2.9. APPROVED MANEUVERS

This airplane is certified in the UTILITY Category in accordance with JAR-VLA.

Permissible Utility Category Maneuvers:

a) All normal flight maneuvers

b) Stalls (except dynamic stalls)

c) Lazy Eight's Entry speed: 116 kts (215 km/h)

Chandelles: Entry speed: 116 kts (215 km/h)

Steep turns in which the angle of bank does not exceed 60°

d) Spinning (with Wing Flaps UP)

NOTE

Aerobatics are prohibited.

2.10. MANEUVERING LOAD FACTORS

Table of structural maximum permissible load factors:

	at v_A:	at v_{NE}:	with fully extended flaps
Positive	+ 4.4	+ 4.4	+ 2.0
Negative	- 2.2	- 2.2	0

WARNING

Exceeding the maximum load factors will result in overstressing of the airplane. Simultaneous full deflection of more than one control surface can result in overstressing of the structure, even at speeds below the maneuvering speed.

2.11. MAXIMUM PASSENGER SEATING

Maximum Passenger Seating: one passenger.

2.12. FLIGHT CREW

Minimum Flight Crew: one pilot,

aircraft to be flown solo from left seat only

2.13. KINDS OF OPERATION

Flights are permissible in accordance with visual flight rules.

Note: Aircraft S/N 10002 through 10020 are limited to day VFR operation only, unless Service Bulletin 95-01 has been complied with.

Minimum Equipment, Flight and Navigation Instruments:

- Airspeed Indicator
- Altimeter
- Magnetic Compass
- Turn and Bank Indicator (not mandatory for Day-VFR only)
- Instrument Panel and Map Lighting (not mandatory for Day-VFR only)

Minimum Equipment, Powerplant Instruments:

- Fuel Quantity Indicator
- Oil Pressure Indicator
- Oil Temperature Indicator
- Manifold Pressure Indicator
- Cylinder Head Temperature Indicator
- Tachometer
- Fuel Pressure Warning Light
- Voltmeter
- Ammeter
- Generator Warning Light

Note: Additional equipment may be required for compliance with specific operational or specific national requirements. It is the operators responsibility to ensure compliance with any such specific equipment requirements.

2.14. FUEL

Fuel Capacity

Total Fuel Quantity:	: 20.1 US gal. (76 liters)
Usable Fuel:	: 19.5 US gal. (74 liters)
Unusable Fuel:	: 0.6 US gal. (2 liters)

2.15. PLACARDS

The following placards must be installed:

1. On the instrument panel next to airspeed indicator

Note: Ensure correct applicability of placard, depending on national limitations.

Effective for aircraft S/N 10002 through 10020, unless Service Bulletin 95-01 has been complied with

> This airplane is classified as a very light airplane approved for day VFR only, in non-icing conditions. All aerobatic maneuvres, except for intentional spinning which is permitted with flaps UP only, are prohibited. See Flight Manual for other limitations.

Effective for aircraft S/N 10021 and subsequent and aircraft S/N 10002 through 10020 if Service Bulletin 95-01 has been complied with

> This airplane is classified as a very light airplane approved for VFR only, in non-icing conditions. All aerobatic maneuvres, except for intentional spinning which is permitted with flaps UP only, are prohibited. See Flight Manual for other limitations.

Effective for all aircaft operated strictly under JAR-VLA regulations

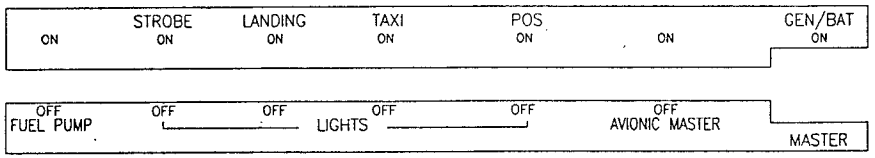
> This airplane is classified as a very light airplane approved for day VFR only, in non-icing conditions. All aerobatic maneuvres, including intentional spinning, are prohibited. See Flight Manual for other limitations.

2. On the instrument panel under the airspeed

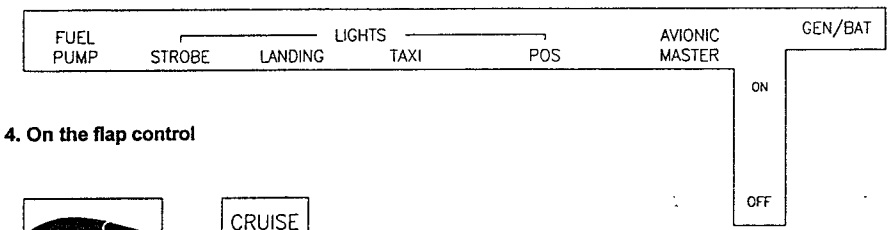
> Moneuvering speed V_A = 104kts

3. Next to the switches

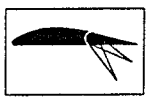
Effective for aircraft S/N 10002 through 10020



Effective for aircraft S/N 10021and subsequent, or aircraft S/N 10002 through 10020, if Service Bulletin 95-01 has been complied with.



4. On the flap control



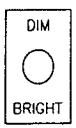
> Flaps

CRUISE
T/O
LDG

5. On the dimming switch for trim display, flap control and GPS (if installed)

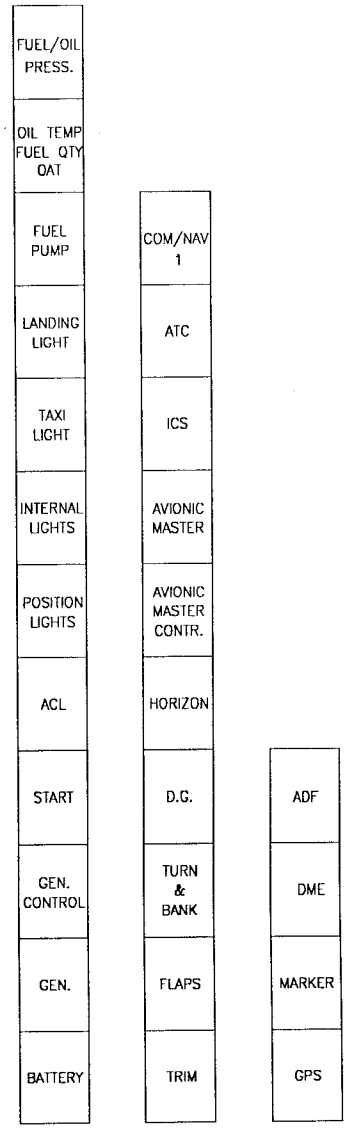
6. Next to dimming potentiometer for cabin and fuel shut-off valve light

Effective aircraft S/N 10021 and subsequent, and aircraft S/N 10002 through 10020 if Service Bulettin 95-01 has been complied with



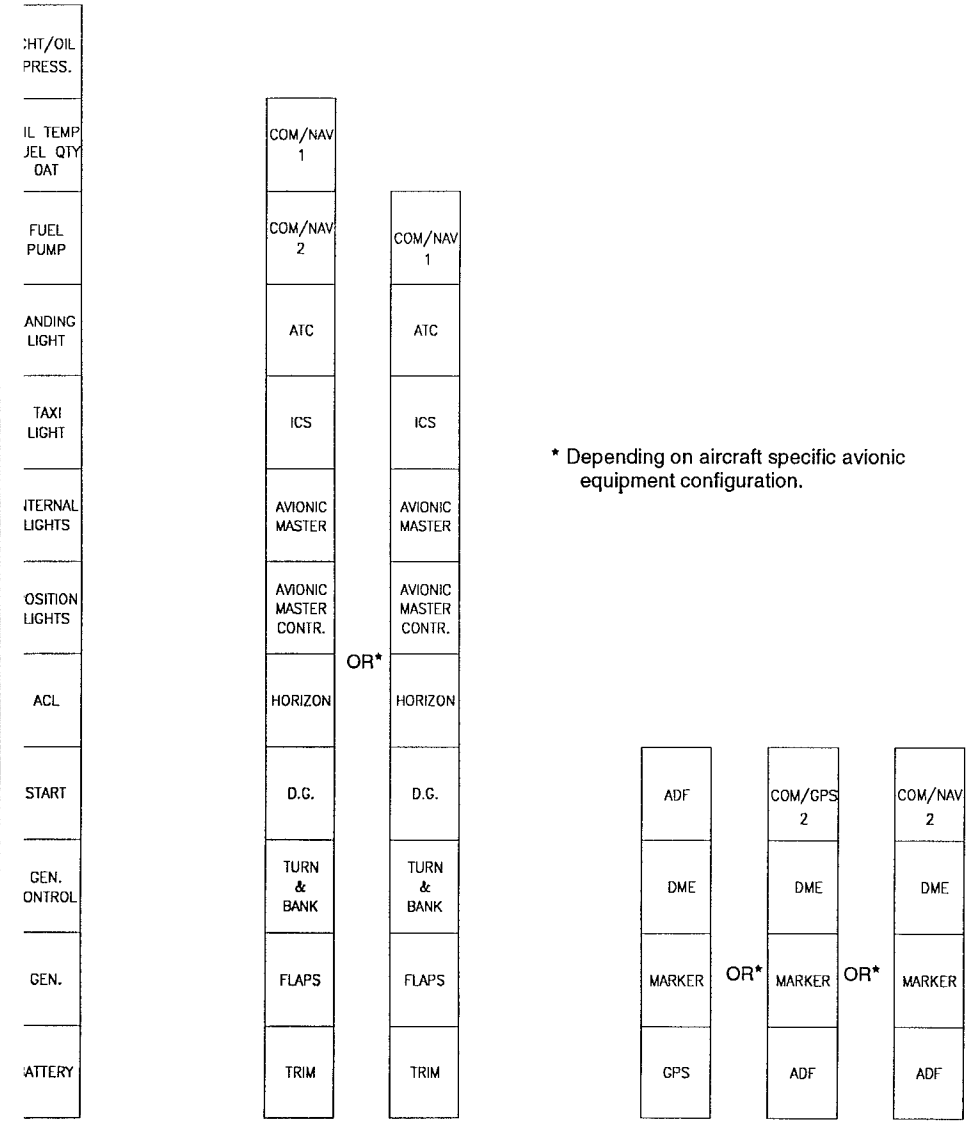
'. On the instrument panel next to the individual circuit breakers

Effective for aircraft S/N 10002 through 10020, unless Service Bulletin 95-01 has been complied with



On the instrument panel next to the individual circuit breakers

Effective for aircraft S/N 10021and subsequent and aircraft S/N 10002 through 10020 if Service Bulletin 95-01 has been complied with



* Depending on aircraft specific avionic equipment configuration.

8. On top of the instrument panel under the compass

FOR	N	30	60	E	120	150
STEER	357	28	60	90	117	145
FOR	S	210	240	W	300	330
STEER	176	210	241	271	299	32
DATE						Airpath

9. Around Trim Display on top of the instrument panel

TRIM
NOSE UP
NEUTRAL
NOSE DOWN

10. On top the instrument panel within pilot's direct line of vision

No smoking!

11. On DME channeling switch on the RH side of the radio stack (optional)

DME CH
NAV 1
NAV 2

12. Above RH air vent on the instrument panel (optional)

FAN
OFF

13. Above the OAT indicator

O.A.T.

14. Below Microphone jack on the LH of the instrument panel

Mic

15. On the fuel quantity gauge

Usable
74L/19.5 US gal.

16. Next to GPS (if installed)

GPS limited for VFR only

17. Under the instrument panel next to the individual knobs

CABIN HEAT
Pull–ON

CHOKE
Pull–ON

CARB HEAT
Pull–ON

PARKING BRAKE
Pull

18. On the centre consol between throttle and propeller levers

THROTTLE PROP
FULL IDLE
HIGH LOW
RPM

19. On the side of the throttle quadrant next to tension adjustment knob

THROTTLE TENSION

20. Next to trim switch on the centre console

NOSE DOWN
TRIM
NOSE UP

21. Next to instrument and map light switches on the centre console

Effective for aircraft S/N 10021and subsequent (and S/N 10002 through 10020 if Service Bulletin 95-01 has been complied with)

INSTRUMENT LIGHT
MAP LIGHT
ON
OFF

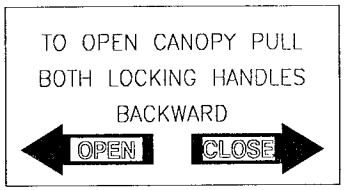
22. Next to fuel shut-off valve in correct position

Fuel Valve
CLOSED

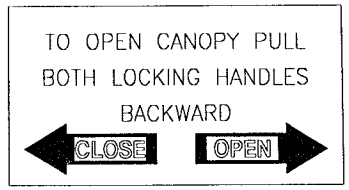
Fuel Valve
OPEN

23. Next to canopy release handles

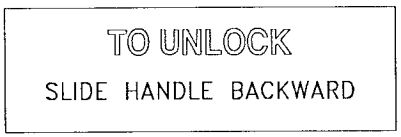
Inside Left (partially coloured red)



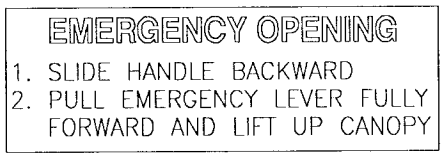
Inside Right (partially coloured red)



Outside Left

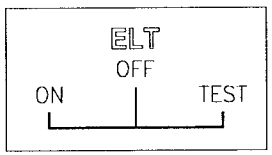


Outside Right

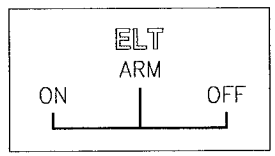


24. Next to ELT (if installed) to indicate switch position

for EBC 102A ELT model

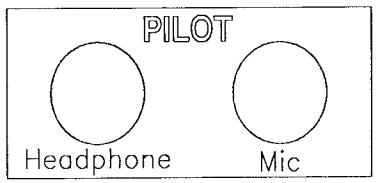


for EBC 502 ELT model

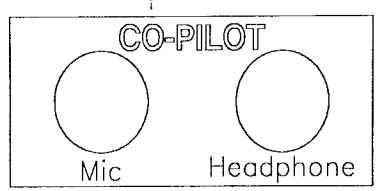


25. Next to Headset Jacks on the Back Rest

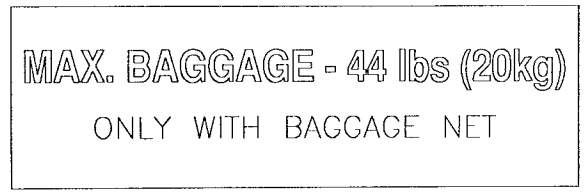
Pilot side (LH)



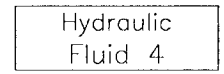
Co-pilot side (RH)



26. On the LH side of baggage compartment

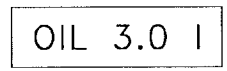


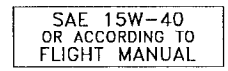
27. On the brake fluid reservoires (rudder pedals)



28. On inside of oil filler door (coloured red)

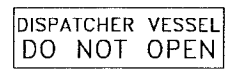
29. On oil filler cap



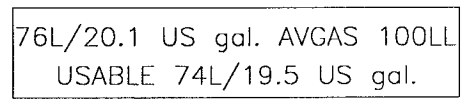


30. On coolant equalizing reservoir

31. On coolant dispatcher vessel



32. Next to fuel filler cap



CHAPTER 3

EMERGENCY PROCEDURES

3.1. INTRODUCTION

The following chapter contains check-lists as well as descriptions of the recommended procedures in case of an emergency. However, engine failure or other airplane related emergency situations will most likely never occur if the mandatory pre-flight check and maintenance are performed properly.

