7.0 DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

7.1. INTRODUCTION

This Chapter provides description and operation of the airplane and its systems.

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 25 kg (55 lbs.).

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).

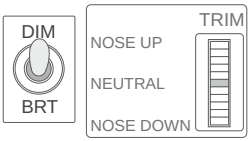
7.3. FLIGHT CONTROLS

The ailerons and elevator are actuated via push rods, and the rudder is controlled using control cables. The flaps have three positions (up [UP], take-off [T/O], and landing [LDG]) and are electrically operated. The switch is located on the instrument panel. In addition the flap control circuit is provided with a 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 switch controls an electrical actuator beside the vertical push rod in the vertical stabilizer. The actuator applies via compression springs a load on the elevator controls. Its circuit breaker is located in the circuit breaker panel and can also be triggered manually. Pushing the switch forward will trim the aircraft nose down.



The digital trim indicator is located in the middle of the instrument panel.

7.3.2 FLAPS

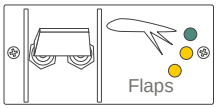
The flaps are driven by an electric motor. The flaps are controlled by a three position flap operating switch on the instrument panel. The three positions of the switch correspond to the position of the flaps, where the top position of the switch is used during cruise flight. When the switch is moved to a different position, the flaps move automatically until the selected position is reached. The up (fully retracted) and landing (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 breaker 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.

FLAPS 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 is the 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 on the rudder pedal sled aft pedestal.

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 whenever the aircraft is parked.

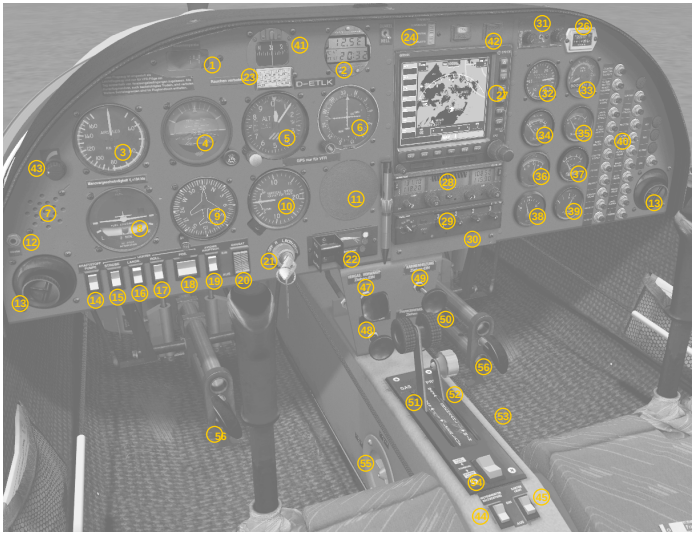
NOTE:

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

FSX:

The Flight Control Lock (red band) is stored in the baggage compartment if not applied to the controls and can be used by a click with the mouse. Another click will move it back into the compartment.

7.4. INSTRUMENT PANEL



1.	Outside Air Temp.	**21.**	Ignition Switch	**41.**	Compass
2.	M803 Clock	**22.**	Flap Control	**42.**	Canopy Warn Lt.
3.	Airspeed Ind.	**23.**	Compass Card	**43.**	I-Panel Reostat
4.	Artifical Horizon	**24.**	Trim Indicator	**44.**	I-Panel Lt. Switch
5.	Altimeter	**25.**	Annunciator Lights	**45.**	Map Light Switch
6.	CDI	**26.**	Hobbs Meter	**46.**	Trim Ind. Dimmer
7.	Stall Warning Horn	**27.**	GPS Unit	**47.**	Carb Heat Knob
8.	Turn and Bank Ind.	**28.**	Radio	**48.**	Choke Knob
9.	Directional Gyro	**29.**	Transponder	**49.**	Cabin Heat Knob
10.	Vertical Speed Ind.	**30.**	Not Used	**50.**	Parking Brk. Knob
11.	Not used	**31.**	Intercom	**51.**	Power Lever
12.	Microphone Jack	**32.**	Manifold Pressure	**52.**	Prop. RPM Lever
13.	Air Vent	**33.**	Tachometer	**53.**	Lever Tension
14.	Fuel Pump Switch	**34.**	Oil Pressure Ind.	**54.**	Trim Switch
15.	Strobe Light Switch	**35.**	Oil Temp. Ind.	**55.**	Fuel Shut-Off Valve
16.	Landing Light Switch	**36.**	Voltmeter	**56.**	Pedal Adjustment
17.	Taxi Light Switch	**37.**	Cylinder Head Temp.		
18.	Nav. Lights Switch	**38.**	Ammeter		
19.	Avionics Master	**39.**	Fuel Indicator		
20.	Master Switch	**40.**	Circuit Breakers		

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 shroud (located around the muffler) into the heat valve. The warm air is then directed to both the window 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 canopy 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 the brakes are to be released. To set the parking brake, pull the knob to the stop. Repeated pushing of the toe-brake pedals will build up the required brake pressure which will remain in effect until the parking brake is released.

7.6. SEATS AND SAFETY BELTS

The seats are removable to facilitate the maintenance and inspection of the underlying controls. Covers on the control sticks prevent loose objects to foul the controls.

The seats are equipped with removable cushions. Manually triggered seat-type parachutes may be used instead of cushions. For automatically triggered parachutes it is possible to install suitable fastening loops 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 lap belt through the shoulder belt-ends and inserting the lap belt-end into the belt lock. The belt is opened by pulling the lock cover.