In the event that an emergency situation does appear, the procedures presented in this manual should be used to rectify such problems. Since it is impossible to present in the Flight Manual all emergency situations which may occur, knowledge of the airplane and experience of the pilot are essential in rectifying such problems.

3.2. AIRSPEEDS DURING EMERGENCY PROCEDURES

	v_{IAS} kts	v_{IAS} mph	v_{IAS} km/h
Engine failure after take-off with flaps in T/O position	60	68	110
Manoeuvring Speed	104	120	193
Airspeed for best glide angle			
Wing Flaps in T/O Position 1609 lbs (730 kg)	72	83	133
Wing Flaps in T/O-Position 1322 lbs (600 kg)	66	76	121
Precautionary Landing (with power and Wing Flaps in landing position)	57	66	106
Emergency landing with engine off (Wing Flaps in T/O or LDG position)	57	66	106
Emergency landing with engine off (Wing Flaps UP)	65	75	120

3.3. EMERGENCY PROCEDURES - CHECKLISTS

3.3.1. Engine Failures

(a) Engine Failure during Take-off Run

1.	Throttle	IDLE
2.	Brakes	as required

(b) Engine Failure after Take-Off

I. INSUFFICIENT ENGINE POWER

1.	Airspeed (v_{IAS})	60 kts / 68 mph / 110 km/h
2.	Throttle	FULL
3.	Carburetor Heat	ON
4.	Choke	OFF
5.	Fuel Shut-off Valve	OPEN
6.	Ignition Switch	BOTH
7.	Electric Fuel Pump	ON
8.	Propeller Speed Control Lever	max. RPM

WARNING

If adequate engine performance cannot be restored immediately, prepare for an emergency landing. If possible, land straight ahead, avoiding obstacles.

Shortly before landing:

9.	Fuel Shut-off Valve	CLOSED
10.	Ignition Switch	OFF
11.	Master Switch (Battery)	OFF

II. ENGINE INOPERATIVE

Perform emergency landing according to paragraph 3.3.2.

(c) Engine Failure during Flight

I. ENGINE RUNNING ROUGHLY

1.	Carburetor Heat	ON
2.	Electric Fuel Pump	ON
3.	Ignition Switch	cycle L - BOTH - R - BOTH
4.	Throttle	at present position
5.	No Improvement	reduce throttle to minimum required power, land as soon as possible.

II. LOSS OF OIL PRESSURE

1.	Oil Temperature	check
2.	If Oil Pressure drops below Green Arc but Oil Temperature is normal	land at nearest airfield
	If Oil Pressure drops below Green Arc and Oil Temperature is rising	reduce throttle to minimum required power; land as soon as possible. Be prepared for engine failure and emergency landing

III. LOSS OF FUEL PRESSURE

1.	Electric Fuel Pump	ON, and land at nearest suitable airport
2.	If Fuel Pressure Warning Light does not extinguish	Land at nearest suitable airport. Be prepared for engine failure and emergency landing.

IV. RESTARTING THE ENGINE WITH PROPELLER WINDMILLING

As long as the airspeed (v_{IAS}) is at least 54 kts / 62 mph / 100 km/h, the propeller will continue to windmill.

1.	Airspeed (v_{IAS})	70 kts / 81 mph / 130 km/h
2.	Wing Flaps	T/O Position
3.	Propeller Speed Control Lever	max. RPM
4.	Fuel Shut-off Valve	OPEN
5.	Ignition Switch	BOTH
6.	Electric Fuel Pump	ON
7.	Throttle	3/4 in (2 cm) forward

If the engine does not start within 10 seconds: Cold Start

8.	Throttle	IDLE
9.	Choke	ON (Pulled)
10.	Ignition Switch	START

V. RESTARTING THE ENGINE WITH PROPELLER AT FULL STOP

1.	Electrically Powered Equipment		OFF
2.	Master Switch (Battery)		ON
3.	Propeller Speed Control Lever		max. RPM
4.	Fuel shut off valve		OPEN
5.	Electric Fuel Pump		ON
6.	Throttle	Cold Start:	IDLE
		Warm Start:	3/4 in (2 cm) forward
7.	Choke	Cold Start:	ON (pulled)
		Warm Start:	OFF
8.	Ignition Switch		START

NOTE

The engine may also be re-started by increasing the airspeed by pushing the airplane into a descent and accelerating to approx. (v_{IAS}) 115 kts / 132 mph / 213 km/h. A loss of 1000 ft / 300 m altitude must be taken into account.

After successful re-start:

9.	Oil Pressure	check
10.	Choke	OFF
11.	Electrically Powered Equipment	ON if required
12.	Oil Temperature	check

3.3.2. Emergency Landing

(a) Emergency Landing Approach with Engine off

1.	Airspeed (v_{IAS}) (Flaps in T/O and LDG position)	57 kts / 66 mph / 106 km/h
	Airspeed (v_{IAS}) (Flaps UP)	65 kts / 75 mph / 120 km/h
2.	Fuel Shut-off Valve	CLOSED
3.	Ignition Switch	OFF
4.	Safety Belts	secured
5.	Radio	Transmit, giving location and intentions
6.	Master Switch (Battery)	OFF

(b) Precautionary Landing with Engine Power Available

NOTE

A precautionary landing would be required if continuing the flight would endanger the aircraft or its occupants. Such circumstances could include mechanical defects, low fuel quantity or deteriorating weather conditions.

1.	Search for a suitable place to land. Special attention must be given to wind direction and obstacles in the approach path	
2.	Safety Belts	secured
3.	Initiate Descent	
4.	Throttle	as required
5.	Trim	as required
6.	Wing Flaps (observe permissible speed)	as required
7.	Overfly selected landing area (not below 500 ft / 150 m above ground) to confirm suitability and that approach route is free of obstacles	
8.	Climb up to 1000 ft AGL (if possible)	
9.	Low pass over flight (around 100 feet) to observe any possible obstacles, such as cables, fences, ditches	
10.	Climb up to 1000 ft AGL (if possible)	
11.	Radio	Transmit, giving location and intentions
12.	Final Approach	
	Throttle	as required
	Propeller Speed Control Lever	max. RPM
	Carburetor Heat	ON
	Electric Fuel Pump	ON
	Wing Flaps	LDG
	Airspeed (v_{IAS})	57 kts / 66 mph / 106 km/h
13.	Touch-down is to be made with minimum airspeed, nose wheel should be kept above ground as long as possible	
14.	After Touch-down:	
	Brake	as required
	Fuel Shut-off Valve	CLOSED
	Ignition Switch	OFF
	Master Switch (Battery)	OFF

NOTE

If no suitable level landing area can be found, an up-hill landing should be performed, if possible.

3.3.3. Fire

(a) Engine Fire during Engine-Start-Up on the Ground

1.	Fuel Shut-off Valve	CLOSED
2.	Throttle	FULL
3.	Master Switch (Battery)	OFF
4.	Ignition Switch	OFF
5.	Evacuate Airplane immediately	

(b) Engine Fire during Flight

1.	Fuel Shut-off Valve	CLOSED
2.	Airspeed (v_{IAS})	70 kts / 81 mph / 130 km/h
3.	Flaps	T/O
4.	Throttle	FULL
5.	Electric Fuel Pump	OFF
6.	Cabin Heat	CLOSED
7.	Perform emergency landing with engine off according to paragraph 3.3.2	

(c) Electrical Fire including Smoke during Flight

1.	Master Switch (Battery)	OFF
2.	Cabin Air	OPEN
3.	Fire Extinguisher	use only if smoke development continues.

CAUTION

If fire extinguisher is used, the cabin must be aerated.

In case the fire is extinguished and electric power is required for continuation of the flight:

4.	Avionics Master Switch	OFF
5.	Electrically Powered Equipment	OFF
6.	Master Switch (Battery)	ON
7.	Avionics Master Switch	ON
8.	Radio	ON
9.	Land as soon as possible.	

(d) Electrical Fire including Smoke on the Ground

1.	Master Switch (Battery)	OFF

If engine running:

2.	Throttle	IDLE
3.	Fuel Shut-off Valve	CLOSED
4.	Ignition Switch	OFF
5.	Canopy	open
6.	Fire Extinguisher	deploy as required

(e) Cabin Fire during Flight

1.	Master Switch (Battery)	OFF
2.	Cabin Air	OPEN
3.	Cabin Heat	CLOSED
4.	Fire Extinguisher	deploy as required
5.	Land as soon as possible	

CAUTION

If fire extinguisher is used, the cabin must be aerated.

3.3.4. Icing

Unintentional Flight into Icing Area

1. Leave icing area (through change of altitude or change of flight direction to reach area with higher outside air temp.).
2. Continue to move control surfaces to maintain their moveability.
3. Carburetor Heat — ON
4. Increase RPM to avoid icing of propeller blades (observe maximum RPM)
5. Cabin Heat — OPEN

CAUTION

In case of icing on the leading edge of the wing, the stall speed will increase.

CAUTION

In case of icing on wing leading edge, erroneous indicating of the airspeed, altimeter, rate of climb and stall warning should be expected.

3.3.5. Recovery from Unintentional Spin

1. Throttle — IDLE
2. Rudder — fully applied opposite to direction of spin
3. Control Stick — ease forward
4. Rudder — neutral, after rotation has stopped
5. Wing Flaps — UP
6. Elevator — pull cautiously

   Bring airplane from descent into level flight position. Do not exceed maximum permissible speed (v_{NE})

3.3.6. Landing with Defective Tire on Main Landing Gear

1. Final approach with wing flaps in landing position.
2. Land airplane on the side of runway opposite to the side with the defective tire to compensate for change in direction which is to be expected during final rolling.
3. Land with wing slightly tipped in the direction of the non-defective tire. To increase the maneuvrability during rolling, the nose-wheel should be brought to the ground as soon as possible after touch-down.
4. To ease the load on the defective tire, the aileron should be fully applied in the direction of the non-defective tire.

3.3.7. [Intentionally left blank]

3.3.8. Gliding

1.	Wing Flaps	T/O
2.	Airspeed at 1609 lbs (730 kg) (v_{IAS})	72 kts / 83 mph / 133 km/h
3.	Glide Ratio 14, which means at 1000 ft/305m above ground, and with no wind the distance of glide is 2.5 NM (4.3 km)	

NOTE

The glide distance from 1000 ft altitude increases for each 10 kts tail wind by 1968 ft (0.6 km).

The glide distance from 1000 ft altitude decreases for each 10 kts head wind by 2296 ft (0.7 km).

3.3.9. Electrical Power Failure

a) Total Electrical Power Failure

1.	Battery Circuit Breaker	If tripped, reset
2.	Master Switch (Generator/Battery)	check ON
3.	If Unsuccessful	Land at nearest suitable airport

b) Generator Failure

GEN. Annunciator Illuminated

1.	Master Switch (Generator)	Cycle Generator Master Switch OFF - ON
2.	Generator Circuit Breaker	If tripped, reset
3.	Generator CONTROL Circuit Breaker	If tripped, reset
4.	If Generator can not be brought on-line	Switch OFF all non-flight essential electri consumers. Monitor Ammeter and Voltmeter. Land nearest suitable airport.

NOTE

There are 30 minutes of battery life remaining at a discharge load of 20 amperes.

c) Low Voltage Indication (needle in yellow Arc)

I. LOW VOLTAGE INDICATION (NEEDLE IN YELLOW ARC) WHILE AIRPLANE ON GROUND

1.	Propeller RPM	Increase RPM until needle is in the Green Arc. This should occur before exceeding 1350 RPM.
2.	Non-flight essential electrical consumers	Switch OFF consumers until needle is in the Green Arc.
3.	If needle remains in the yellow arc and the ammeter is indicating to the left of centre (discharge)	Discontinue any planned flight activity

II. LOW VOLTAGE INDICATION (NEEDLE IN YELLOW ARC) DURING FLIGHT

1.	All non-flight essential electrical consumers	Switch OFF
2.	If needle is remaining in the yellow arc and the ammeter is indicating to the left of centre (discharge):	Generator Failure: Refer to paragraph 3.3.9 (b)

III. LOW VOLTAGE INDICATION (NEEDLE IN YELLOW ARC) DURING LANDING:

1.	After landing	proceed in accordance with paragraph 3.3.9 (c).

WARNING

If at any time the Voltmeter needle indicates in the red arc, you should land at the nearest suitable airfield and service the aircraft accordingly before continuing the flight.

3.3.10. Flap System Failure

Flap Position Indicator Failure

- visual check of the flap position
- select airspeed within the range of the white arc marked on the airspeed indicator
- check all positions of the flap toggle switch (flap stops are fail-safe)
- modify approach and landing as follows:

  - only UP available:
    - raise approach speed by 5 kts
    - throttle as required
    - flat approach angle
  - only T/O available:
    - normal approach speed
    - throttle as required
    - flat approach angle
  - only LDG available:
    - normal landing

3.3.11. Starter Failure

Starter does not disengage after starting the engine (continuous whining sound audible).

1.	Throttle	IDLE
2.	Ignition Switch	OFF
		discontinue any planned flight

3.3.12 Avionics System Failure

Total Avionic Failure:

1.	Check Avionic Master Circuit Breaker	If tripped, re-engage and monitor status, If it trips again, land at nearest suitable airport
2.	Check Avionic Master Switch	Toggle avionic master switch, if avionic system remains off-line, pull avionic master control circuit breaker and land at nearest suitable airport

Radio System Operative, no reception:

1.	Microphone Key	check for stuck Microphone Key on transceiver display
2.	Headphones	check, deactivate SQUELCH for a few moments, if SQUELCH not heard, check headset connection

Radio System Operative, transmitting not possible:

1.	Selected Frequency	check if correct
2.	Microphone	check, if available use different one (headset)

Problem cannot be resolved: switch transponder (if available) to "COMM FAILURE" code if required by the situation and permitted by applicable national regulations.

3.3.13 Trim System Failure

Stuck Trim:

1.	Circuit breaker	check, reset if breaker is tripped
2.	Rocker switch	depress in both directions, wait 5 minutes, try again

NOTE

Full range of travel is available for elevator, but expect forces up to 20 lbs. on control stick.

3. Land at nearest suitable airport

Runaway of Trim:

1.	Control Stick	Grip stick and maintain control of airplane
2.	Trim motor circuit breaker	Pull circuit breaker
3.	Rocker Switch	Check if depressed

If reason for runaway condition is obvious and has been resolved, push in (engage) circuit breaker.

NOTE

Full travel of the elevator trim system will take approximately 10 seconds.

3.3.14 Instrument Panel Lighting Failure (Effective only for S/N 10021 and subsequent and for S/N 10002 through S/N 10020 if Service Bulletin 95-01 has been complied with)

1.	Rocker Switch, map light	ON
2.	Rocker Switch, I-panel lighting	Cycle Rocker Switch OFF - ON
3.	Dimming Control	Turn fully clockwise
4.	Internal Lighting Circuit Breaker.	If tripped, reset
5.	If NOT Successful	Use Flashlight
	Expect electrical power failure.	Ref. 3.3.9

3.3.15 Tachometer failure

Operation at T/O (5 minute) power:

1.	Airspeed	Do not exceed 110 KIAS

Operation at maximum continuous power:

1.	Propeller Speed Control Lever	Ensure lever is at least ½ inch (10mm) (measured at slot) aft of full forward position. Engine will now be operating at, or below, maximum continuous power.

NOTE

With propeller speed control lever at least ½ inch (10mm) aft of full forward position, the Max. Permissible Continuous RPM (2420 RPM) cannot be exceeded at any throttle setting and airspeed. However, maximum engine power may not be available.

CHAPTER 4

NORMAL OPERATING PROCEDURES

4.1. INTRODUCTION

Chapter 4 provides checklist and amplified procedures for the normal operation. For normal procedures and supplementary information associated with optional systems refer to Chapter 9.

4.2. AIRSPEEDS FOR NORMAL FLIGHT OPERATION

Unless stated otherwise, the following table contains the applicable airspeeds for maximum take-off and landing weight. The airspeeds may also be used for lower flight weights.

TAKE-OFF	v_{IAS} kts	mph	km/h
Climb Speed during normal take-off for 15 m (50 ft) obstacle	60	68	110
Best Rate-of-Climb speed at sea level v_Y (Wing Flaps T/O)	65	75	120
Best Angle-of-Climb speed at sea level v_X (Wing Flaps T/O)	57	66	106

LANDING	v_{IAS} kts	mph	km/h
Approach speed for normal landing, Wing Flaps in landing position	57	66	106
Balked landing climb speed, Wing Flaps in landing position	57	66	106
Maximum demonstrated crosswind speed during take-off and landing	15	17	27

CRUISE	v_{IAS} kts	mph	km/h
Maximum permissible speed in rough air v_{NO}	118	135	218
Maximum permissible speed with full control surface deflections v_A	104	120	193
Maximum permissible speed with Wing Flaps extended v_{FE}	81	93	150

4.3 STRUCTURAL TEMPERATURE INDICATOR

A structural temperature indicator, installed on the spar bridge, indicates when the structural temperatur limitation is exceeded (ref. section 2.17). The indicator need only be checked if the OAT exceeds 38° ((100° F).

The indicator is accessed by lifting the flap between the two seatback cushions. The indicator is visibl through the cut out in the seat shell backs (ref. fig. 2).

At temperatures below the 55° C (131° F) limit, the indicator appears all red with a faint indication of "55 (° C). At temperatures exceeding the 55° C (131° F) limit, the indicator displays a clearly contrasting re "55" (° C) on a black background (ref. fig.1).

NOTE

At temperatures approaching the limit, the background will progressively darken prior to turning black; this indicates acceptable temperatures.

Red "55" on black background indicates that structural temperature limit is exceeded. Flight is prohibited.

All red indicates that structural temperature is below limit. Flight is permitted.

Figure 1

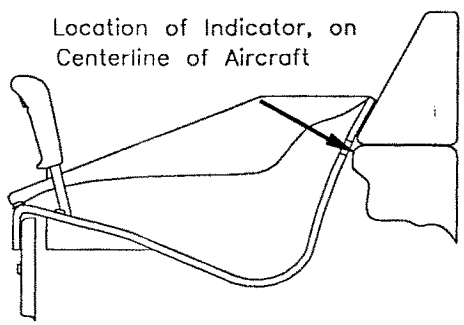


Figure 2

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4.4.2. Before Starting Engine

1.	Preflight Inspection	performed
2.	Pedals	adjust, lock
3.	Passenger Briefing	performed
4.	Safety Belts	fasten
5.	Parking Brake	set
6.	Controls	free
7.	Fuel Shut-off Valve	OPEN
8.	Carburetor Heat	OFF
9.	Throttle	IDLE
10.	Propeller Speed Control Lever	max. RPM
11.	Friction Device of Throttle Quadrant	adjust
12.	Avionics Master Switch	OFF
13.	Master Switch (Battery/Generator)	ON
14.	Generator Warning Light	illuminated
15.	Fuel Pressure Warning Light	illuminated
16.	Exterior Lights	as required
17.	Instrument Panel Lighting (Effective only for S/N 10021 and subsequent and for S/N 10002 through S/N 10020 if Service Bulletin has been complied with.)	as required
18.	Canopy	Close and Secure
19.	Canopy Locking Warning Light	OFF

NOTE

Under certain circumstances, activation of the fuel pressure warning light might take as long as 10 minutes after shutting down the engine or switching off the electric fuel pump.

4.4.3. Starting Engine

NOTE

Extreme low temperatures require that the engine be preheated prior to engine start. Satisfactory engine starts have been demonstrated at -31°F (-35°C) OAT after a 2 hour preheat with the Tannis TAS100-27 preheat system.

1.	Electric Fuel Pump	ON (noise of pump audible)
2.	Fuel Pressure Warning Light	OFF
3.	Throttle - Cold Start	IDLE
	- Warm Engine	approximately 3/4 in (2 cm) forward
4.	Choke - Cold Start	ON, fully pulled and hold
	- Warm Engine	OFF
5.	Toe Brakes	Hold
6.	Propeller Area	Clear

WARNING

Ensure that propeller area is clear!

7.	Ignition Key	START

NOTE

During extreme cold weather starts, hold the choke on until the engine starts to warm up.

8.	Choke	OFF
9.	Throttle	maximum 1500 RPM
10.	Oil Pressure	within green range after maximum of 10 seconds

CAUTION

If Oil Pressure is below 22 psi (1.5 bar) shut down engine immediately (max. 10 seconds delay).

NOTE

Oil Pressure may advance to the yellow arc until Oil Temp. reaches normal operating temperatures.

NOTE

Activate starter for max. 10 sec. only, followed by a cooling period of 2 min.

NOTE

The Electronic Ignition requires a min. of 100 Propeller RPM to start engine.

11.	Generator Warning Light	OFF
12.	Exterior Lights	as required
13.	Electric Fuel Pump	OFF

4.4.4. Before Taxiing

1.	Avionics Master Switch	ON
2.	Flight Instruments and Avionics	set
3.	Engine Gauges	check
4.	Voltmeter	check, ensure needle is in the green arc. Increase RPM to achieve or turn OFF non-flight essential electrical consumers
5.	Warning Lights (Gen., Fuel Press., Canopy)	push to test
6.	Parking Brake	release

CAUTION

Warm-up engine to a minimum Oil Temperature of 122° F (50° C) at 1100 to 1500 RPM (also possible during taxi).

4.4.5. Taxiing

1.	Brake	check
2.	Direction Control	check
3.	Flight Instruments and Avionics	check
4.	Compass	check

CAUTION

At high Propeller RPM the propeller may be damaged by loose sand, gravel or water.

4.4.6. Before Take-off (Engine Run-up)

NOTE

For OAT's less than -5º F (-20º C) turn cabin heat on for at least 10 minutes prior to take-off.

1.	Toe Brakes	hold
2.	Safety Belts	fastened
3.	Canopy	closed and locked
4.	Fuel Pressure Warning Light	OFF (If light illuminates, maintenance action is required and flight should not be initiated)
5.	Fuel Shut-off Valve	check OPEN
6.	Fuel Quantity Indicator	check
7.	Engine Gauges	within green range
8.	Trim	NEUTRAL
9.	Controls	free
10.	Throttle	1800 - 1900 RPM
11.	Propeller Speed Control Lever	Cycle 3 times (RPM drop: 50 - 250 RPM)
12.	Ignition Switch	Cycle L - BOTH - R - BOTH (Max. RPM drop: 150 RPM) (Max. RPM difference (L/R): 50 RPM) (Min. RPM difference (L/R): none, but RPM drop must be noticeable)
13.	Throttle	1500 RPM
14.	Carburetor Heat	ON RPM drop: max. 50 RPM;
15.	Throttle	IDLE
16.	Carburetor Heat	OFF
17.	Circuit Breakers	check pressed IN
18.	Electric Fuel Pump	ON
19.	Wing Flaps	T/O
20.	Parking Brake	release

4.4.7. Take-off

1.	Electric Fuel Pump	check ON
2.	Master Switch (Battery/Generator)	check ON
3.	Ignition Switch	check BOTH
4.	Carburetor Heat	check OFF
5.	Wing Flaps	check T/O
6.	Propeller Speed Control Lever	check max. RPM
7.	Throttle Check RPM	FULL 2400 RPM to 2550 RPM
8.	Elevator - at beginning of rolling	NEUTRAL
9.	Directional Control	maintain with rudder

NOTE

In crosswind conditions, directional control can be enhanced by using the single wheel brakes. Note that using the brakes for directional control increases the take-off roll distance.

10.	Rotate (v_{IAS})	51 kts / 59 mph / 95 km/h
11.	Climb Speed (v_{IAS})	60 kts / 69 mph / 111 km/h

CAUTION

For the shortest possible take-off distance to clear a 15 m (50 ft) obstacle:

Lift-off Speed (v_{IAS})	57 kts / 66 mph / 106 km/h
Climb Speed (v_{IAS})	60 kts / 69 mph / 111 km/h

12.	Propeller Speed Control Lever	2400 RPM (after reaching safe height)
13.	Electric Fuel Pump	OFF

NOTE

In order to avoid excessive noise, the propeller speed should be reduced to 2400 RPM as soon as a safe flight altitude has been reached.

4.4.8. Climb

1.	Propeller Speed Control Lever	2400 RPM
2.	Throttle	FULL
3.	Engine Gauges	within green range
4.	Wing Flaps	T/O or UP
5.	Airspeed	65 kts / 75 mph / 120 km/h
6.	Trim	adjust

NOTE

The best rate of climb speed decreases with increasing altitude.

	Speeds [v_{IAS}]					
Altitude	flaps T/O			flaps UP		
feet	kts	mph	km/h	kts	mph	km/h
0 - 4000	65	75	120	69	79	128
4000 - 7000	63	73	117	65	75	120
7000 -10000	62	71	115	—	—	—
above 10000	59	68	110	—	—	—

4.4.9. Cruise

1.	Throttle	as required
2.	Propeller Speed Control Lever	1900 - 2400 RPM

NOTE

For favorable manifold pressure/RPM combinations refer to Chapter 5.

3.	Wing Flaps	UP
4.	Trim	as required
5.	Engine Gauges	check

4.4.10. Descent

1.	Flight Instruments and Avionics	adjust
2.	Throttle	as required
3.	Propeller Speed Control Lever	1900 - 2400 RPM
4.	Carburetor Heat	as required

NOTE

To achieve a fast descent:

Propeller Speed Control Lever	2400 RPM
Throttle	IDLE
Carburetor Heat	ON

NOTE

If RPM drops and then rises, suspect carburetor icing and leave Carb Heat ON.
Otherwise turn Carb Heat OFF.

Wing Flaps	UP
Airspeed	118 kts / 135 mph / 218 km/h

4.4.11. Landing Approach

1.	Seat Belts	fastened
2.	Electric Fuel Pump	ON
3.	Lights	as required
4.	Master Switch (Battery/Generator)	check ON
5.	Ignition Switch	check BOTH
6.	Carburetor Heat	ON

NOTE

If RPM drops and then rises, suspect carburetor icing and leave Carb Heat ON.
Otherwise turn Carb Heat OFF.

7.	Throttle	as required
8.	Airspeed	max. 81 kts / 93 mph / 150 km/h
9.	Wing Flaps	T/O
10.	Trim	as required

11.	Propeller Speed Control Lever	max. RPM
12.	Wing Flaps	LDG
13.	Approach Speed	57 kts / 66 mph / 106 km/h

CAUTION

For strong headwind, crosswind, danger of wind-shear or turbulence, a higher approach speed should be selected.

4.4.12. Balked Landing

1.	Propeller Speed Control Lever	max. RPM
2.	Throttle	FULL
3.	Carburetor Heat	OFF
4.	Wing Flaps	T/O
5.	Airspeed	57 kts / 66 mph / 106 km/h

4.4.13. After Landing

1.	Throttle	as required
2.	Wing Flaps	UP
3.	Carburetor Heat	OFF
4.	Exterior Lights	as required
5.	Electric Fuel Pump	OFF

4.4.14. Engine Shut-down

1.	Throttle	IDLE
2.	Parking Brake	set
3.	ELT	Check (by listening to 121.5 MHZ for signal)
4.	Avionics Master Switch	OFF
5.	Electric Consumers	OFF
6.	Ignition Switch	OFF
7.	Instrument Panel Lighting (Effective only for S/N 10021 and subsequent and for S/N 10001 through S/N 10020 if Service Bulletin has been complied with.)	OFF

8.	Master Switch (Battery)	OFF
9.	Tie Downs and Wheel Chocks	as required

NOTE

In case of post ignition due to hot weather conditions, the ignition should be switched on, choke pulled and after approximately 3 seconds, ignition should be turned off again.

4.4.15. Flight in Rain

NOTE

Flight performance might be reduced, especially for the T/O-distance and the maximum horizontal air speed. The influence on flight characteristics of the airplane is negligible. Flights through heavy rain should be avoided due to the reduced visibility.

4.4.16. Spinning

(a) Spin Entry

1.	Loose Items	stowed
2.	Seat Belts	fastened
3.	Altitude and Airspace	check
4.	Electric Fuel Pump	OFF
5.	Wing Flaps	UP
6.	Carburetor Heat	ON
7.	Throttle	IDLE
8.	Entry Speed	trim to 65 kts / 75 mph / 120 km/h
9.	Reduce speed with elevator	speed reduction rate 2-3 kts per second
10.	When stall warning sounds	apply simultaneously, full aft stick and full rudder

CAUTION

Intentional spinning is only permitted with flaps in UP position.

CAUTION

Depending on CG and spin entry technique, attempts to enter spins may develop into spiral dives. Monitor the airspeed during the first turn and recover immediately if it increases to 70 KIAS.

NOTE

Spins with aft CG may oscillate in yaw rate and pitch attitude. This has no effect on recovery procedure or recovery time

(b) Recovery from Spinning

1.	Throttle	IDLE
2.	Rudder	fully applied in opposite to direction of spin
3.	Control Stick	ease stick forward until spinning stops
4.	Rudder	neutral, immediately after rotation has stopped.
5.	Wing Flaps	check UP
6.	Control Stick	ease stick backward cautiously
		Bring airplane from descent into level flight position. Do not exceed maximum permissible speed (v_{NE})

CHAPTER 5

PERFORMANCE

5.1. INTRODUCTION

The performance tables and diagrams on the following pages have been prepared to illustrate the performance you may expect from your airplane as well as to assist you in precise flight planning. The data presented in these tables and diagrams has been derived from test-flights using an airplane and engine in good operating condition, and was corrected to standard atmospheric conditions (59° F (15° C) and 29.92 in. Hg (1013.25 mbar) at sea level).

The performance tables do not take into account the expertise of the pilot or the maintenance condition of the airplane. The performance illustrated in the tables can be achieved if the indicated procedures are followed and the airplane is in good maintenance condition.

Note that the flight duration data does not include a fuel reserve. The fuel consumption during cruise is based on propeller RPM and manifold pressure settings. Some undefined variables such as the operating condition of the engine, contamination of the aircrafts surface, or turbulence could have influences on flight distance and flight duration. For this reason, it is of utmost importance that all available data is used when calculating the required amount of fuel for a flight.

For flight operation without wheel fairings the resulting performance variations is given in %.

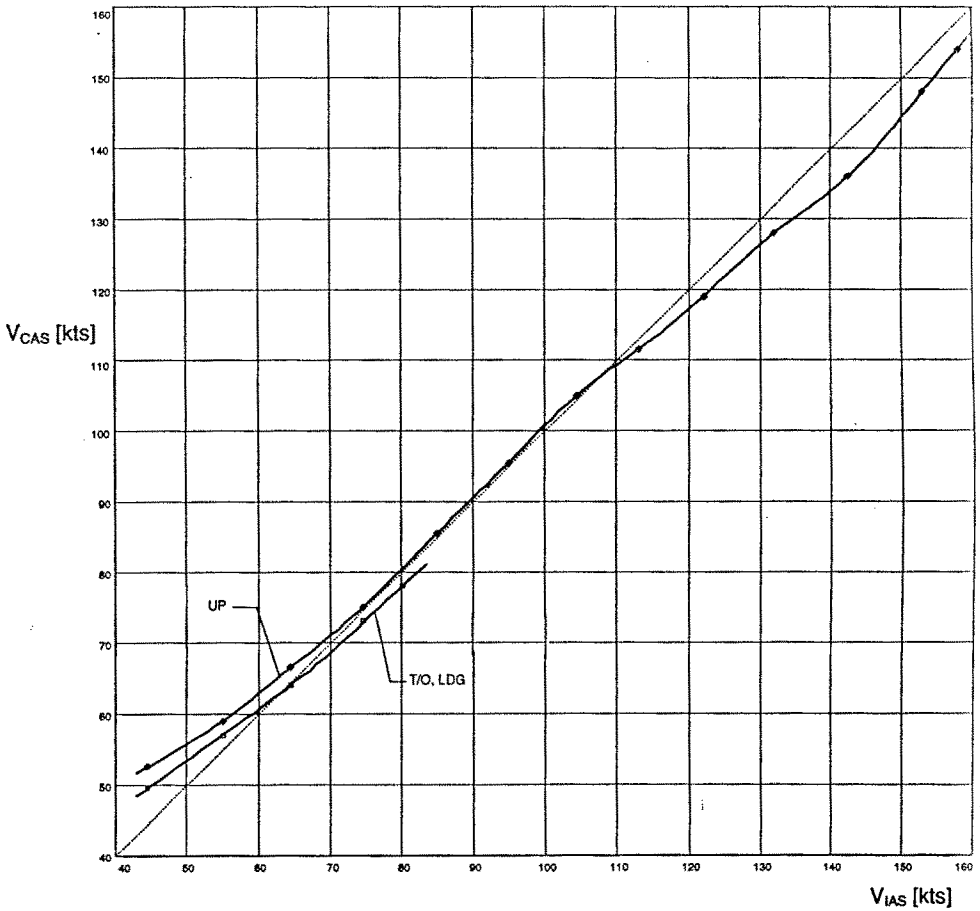
5.2. USE OF PERFORMANCE TABLES AND DIAGRAMS

The performance data is shown in the form of tables and diagrams to illustrate the influence of the different variables. These tables contain sufficiently detailed information to plan any flight with the necessary precision and safety on the conservative side.

5.3. PERFORMANCE TABLE AND DIAGRAMS

5.3.1. Figure 5.1: Airspeed System Calibration

Assumes zero indicator error



Example: v_{IAS} = 93 kts equals v_{CAS} = 95 kts.

5.3.2. Figure 5.2: Cruising Performance

Revolutions per Minute: RPM * 100

Pressure Altitude		Standard Temp.	Engine power as % of max. continuous power. 55 %		65 %		75 %	
[ft]	[m]	[°F]([°C])	RPM	MP	RPM	MP	RPM	MP
0	0	59 (15)	19	24.7	21	25.3	22	26.3
2000	600	52 (11)	19	24.0	21	24.7	22	25.7
4000	1200	45 (7)	19	23.3	21	24.0	22	25.0
6000	1800	37 (3)	19	23.0	21	23.7	23	23.7
8000	2400	30 (-1)	20	21.3	23	21.7	24	22.0
10000	3000	23 (-5)	21	20.0	24	20.3	---	---
12000	3600	16 (-9)	22	18.7	---	---	---	---
13000	4000	12(-11)	23	17.3	---	---	---	---
Consumption (per hour):			3.25 US gal. (12.3 liters)		3.83 US gal. (14.5 liters)		4.39 US gal. (16.6 liters)	

Pressure Altitude		Standard Temp.	Engine power as % of max. continuous power. 85 %		95 %		104 %	
[ft]	[m]	(°F)[C]	RPM	MP	RPM	MP	RPM	MP
0	0	59 (15)	23	27.7	24	28.0	25.5	29.7
2000	600	52 (11)	23	27.0	24	27.7	---	---
4000	1200	45 (7)	24	25.3	---	---	---	---
Consumption (per hour):			5.10 US gal. (19.3 liters)		6.00 US gal. (22.7 liters)		6.52 US gal. (24.7 liters)	

To maintain constant performance at non standard temperature gradient:

Raise manifold pressure by 0.7 in.Hg at ISA + 18° F (10° C)

Lower manifold pressure by 0.7 in.Hg at ISA - 18° F (10° C)

NOTE

To keep engine wear to a minimum, engine operation below 1900 RPM is not recommended.

5.3.3. Figure 5.3: Stall Speeds

Configuration:

Idle, most forward center of gravity, max. weight

(this is the most adverse configuration)

Stall speeds in **kts**

Flaps	Bank Angle							
	0°		30°		45°		60°	
	IAS	CAS	IAS	CAS	IAS	CAS	IAS	CAS
UP	41	50	46	53	55	59	69	70
T/O	39	46	44	49	51	54	63	65
LDG	37	44	41	47	49	52	59	62

Stall speeds in **mph**

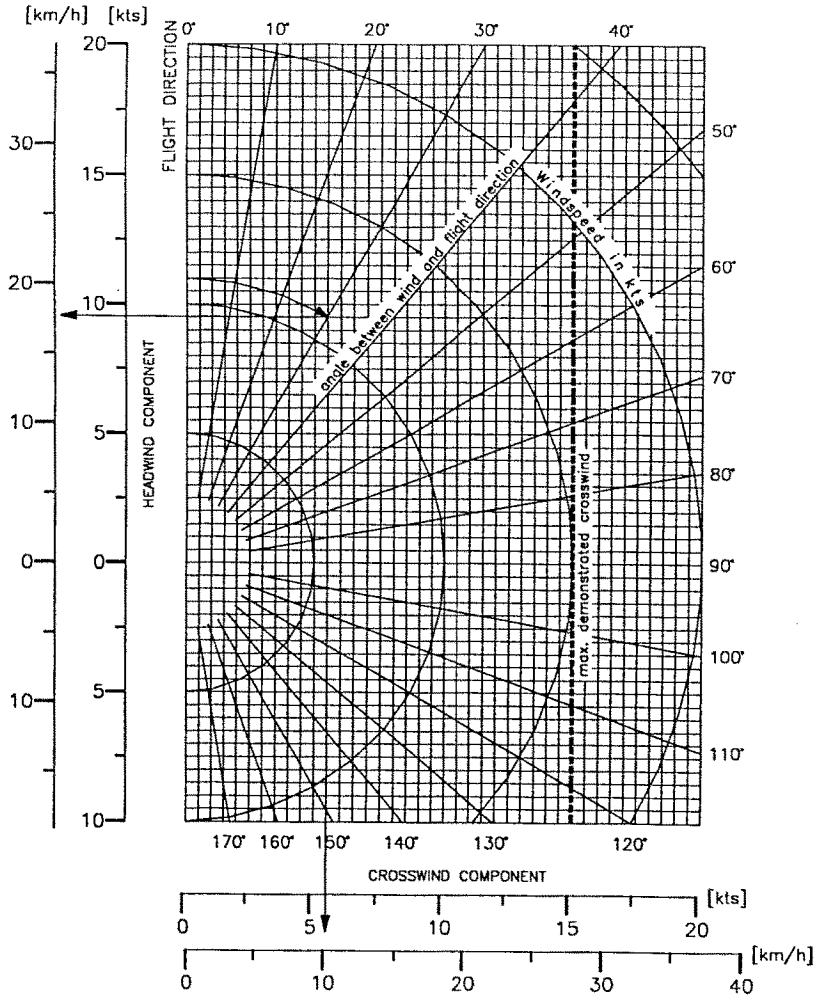
Flaps	Bank Angle							
	0°		30°		45°		60°	
	IAS	CAS	IAS	CAS	IAS	CAS	IAS	CAS
UP	47	57	53	62	63	68	79	81
T/O	45	52	51	56	59	62	72	75
LDG	43	50	47	54	56	60	68	72

Stall speeds in **km/h**

Flaps	Bank Angle							
	0°		30°		45°		60°	
	IAS	CAS	IAS	CAS	IAS	CAS	IAS	CAS
UP	76	93	85	99	101	109	127	130
T/O	72	84	81	91	94	100	117	120
LDG	69	81	76	87	91	96	109	115

5.3.4. Figure 5.4: Wind Components

Maximum demonstrated crosswind component: 15 kts (27 km/h)



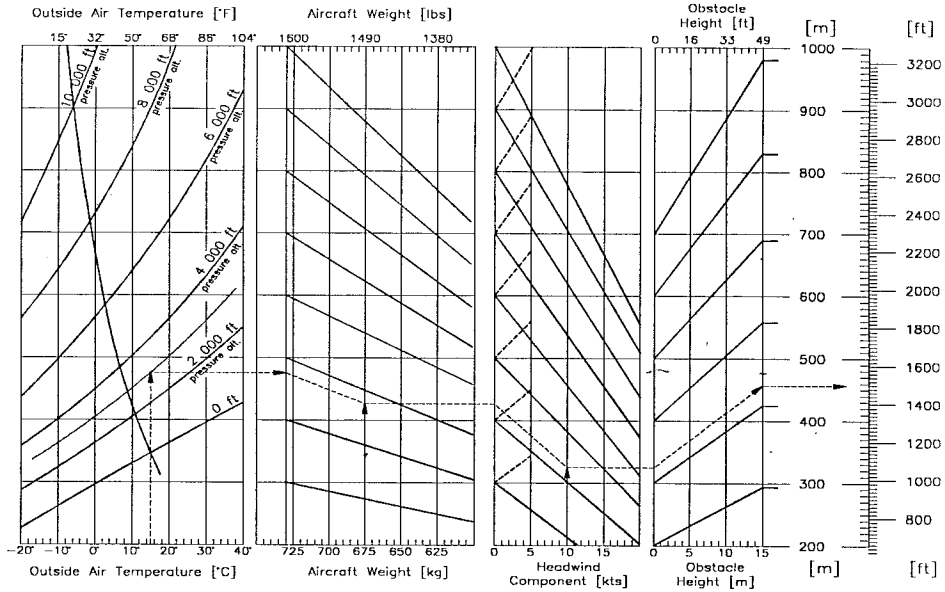
Example:

Wind speed:	11 kts (20 km/h)
Angle between wind direction and flight direction:	30°
Headwind component:	9.5 kts (18 km/h)
Crosswind component:	5.5 kts (10 km/h)

5.3.5. Figure 5.5: Take-off Distance

Conditions:

- maximum take-off power
- lift-off speed 57 KIAS and speed for climb over obstacle 60 KIAS
- level runway, paved
- Wing Flaps in Take-Off Position (T/O)



Example:

- Pressure altitude:	3000 ft
- Outside temperature:	15° C (59° F)
- Weight :	1488 lbs (675 kg)
- Wind:	10 kts

Result:

- Take-off roll distance:	1080 ft (330 m)
- Take-off distance to clear a 15 m (50 ft) obstacle:	1540 ft (470 m)

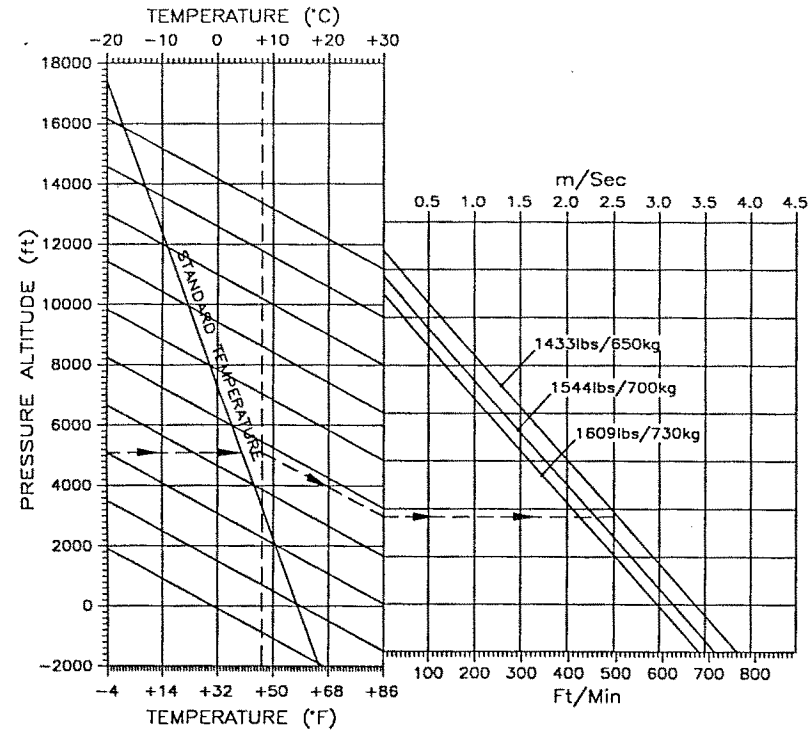
NOTE

Poor maintenance condition of the airplane, deviation from the given procedures as well as unfavorable outside conditions (i.e. high temperature, rain, unfavorable wind conditions, including cross wind) could increase the take-off distance considerably. For take-off from dry, short-cut grass covered runways compared to paved runways, a 25% increase in take-off roll distance must be taken into account.
On soft grass covered runways with grass deeper than 4 in, (10 cm) the take-off roll distance might be increased by as much as 40%.

5.3.6. Figure 5.6 : Climb Performance / Cruising Altitudes

Max. Cruising Altitude (in standard conditions): 13120 ft (4000 m)

Best Rate-of-Climb Speed with Wing Flaps in Take-Off Position (T/O): 65 kts / 75 mph / 120 km/h



Example:

Pressure Altitude:	5000 ft (1524 m)
OAT:	46° F (8° C)
Weight :	1477 lbs (670 kg)

Result: Climb performance: 490 ft/min (2.5 m/s)

CAUTION

In case of operation without wheel fairings the climb performance is reduced by approximately 3%.

5.3.7. [INTENTIONALLY LEFT BLANK]

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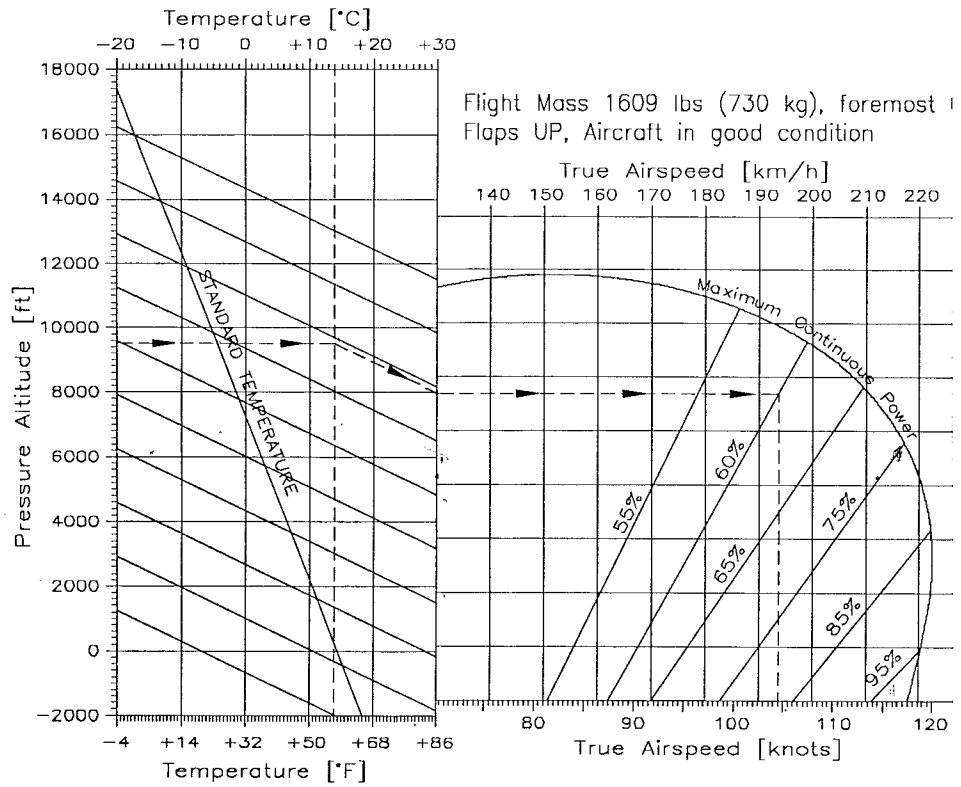
5.3.8. Figure 5.8: Cruising Speed (True Airspeed)

Diagram for true airspeed (TAS) calculation at selected power level.



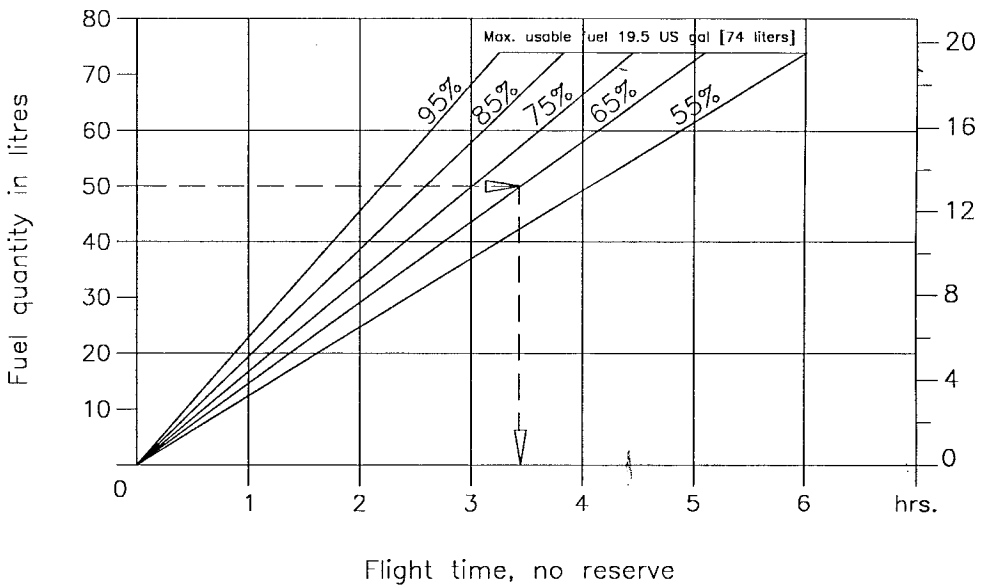
Example:	Pressure altitude:	9500 ft
	Temperature:	57° F (14° C)
	power setting:	60 %
Result:	True airspeed (TAS):	104.2 kts (193 km/h)

CAUTION

In case of operation without wheel fairings the maximum cruising speed is reduced by approximately 5%.

5.3.9. Figure 5.9: Maximum Flight Duration

Diagram for calculation of the maximum flight duration depending on fuel availability.



Example:

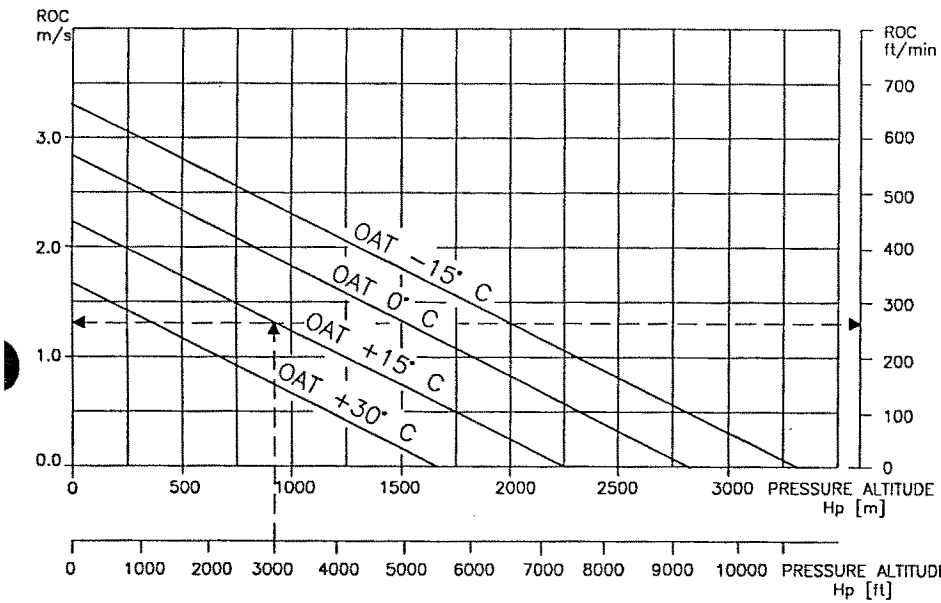
	Fuel quantity:	13.2 US gal (50 liters)
	Power Setting:	65%

Result:

	Possible flight time without reserve:	3:28 h:min
	Possible flight time with reserve of 45 mins:	2:43 h:min

5.3.10. Figure 5.10: Climb Performance during Balked Landing

Conditions: Speed = 57 kts / 67 mph / 108 km/h
Wing Flaps in Landing Position (LDG)
Weight 1609 lbs (730 kg)
most forward center of gravity
max take-off power



Example:

	Pressure altitude:	3000 ft
	Outside temperature:	59° F (15° C)

Result:

	Climb performance during balked landing:	270 ft/min. (1.3 m/s)

CAUTION

In case of operation without wheel fairings the climb performance is reduced by approximately 3%.

CHAPTER 6

WEIGHT AND BALANCE / EQUIPMENT LIST

6.1. INTRODUCTION

To obtain the performance, flight characteristics and safe operation described in this Flight Manual, the airplane must be operated within the permissible weight and balance envelope as described in Chapter 2. It is the pilot's responsibility to adhere to the weight and balance limitations and to take into consideration the change of the CG position due to fuel consumption.
The procedure for weighing the airplane and calculating the empty weight CG position are given in this Chapter.

The aircraft is weighed when new and should be reweighed in accordance with applicable air regulations. Empty weight and the center of gravity are recorded in a Weighing Report as illustrated in figure 6.1 and in the Weight & Balance Report (figure 6.2).
In case of equipment changes, the new weight and empty weight CG position must be determined by calculation or by weighing and must be entered in the Weight & Balance Report. The following pages are sample forms which can be used for airplane weighing, calculation of the empty weight CG position, and for the determination of the useful load.

NOTE

After every repair, painting or change of equipment the new empty weight must be determined as required by applicable air regulations. Weight, empty weight CG position and useful load must be entered in the Weight & Balance Report by an authorized person.

6.2. AIRPLANE WEIGHING

Pre-weighing conditions:

- equipment must be in accordance with the airplane equipment list
- brake fluid, lubricant (3.17 US qt / 3 liters), coolant (2.64 US qt / 2,5 liters) and unusable fuel (0.53 US gal./ 2 liters), included

To determine the empty weight and the empty weight CG position, the airplane is to be position above mentioned pre-weighing condition, with the nose gear and each main gear on a scale. E aircraft is level longitudinally as illustrated on the weighing report (see figure 6.1).
With the airplane correctly positioned, a plumb line is dropped from the leading edge of each wi root rib to the floor, join these two points to determine the reference datum (RD). From this li suspended plumb line aligned with each landing gear to measure the distances D_N (nose gear) main gear) and D_R (right main gear).

The following formulas apply:

Empty Weight: $W_T = W_N + W_L + W_R$ lbs [kg]

Empty Weight Moment: $M = W_N \times D_N + W_L \times D_L + W_R \times D_R$ in·lbs [m·kg]

Empty Weight CG position : $= \frac{\text{Empty Weight Moment}}{\text{Empty Weight}} = \frac{M}{W_T}$ in [m]

CAUTION

Items ahead of RD are considered to have a negative lever arm.

Items aft of RD are considered to have a positive lever arm.

Figure 6.1: Weighing Report

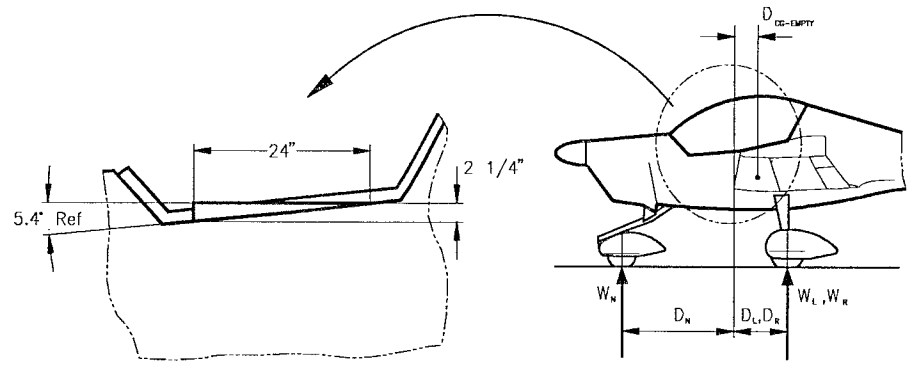
Model: DA 20 S/N: _____ Registration: _____

Data in accordance with TCDS and Flight Manual Reason for Weighing: _____

Reference Datum: Leading edge of wing at root rib

Horizontal reference line: 24" Spirit Level placed on Fuselage Canopy Rail (L or R), supported at front by a 2 1/4" spacer as shown below

Weighing Conditions: including brake fluid, lubricant, coolant and unusable fuel (3.31 lbs/1.5 kg)
Equipment List dated: _____



Support	Gross [lbs] ([kg])	Tare [lbs] ([kg])	Net Weight [lbs] ([kg])	Lever Arm [in] ([m])
Nose			W_N =	D_N =
Main Left			W_L =	D_L =
Main Right			W_R =	D_R =
Empty Weight $W_T = W_N + W_L + W_R$ = _____ lbs (kg)				

Empty Weight Moment $M = W_N \times D_N + W_L \times D_L + W_R \times D_R$ = _____ in lbs [m kg]

Empty Weight CG Position $\frac{\text{Empty Weight Moment}}{\text{Empty Weight}} = \frac{M}{W_T}$ = _____ in [m]

(Positive results indicate, that CG is located aft of RD)

Maximum Permissible Useful Load:	Maximum Weight [lbs] ([kg])	+
	Empty Weight [lbs] ([kg])	–
	Max useful Load [lbs] ([kg])	=

Data to be entered into the Flight Manual: see page 6-6

Empty Weight [lbs] ([kg])	Empty- Weight-Moment [in·lbs] ([kg·m])

Place / Date	Inspector's Stamp	Inspector's Signature

WEIGHT AND BALANCE REPORT

Diamond
AIRCRAFT

Model: DA 20 S/N: 10053 Registration: N53MF

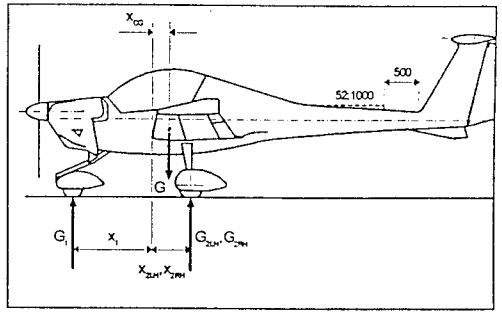
COF

Data in acordance with TCDS and Flight Manual Reason for Weighing: ORIGIN

Reference Datum: Leading edge of wing at root rib.
Horizontal reference line: Wedge 52:1000, 19.69 in (500mm) forward of rudder fin.

Weighing and empty weight CG

Equipment List Date: OCT 3/95
Weighing Conditions:
Including Brake Fluid,
Lubricant, Coolant, and
Unusable Fuel (1.5 kg/3.31 lbs)



Support	Gross ([lbs])	Tare ([lbs])	Net Weight ([lbs])	Lever Arm ([in])
Front G_1			172	$x_1 = 44.5$
Rear G_{2li}			504	$x_{2li} = 22.5$
Rear G_{2re}			492	$x_{2re} = 22.5$
Empty Weight G_l = 1168 (lbs)				

CG position for Empty Weight: TOTAL MOMENTS/TOTAL WEIGHTS = 12.63 IN.AFT DATUM

Empty Weight Moment: $M_L = G_l * x_1$ = 1168 * 12.63 = 14751.84 IN-LBS

Maximum Permissible useful load: 441 LBS

Maximum Weight ([lbs])	1609
Empty Weight ([lbs])	1168
Max useful Load ([lbs])	441

Data to be entered into the Flight Manual: see page 6-6

Empty Weight ([lbs])	Empty- Weight-Moment ([inlbs])	
1168	14751.84	
INSPECTOR'S SIGNATURE W.T. HAYES	INSPECTOR'S STAMP DA Q4	DATE OCT 3 / 1995

6.3. WEIGHT AND BALANCE REPORT

The empty weight and Empty Weight CG position data determined prior to delivery of the airplane is the first entry in the Weight and Balance Report. Each change of the installed equipment as well as each repair affecting the empty weight, the CG position of the empty weight or the empty weight moment must be entered in the Weight and Balance Report.

Ensure that you are using the latest weight and balance information when performing a weight and balance calculation.

Figure 6.2: Weight and Balance Report

(Continuous report of structural changes or change of equipment).

DA 20 KATANA			Serial No.: 10053			Registration: N53MF			Page No.: 1		
			Changes of Weight						Actual		
Date	Entry No.		Description of part or modification	Addition (+)			Subtraction (-)			Empty Weight		
	IN	OUT		Weight [lbs] ([kg])	Arm [in.] ([m])	Moment [in.lbs] ([kgm])	Weight [lbs] ([kg])	Arm [in.] ([m])	Moment [in.lbs] ([kgm])	Weight [lbs] ([kg])	Arm [in.] ([m])	Mo [in ([k
1/A/00		X	Yunsa Bolt				-11	-32	352	1157	13.06	151
1/9/00	X		Pilot Batt	15	-32	-480.0				1172.0	12.48	14

6.4. FLIGHT WEIGHT AND CENTER OF GRAVITY

The following data enables the pilot to operate the DA 20 within the required weight- and center of gravity limitations.

The following diagrams,

Figure 6.3 Weight & Balance Diagram

Figure 6.4 Calculation of Loading Condition

Figure 6.5 Permissible Center of Gravity Range and permissible Flight-Weight-Moment

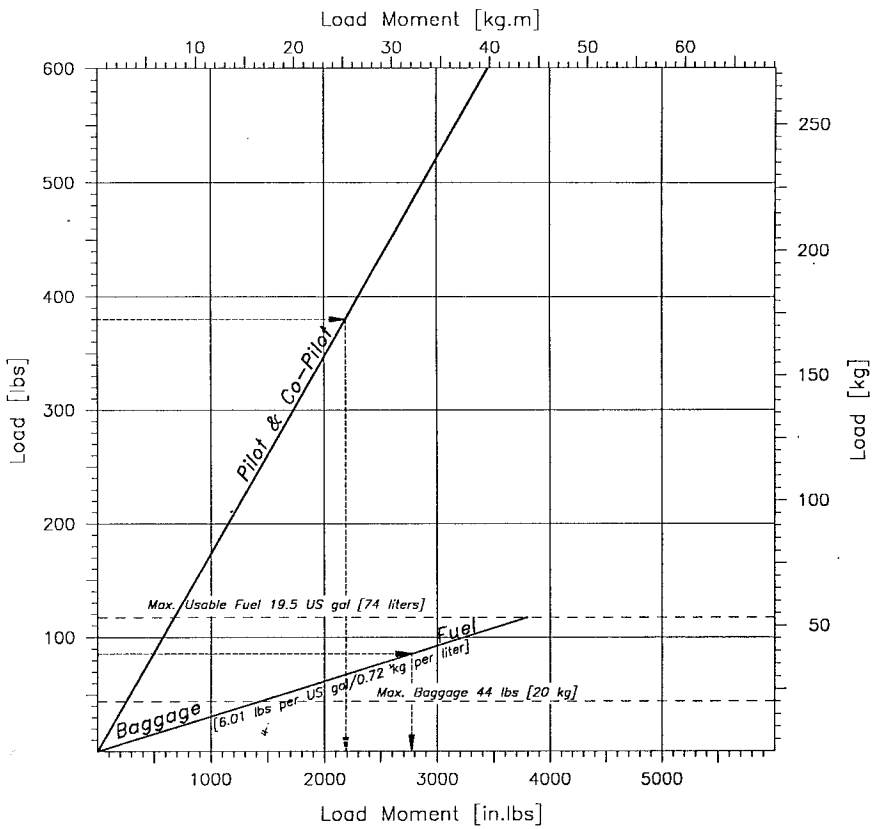
are to be used for calculations of the flight-weight and the center of gravity as follows:

1. The empty weight and the empty-weight-moment of the airplane should be taken from th weighing report or from the weight & balance report and entered into the form "Calculation c Loading Condition" (figure 6.4) in the columns identified with "Your DA 20".

2. Using the Weight & Balance Diagram (see figure 6.3) determine the moment for each part to b loaded, and enter it in the respective column in figure 6.4.

3. Add the weights and the moments of each column (point 4 and point 6 in figure 6.4) and enter th sum in figure 6.5 "Permissible CG Range and Permissible Flight-Weight-Moment" to check if th values are within the permissible limits of the loading range.

Figure 6.3: Weight & Balance Diagram



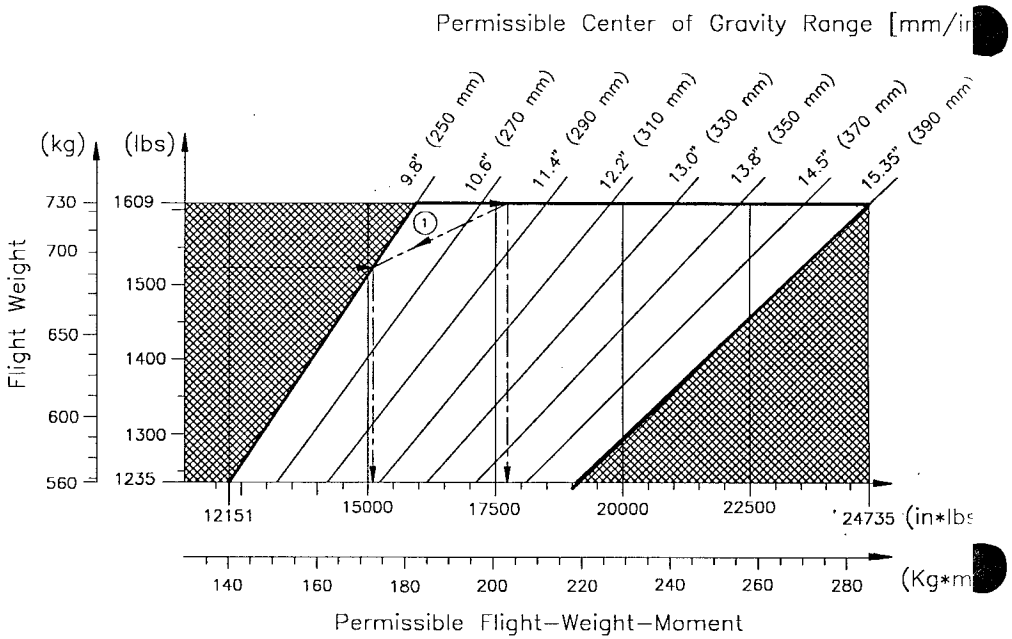
Example: Pilot and Passenger: 380 lbs. (172 kg)
Fuel 14.0 US gal. / 52.9 liters: 84 lbs. (38 kg)
(6.01 lbs. per US gal./0.72 kg per liter)

Result: Moment of Pilot and Passenger: 2139 in.lbs. (24.6 kgm)
Moment of Fuel: 2725 in.lbs. (31.3 kgm)

Figure 6.4: Calculation of the Load Limits

Calculation of the Load Limits	*DA 20 (Example)*		Your DA 20	
	Weight [lbs] (Weight [kg])	Moment [in.lbs] ([kgm])	Weight [lbs] (Weight [kg])	Moment [in.lbs] ([kgm])
1. Empty Weight (use the data for your airplane recorded in the equipment list, including unusable fuel, lubricant and coolant).	1145 (520)	12880 (148.404)		
2. Pilot and Passenger: Lever Arm: 0.143 m (5.63 in)	380 (172)	2139 (24.596)		
3. Baggage: Lever Arm: 0.824 m (32.44 in)	-- (--)	-- (--)		
4. Total Weight and Total Moment with empty fuel tank (sum of 1. - 3.)	**1525 (692)**	**15019 (173.00)**		
5. Usable Fuel Load (6.01 lbs. per US gal./0.72 kg per liter) Lever Arm (32.44 in) (0.824 m)	84 (38)	2725 (31.312)		
6. Total Weight and Total Moment, taking fuel into account (sum of 4. and 5.)	**1609 (730)**	**17744 (204.312)**		
7. Find the values for the total weight (1525 lbs. and 1609 lbs.) and the total moment (15019 in lbs. and 17744 in.lbs.) in the center of gravity diagram. Since they are within the limitation range, the loading is permissible.				

Figure 6.5: Permissible Center of Gravity Range and permissible Flight-Weight-Moment



_ _ DA 20 (Example of page 6-9)

① Changes during flight (due to fuel consumption)

6.5. EQUIPMENT LIST

The following table lists the equipment of the airplane. The equipment installed in your airplane is marked as installed in the respective column (Inst.).

The equipment list comprises the following data:

- The item No. containing an alpha character for the equipment group and a sequential number.
- Abbreviations:

  A Avionics

  I Instruments

  M Miscellaneous (any equipment other than avionics or instruments)

Weight and lever arm of the equipment items are shown in the columns "Weight" and "Arm".

NOTE

Additional installation of equipment must be carried out in compliance with the specifications in the Maintenance Manual. The columns "Weight" and "Arm" show the weight and the CG position of the equipment with respect to the reference datum. A positive value shows the distance aft of the reference datum, a negative value shows the distance forward of the reference datum.

Equipment List		Airplane Serial No.:		Registr.:	
				Date:	
Seq. No.:	Part Description, Manufacturer, Type	Serial No.:	Inst.	Weight [lbs] (kg)	Arm [in] (m)
M1	Wheel Fairing, Main Gear DIAMOND left or right			2.65 (1.20)	+27.56 (+0.700)
M2	Wheel Fairing, Nose Gear DIAMOND			2.65 (1.20)	-44.84 (-1.139)
M3	Seat Cushion, standard DIAMOND, 2 pieces			4.50 (2.05)	+12.00 (+0.305)
M4	Seat Cushion, leather DIAMOND, 2 pieces			5.63 (2.55)	+12.00 (+0.305)
M5	Fire Extinguisher AMEREX A 620			2.25 (1.02)	+32.25 (+0.895)

Equipment List		Airplane Serial No.: 10053		Registr.: N53MF	
				Date: OCT 3/95	
Seq. No.:	Part Description, Manufacturer, Type	Serial No.:	Inst.	Weight [lbs] (kg)	Arm [in] (m)
I1	Altimeter United, 5934PD3	9J942	X	0.86 (0.39)	-16.35 (-0.415)
I2	Compass Airpath C2300L4	D-9	X	0.75 (0.34)	-15.0 (-0.381)
I3	Compass IFR 31-12			0.64 (0.290)	-16.35 (-0.415)
I4	Emergency Locator Trans. EBC102A			2.12 (0.96)	+44.75 (+1.137)
I5	Ammeter VDO, 190-031S3		X	0.18 (0.08)	-16.35 (-0.415)
I6	Cylinder Head Temp. Indicator VDO		X	0.31 (0.14)	-16.35 (-0.415)
I7	Fuel Quantity Indicator VDO 310-035SB		X	0.20 (0.09)	-16.35 (-0.415)
I8	Manifold Pressure Indicator Yuma 7-100-20		X	0.29 (0.13)	-16.35 (-0.415)
I9	Oil Pressure Indicator VDO 350-041SB		X	0.31 (0.14)	-16.35 (-0.415)
I10	Oil Temperature Indicator VDO 310-012SB		X	0.31 (0.14)	-16.35 (-0.415)
I11	Directional Gyro R.C. Allen, RCA15AK-2	95D0200	X	2.45 (1.11)	-16.35 (-0.415)
I12	Artificial Horizon R.C. Allen, RCA26AK-4	95E0615	X	2.43 (1.10)	-16.35 (-0.415)
I13	Airspeed Indicator United, 8000	144009	X	0.66 (0.30)	-16.35 (-0.415)
I14	Turn & Slip Indicator R.C. Allen RCA56-3BL	95C0126	X	1.23 (0.56)	-16.35 (-0.415)
I15	Vertical Speed Indicator United, 7000	7F301	X	0.77 (0.35)	-16.35 (-0.415)
I16	RPM Indicator Mitchell D1-112-5240	1069	X	0.84 (0.38)	-16.35 (-0.415)

Equipment List		Airplane Serial No.: 10053		Registr.: N53MF Date: OCT 3/95	
Seq. No.:	Part Description, Manufacturer, Type	Serial No.:	Inst.	Weight [lbs] (kg)	Arm [in] (m)
I17	Emergency Locator Tans. EBC502	201867GC	X	2.75 (1.25)	+44.75 (+1.137)
T1	Motor, dry Rotax, 912A3	4380694	X	125.69 (57.00)	-46.69 (-1.186)
T2	Propeller, Hoffmann, (incl. Spinner) HO-V352F/170FQ	H 178	X	23.15 (10.5)	-66.14 (-1.680)
T3	Propeller Governor Woodward, A210786	11405541	X	3.09 (1.40)	-49.21 (-1.250)

Equipment List		Airplane Serial No.: 10053		Registr.: N53MF Date: OCT 3/95	
Seq. No.:	Part Description, Manufacturer, Type	Serial No.:	Inst.	Weight [lbs] (kg)	Arm [in] (m)
Z1	Fuel Tank, 79l DIAMOND		X	15.21 (6.90)	+32.44 (+0.824)
Z2	Wheel Fairing, Main Gear DIAMOND left or right		X	2.65 (1.20)	+27.56 (+0.700)
Z3	Wheel Cover, Nose Gear DIAMOND		X	2.65 (1.20)	-44.84 (-1.139)
Z4	Seat Belt & Shoulder Harness DIAMOND		X	2.65 (1.20)	+9.84 (+0.250)
Z5	Seat Cushion, standard DIAMOND, 2 pieces		X	4.50 (2.05)	+12.00 (+0.305)
Z6	Seat Cushion, leather DIAMOND, 2 pieces			5.63 (2.55)	+12.00 (+0.305)
Z7	Fire Extinquisher AMEREX A620	MC-389101	X	2.25 (1.02)	+32.25 (+0.895)

CHAPTER 7

DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

7.1. INTRODUCTION

This Chapter provides description and operation of the airplane and its systems. Refer to Chapter 9 (Supplements), for details of optional systems and equipment.

7.2. AIRFRAME

7.2.1. Fuselage

The GFRP-fuselage is of semi-monocoque construction. The fire protection cover on the fire wall is made from a special fire retarding fleece, that is covered by a stainless steel plate on the engine side. The main bulkhead is of CFRP/GFRP construction.
The metal instrument panel permits the installation of instruments up to a maximum weight of 55 lbs. (25 kg).

7.2.2. Wings

The GFRP-wings are of semi-monocoque sandwich construction, and contain a CFRP-spar. The ailerons and flaps are made from CFRP and are attached to the wings using aluminum hinges.
The wing-fuselage connection is made with three bolts each. The so-called A- and B- bolts are fixed to the fuselage's root rib. The A-bolt is placed in front of the spar tunnel, the B-bolt lies near the trailing edge. The two main bolts are placed in the middle of the spar tunnel (main bulkhead). They are accessible between the backrests and can be inserted from the front side. A spring loaded hook locks both bolt handles, thereby securing them.

7.2.3. Empennage

The rudder and elevator units are of semi-monocoque sandwich construction. The vertical stabilizer contains a folded-top antenna for the radio equipment, the horizontal stabilizer contains an antenna for the NAV equipment (VOR).

7.3. FLIGHT CONTROLS

The ailerons and elevator are actuated via push rods, and the rudder is controlled using control c
The flaps have three positions (up [UP], take-off [T/O], and landing [LDG]) and are electrically ope
The switch is located on the instrument panel. In addition the flap control circuit is provided
manually triggerable circuit breaker.
Elevator forces may be balanced using the electric trim system.

7.3.1. Trim System

The Rocker switch is located on center console behind engine control unit. The digital trim indic
located in the middle of the instrument panel.
The switch controls an electrical actuator beside the vertical push rod in the vertical stabilizer.
actuator applies via compression springs a load on the elevator controls. Its circuit breaker is loc
the circuit breaker panel and can also be triggered manually.

switch forward = nose down

7.3.2. Flaps

The flaps are driven by an electric motor. The flaps are controlled by a three position flap operating
on the instrument panel. The three positions of the switch correspond to the position of the flaps,
the top position of the switch is used during cruise flight. When the switch is moved to a different p
the flaps move automatically until the selected position is reached. The up (fully retracted) and
(fully extended) positions are additionally equipped with a limit switch to prevent overtraveling.
The electric flap actuator is protected by an automatic circuit breaker (3.5 A), located in the circuit b
panel, which can also be triggered manually.

7.3.3. Flap Position Indicator

The current flap position is indicated by three control lights beside the flap operating switch.

Wing Flap Position	Light	Degree
CRUISE	green	0°
T/O	yellow	15°
LDG	yellow	40°

When two lights are illuminated at the same time, the flaps are between these two positions. This
case while the flaps are in motion.

7.3.4. Pedal Adjustment

NOTE

The pedals may only be adjusted on the ground.

The pedals for rudder and brakes are unlocked by pulling the T-grip located in the front of the control stick

Forward adjustment: Push both pedals forward with your feet while pulling the T-grip.

Backward adjustment: Pull pedals backward to desired position by pulling on T-grip.

NOTE

After the T-grip is released, push the pedals forward with your feet until they lock in place.

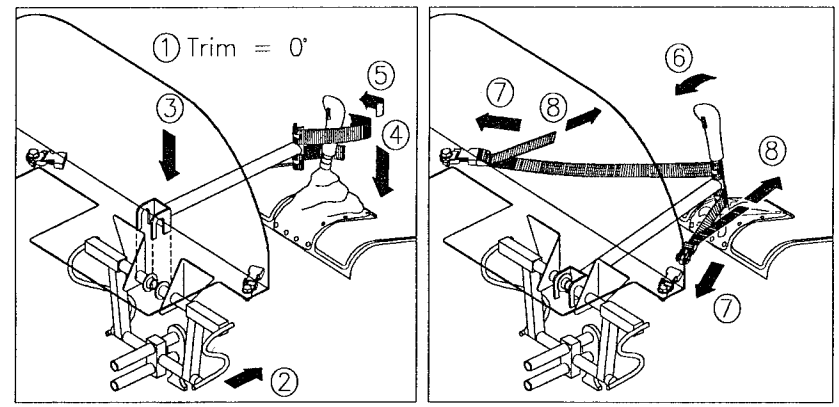
7.3.5. Flight Control Lock

A flight control lock, P/N 20-1000-01-00 , is provided with each aircraft and should be installed whenev
the aircraft is parked.

NOTE

Failure to install the flight control lock whenever the aircraft is parked may result in control system damage, due to gusts or turbulence.

Installation and Removal of the Control Lock:

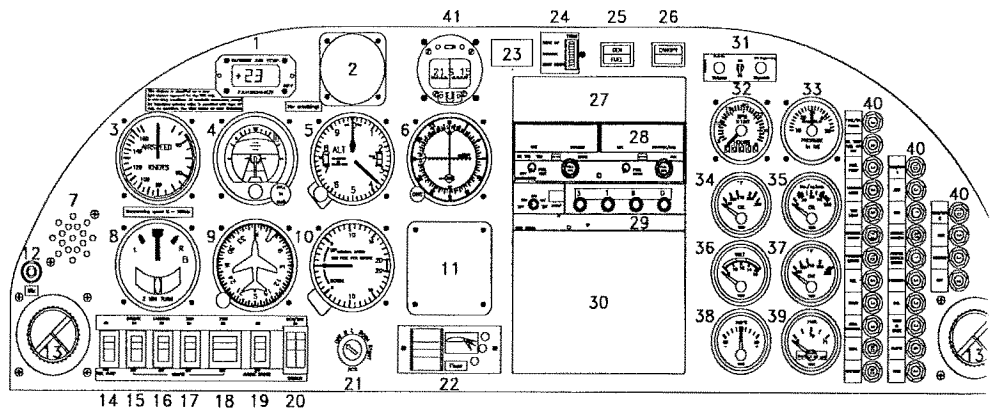


1. Trim aircraft to zero (0) degrees.
2. Pull the left rudder pedals fully aft and check they are locked in position.
3. Hook the Control Lock's forks over the rudder pedal tubes as shown above.

4. Push down the Control Stick's leather boot to expose the Control Stick tube, and push the Control Stick forward against the Control Lock.
5. Loop the straps around the Control Stick as shown, and push forward on the Control Stick.
6. Clip the straps into the left and right buckle receptacles located under the instrument panel.
7. Adjust the straps as required. Straps should be tight to secure the controls properly.
8. **TO REMOVE**, push the Control Stick forward (to relieve strap tension). Unclip the straps and remove the Control Lock. Store in the aircraft's baggage compartment.

7.4. INSTRUMENT PANEL

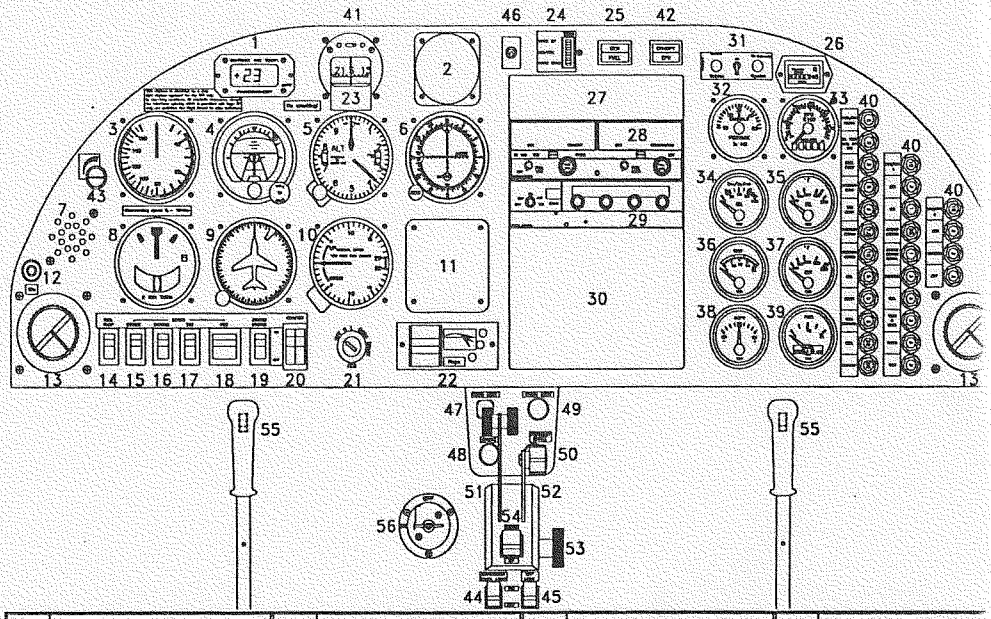
Effective only for S/N 10006 through S/N 10020, unless Service Bulletin 95-01 has been complied with.



Item	Description	Item	Description	Item	Descriptionon	Item	Description
1.	Outside Air Temp. Ind.	12.	Microphone Jack	23.	Compass Card	33.	Manifold Pressur
2.	Not Used	13.	Air Vent	24.	Trim Indicator	34.	Oil Temp Ind.
3.	Air Speed Indicator	14.	Fuel Pump Switch	25.	Annunciator Lights	35.	Oil Pressure Ind.
4.	Artificial Horizon Ind.	15.	Strobe Light Switch	26.	Canopy Locking Warning Light	36.	Voltmeter
5.	Altimeter	16.	Landing Light Switch			37.	Cylinder Head Temperature Ind.
6.	CDI	17.	Taxi Light Switch	27.	Not Used		
7.	Stall Warning Horn	18.	Nav. Lights Switch	28.	Radio	38.	Ammeter
8.	Turn and Bank Ind.	19.	Avionics Master	29.	Transponder	39.	Fuel Indicator
9.	Directional Gyro	20.	Master Switch	30.	Not Used	40.	Circuit Breakers
10.	Vertical Speed Ind.	21.	Ignition Switch	31.	Intercom	41.	Compass
11.	Not Used	22.	Flap Control	32.	Tachometer		

7.4. INSTRUMENT PANEL

Effective only for S/N 10021 and subsequent and for S/N 10002 through S/N 10020 if Service Bulletin 95-01 has been complied with.



Item	Description	Item	Description	Item	Description	Item	Description
1.	Outside Air Temp. Ind.	16.	Landing Light Switch	31.	Intercom	44.	I-Panel Light Swi
2.	Not Used	17.	Taxi Light Switch	32.	Manifold Pressure	45.	Map Light Switch
3.	Air Speed Indicator	18.	Nav. Lights Switch	33.	Tachometer	46.	Trim Ind. Dimmer
4.	Artificial Horizon Ind.	19.	Avionics Master	34.	Oil Pressure Ind.	47.	Carb Heat Knob
5.	Altimeter	20.	Master Switch	35.	Oil Temp. Ind.	48.	Choke Knob
6.	CDI	21.	Ignition Switch	36.	Voltmeter	49.	Cabin Heat Knob
7.	Stall Warning Horn	22.	Flap Control	37.	Cylinder Head Temp.	50.	Parking Brake Kn
8.	Turn and Bank Ind.	23.	Compass Card		Indicator	51.	Power Lever
9.	Directional Gyro	24.	Trim Indicator	38.	Ammeter	52.	Propeller RPM Le
10.	Vertical Speed Ind.	25.	Annunciator Lights	39.	Fuel Indicator	53.	Lever Tension Kn
11.	Not Used	26.	Hobbs Meter	40.	Circuit Breakers	54.	Trim Switch
12.	Microphone Jack	27.	Not Used	41.	Compass	55.	Microphone Switc
13.	Air Vent	28.	Radio	42.	Canopy Locking	56.	Fuel Shut-Off Valv
14.	Fuel Pump Switch	29.	Transponder		Warning Light		
15.	Strobe Light Switch	30.	Not Used	43.	I-Panel Reostat		

7.4.1. Flight Instruments

The flight instruments are installed on the pilot's side of the instrument panel.

7.4.2. Cabin Heat

The cabin heat and defrost system, directs ram air through the coolant radiator and the heat shrou (located around the muffler) into the heat valve. The warm air is then directed to both the windo defrosting vents and to the cabin floor.

The cabin heat knob, located in front of the center console, is used to regulate the flow of heated air.

knob pulled = cabin heat ON

7.4.3. Cabin Air

The cabin aeration is controlled by two adjustable air-vent nozzles. The two sliding windows in the canop can be opened for additional ventilation.

7.5. LANDING GEAR SYSTEM

The landing gear system consists of the two main landing gear wheels mounted to a self-spring steel strut and a free castering nose wheel. The suspension of the nose wheel is handled by an elastomer package. The landing gear wheel fairings are removable. During flight operations without wheel fairings, partially reduced flight performance must be taken into account (see Chapter 5).

7.5.1. Wheel Brakes

Hydraulically operated disc brakes act on the wheels of the main landing gear. The wheel brakes are operated individually using the toe-brake pedals either on the pilot's or on the co-pilot's side. If either the left or right wheel brake system on the pilot's side fail, the co-pilot's brakes fail too. The same applies to a failure on the co-pilot's side, in this case, also the pilot's brakes fail.

CAUTION

When placing the feet on the brake pedals, care should be taken to not contact the structure above the pedals, which could prevent effective application of the brake(s).

7.5.2. Parking Brake

The knob is located on the center console in front of the throttle quadrant, and is pushed in when brakes are to be released. To set the parking brake, pull the knob to the stop. Repeated pushing of toe-brake pedals will build up the required brake pressure which will remain in effect until the parking bra is released.

7.6. SEATS AND SAFETY BELTS

The seats are removable to facilitate the maintenance and inspection of the underlying controls. Covers the control sticks prevent loose objects to foul the controls.
The seats are equipped with removable cushions. Manually triggered seat-type parachutes may be us instead of cushions. For automatically triggered parachutes it is possible to install suitable fastening loc on the A-bolts (under the seats).
Every seat is equipped with four-point safety belt. The locking of the safety belt occurs by slipping the belt through the shoulder belt-ends and inserting the lap belt-end into the belt lock. The belt is opened pulling the lock cover.

7.7. BAGGAGE COMPARTMENT

The baggage compartment is located behind the seat above the fuel tank. The baggage should distributed evenly in the baggage compartment. The baggage net must be secured.

CAUTION

Ensure that baggage compartment limitations (44 lbs/20 kg max.) and aircraft weight and balance limitations are not exceeded.

7.8. CANOPY

Locking:

The canopy is closed by pulling down on the forward handles on the canopy frame. Locking the canopy is accomplished by pushing forward on the two locking handles on the left and right side of the frame.

To lock: Push both LH and RH locking handles forward.

To unlock: Pull both LH and RH locking handles backwards.

A canopy locking warning light, located in the upper center section of the instrument panel, indicates the status of the canopy's locking mechanism. If the canopy locking warning light is illuminated, the canopy is not locked properly.

In an emergency situation, the canopy can be opened from the outside LH side, by sliding the locking handle backward and pulling the emergency release lever forward to a stop and lifting up.

CAUTION

Before starting the engine, the canopy must be closed and locked.

NOTE

The Master Switch must be ON for the Canopy Locking Warning Light to be operational.

7.9. POWERPLANT

7.9.1. Engine

Rotax 912, 4 cylinder, 4 stroke engine, horizontally opposed, liquid cooled cylinder heads, air cooled cylinders.
Propeller drive via integrated reduction gear (crankshaft RPM in parentheses).

Displacement: 73.9 cu.in. (1.211 liters)
Max. T/O Power (5 min.): 80 HP / 59.6 kW at 2550 RPM (5800 RPM)
Max. Continuous Power: 78 HP / 58 kW at 2420 RPM (5500 RPM)
Additional information can be found in the Engine Operating Manual.
The powerplant instruments are located on the instrument panel on the co-pilot's side. The ignition switch is present in form of a key switch. The ignition is turned on by turning the key to position BOTH. The starter is operated by further turning against spring load to the right (position START). The engine is shut off by the ignition switch.
Due to the backlash in the reduction gear, the propeller can be easily turned approximately 30° by hand. Sudden throttle movements should be avoided to prevent impact load in the gearbox.

7.9.2. Carburetor Heat, Throttle, Propeller Pitch Control Lever

The Throttle and Propeller Pitch Control levers are grouped together (throttle quadrant) on the center console. The tension/friction on the throttle quadrant can be adjusted using the friction knob, located on the right side of the center console. The carburetor heat knob is located in the front of the center console.

Carburetor Heat: square knob, in front of throttle in center console
knob pulled = ON
During normal operation the Carburetor heat is OFF (knob pushed IN)

Throttle: large lever with black conical knobs
lever full forward = FULL throttle
lever full rearward = IDLE

Propeller Pitch Control Lever: lever with blue notched knob, right of throttle
lever forward = max. RPM (fine pitch)
lever rearward = min. RPM (coarse pitch)
(also see page 7-10).

7.9.3. Choke

Small black knob below the center instrument panel (self-resetting)
knob pulled = choke ON

7.9.4. Propeller

The HO-V352F Hoffmann Propeller is used on the DA 20 KATANA. The infinitely variable pitch is hydraulically controlled by a Woodward Governor. When the desired propeller RPM is preselected, the governor automatically maintains this RPM, regardless of manifold pressure and airspeed.

7.9.5. Propeller Governor

Woodward A 210786

7.9.6. Propeller Pitch Adjustment

Propeller pitch adjustments are made with the propeller pitch control lever located on the center console (throttle quadrant) to the right of the throttle. Pulling the lever backwards causes a reduction in RPM. The governor keeps the selected RPM constant regardless of airspeed or throttle setting. If the engine power level selected with the throttle is insufficient to keep the selected RPM constant, the propeller blades will move to the smallest possible pitch.
The propeller governor is mounted on the engine. It is driven directly by the engine. The propeller governor oil circuit is part of the engine oil circulation system. A defect in the governor or oil system will cause the blades to run to the minimum pitch position.
The pitch of the blades can be rotated through its pitch angle by hand.

7.9.7. Lubricating

The engine is equipped with a dry sump forced flow lubrication system. If the engine is not operated for an extended period of time, it is possible that some of the oil may drain back into the engine, resulting in a false dip stick reading. Before adding oil let the engine idle for 30 seconds.

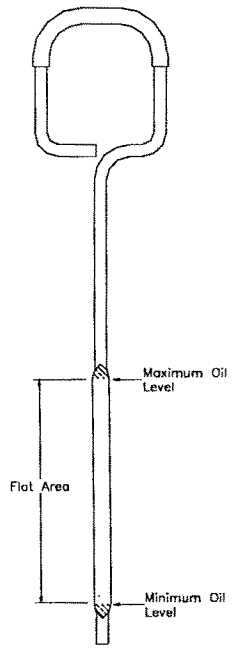
CAUTION

Never operate the engine with the oil filler cap removed.
Observe normal procedures and limitations while running engine.

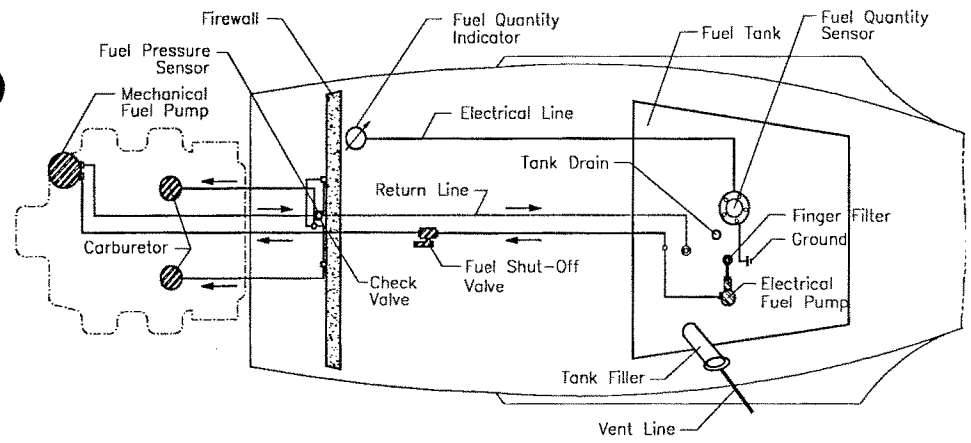
Stop the engine and check the oil level on the dip stick. The oil level must be between the min. and max. quantity as indicated by the flat area of the dip stick.

NOTE

Failure to recognize the above condition could result in overfilling of the oil tank.



7.10. FUEL SYSTEM



The tank, made from aluminum, is located behind the seats, below the baggage compartment. It holds 79 liters (20.9 US gal.), 77 liters (20.3 US gal.) of which are usable. The tank filler on the left side of the fuselage behind the canopy is connected to the tank with a rubber hose. The tank vent line runs from the filler connection piece through the fuselage bottom skin to the exterior of the airplane.

A finger filter is installed at the bottom of the tank. From there, the fuel is led to the electric fuel pump, and from there, through the middle tunnel to the fuel shut-off valve. From the fuel shut-off valve it is led to the firewall breach, and further to the mechanical fuel pump. From there, the fuel reaches the distribution manifold and finally the float chambers of both carburetors. A return line runs from the distribution manifold to the tank. Incorporated in the return line is a check valve or orifice.

A fuel pressure sensor is installed at the distribution manifold. As soon as the fuel pressure drops below 0.1 bar (1.5 psi), the fuel pressure warning light will illuminate.

7.10.1. Fuel Shut-off Valve

The fuel shut-off valve is located on the left hand side of the center console near the pilot's feet. In the open position the tap is parallel to the direction of flight. The valve is protected against unintentional shut-off by a locking detent.

WARNING

The fuel shut-off valve should only be closed during engine fire or fuel system maintenance. After reopening, the locking detent should be checked to ensure it performs the proper safety function. Otherwise the danger of operating the airplane with the fuel shut-off valve closed (engine failure) is given!

7.10.2. Tank Drain

To drain the tank sump, activate the spring loaded drain by pushing the brass tube in with a drain container. The brass tube protrudes approx. 1 1/6 in (30 mm) from the fuselage contour and is located on the left side of the fuselage, approximately at the same station as the fuel filler cap.

7.10.3. Fuel Pipette

A fuel pipette, P/N 20-1200-02-00, is supplied with all aircraft to permit direct measurement of fuel level during the preflight check.

NOTE

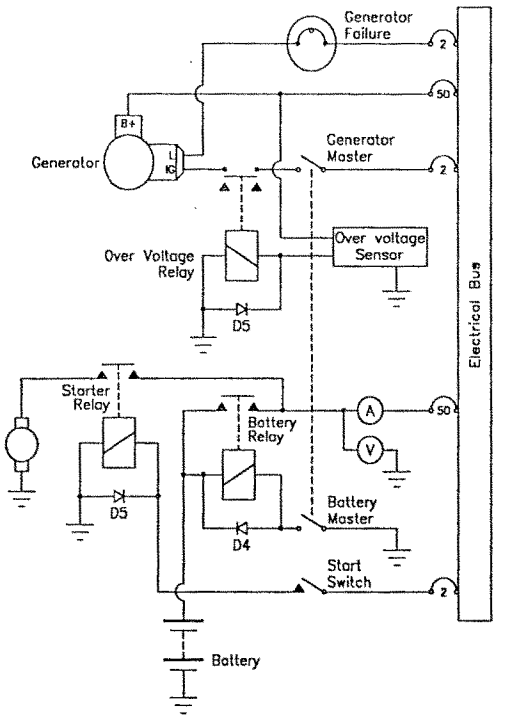
Electric fuel gauges may malfunction. Check fuel quantity with fuel pipette before each flight

To check the fuel level, insert the graduated end of the fuel pipette into the tank through the fuel filler opening until the pipette touches bottom. Place finger on opening at top of pipette, withdraw and read fuel quantity. The pipette is calibrated in increments of ¼ of full tank capacity (76 liters/20.1 US gallons) .

7.11. ELECTRICAL SYSTEM

7.11.1. Power Supply

A 12 V battery is connected to the master bus via the master circuit breaker (50 Amps). The 40 amp. generator is attached to the engine near the propeller hub, recharges the battery via the generator circuit breaker (50 Amps). Both circuit breakers can be triggered manually. The generator warning light is activated by the voltage regulator monitoring circuit and illuminates when the generator is not charging the battery.



Simplified Schematic

7.11.2. Ignition System

The engine is provided with two independent ignition systems. The two magnetos are independent from the power supply system, and are in operation as soon as the propeller RPM is greater than 100. This ensures safe engine operation even in case of an electrical power failure.

WARNING

If the ignition key is turned to L, R or BOTH, the respective magneto is "hot". If the propeller is moved during this time the engine may fire and cause serious or fatal injury to personnel.

7.11.3. Electrical Powered Equipment

The individual consumers (e.g. Radio, Fuel Pump, Position Lights, etc.) are connected in series with their respective circuit breakers. Equipment that does not have switches installed, and requires a switch, is controlled by rocker switches in the lower left side of the instrument panel. Refer to Section 7.4 for a illustration of the instrument panel.

7.11.4 . Voltmeter

The voltmeter indicates the status of the electrical bus. It consists of a dial that is marked numerically from 8 - 16 volts in divisions of 2.
The scale is divided into three colored arcs to indicate the seriousness of the bus condition. These arcs are:

Red	for 8.0 - 11.0 volts,
Yellow	for 11.0 - 12.5 volts,
Green	for 12.5 - 16.0 volts,
Redline	at 16.1 volts.

7.11.5. Ammeter

The ammeter indicates the charging (+) and discharging (-) of the battery. It consists of a dial which is marked numerically from -60 to 60 amps.

7.11.6. Generator Warning Light

The generator warning light (red) illuminates during:

- Generator failure, no output from the generator

The only remaining power source is the battery (20 amps. for 30 minutes)

7.11.7. Fuel Pressure Indicator

As soon as the fuel pressure drops below 1.45 psi (0.1 bar), the fuel pressure switch closes, and the fuel pressure warning light illuminates.

7.11.8. Instruments

The instruments for temperatures, oil pressure, and fuel quantity are connected in series with the respective sensors. The electrical resistance of a sensor changes with the measurable variable, which causes the power to the instrument and consequently the needle deflection to change. Oil pressure indicator, cylinder head temperature indicator and fuel pressure warning light are supplied with power through one circuit breaker. Oil temperature indicator and fuel quantity indicator are also protected together by one circuit breaker.

7.11.9 Internal Lighting

(Effective only for S/N 10021 and subsequent and for S/N 10002 through S/N 10020 if Service Bulletin 95-01 has been complied with)

The internal lighting of the DA 20 KATANA is provided by a lighting module located aft of the Pilot's head and on the center line of the aircraft. Included in this module are two panel illumination lights and one map light. The switches for the lights are located on the center console aft of the Trim control switch. There is a dimming control located on the left side of the instrument panel for adjusting the intensity of the panel lighting. As well there is a toggle switch located on the top center of the instrument panel that controls the intensity of the Wing Flap and Trim annunciator. A red LED mounted underneath the instrument panel, on the pilot's side, is used to illuminate the Fuel Shut Off Valve.