7.7. BAGGAGE COMPARTMENT

The baggage compartment is located behind the seat above the fuel tank. The baggage should be 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

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

FSX:
The SHIFT+E command is working and will open/close both, the locks and the canopy. Keep this in mind because opening the canopy in flight can lead to heavy damages.

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:	1.352 litres (82.5 cu.in.)
Max. T/O Power (5 min.):	100 HP / 73.5 kW at 2385 RPM (5800 RPM
Max. Continuous Power:	94 HP / 69 kW at 2260 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 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 20/100 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.

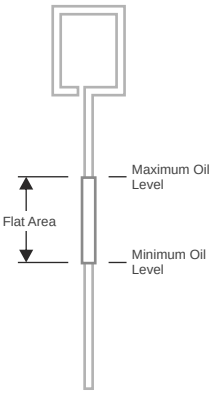
The propeller governor is mounted on the engine. It is driven directly by the engine. The propeller governor oil circuit is part of the engine oil circulation system. A defect in the governor or oil system will cause the blades to run to the minimum pitch position. The pitch of the blades can be rotated 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. To check the oil level, remove the oil tank cap and turn the propeller by hand in the normal rotation of operation. This is to transfer all the oil from the engine crankcase to the oil tank.

WARNING: DO NOT TURN THE PROPELLER IN THE OPPOSITE DIRECTION OF NORMAL ROTATION OF OPERATION.

The process is finished when crankcase air can be heard being forced back to the oil tank. The sound will be noticed as a gurgle coming from the oil tank with the oil cap removed. The sound verifies that the crankcase has been purged of residual oil. Remove the oil dip stick, clean and reinsert. Let the oil dip stick sit for a few seconds then remove verifying the oil level is in the middle of the level marks.



CAUTION:

Never operate the engine with the oil filler cap removed. Observe normal procedures and limitations while running engine. The oil level must be between the min. and max. quantity as indicated by the flat area of the dip stick.

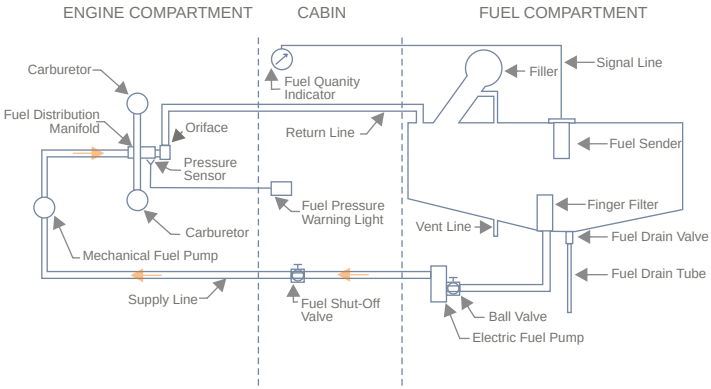
NOTE:

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

FSX:

The **Oil and Liquids** window shows only the flat area of the dip stick.

7.10. FUEL SYSTEM



The tank, made from aluminum, is located behind the seats, below the baggage compartment. It holds 76 liters (20.1 US gal.), of which 74 liters (19.5 US gal.) 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 .

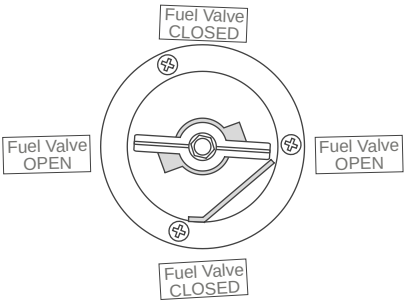
A finger filter is installed at the bottom of the tank. From there, the fuel is fed to the electric fuel pump, and from there, through the middle tunnel to the fuel shut-off valve. From the fuel shut-off valve it is fed to the firewall breach, and further to the mechanical fuel pump. From there, the 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 an 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 shutoff 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 possible!

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

NOTE:

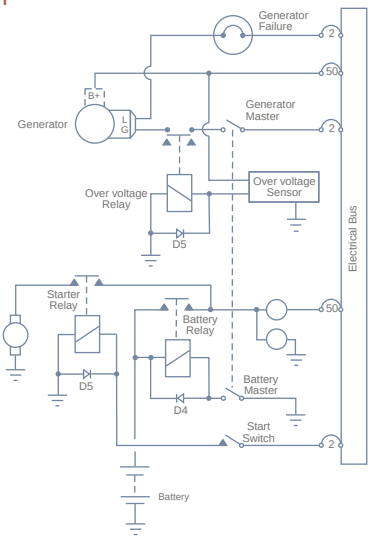
Electric fuel gauges may malfunction. Check fuel quantity with fuel pipette before each flight.

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.



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.

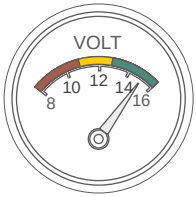
! WARNING:

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

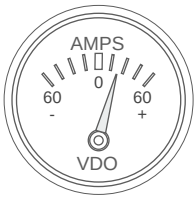


The voltmeter indicates the status of the electrical bus. It consists of a dial that is marked numerically from 8 - 16 volts in divisions of 2.

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)

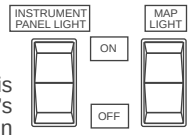
7.11.7 FUEL PRESSURE INDICATOR

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



The internal lighting of the DA 20/100 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.

7.12. PITOT AND STATIC PRESSURE SYSTEMS

The pitot pressure is measured on the leading edge of a calibrated probe below the left wing. The static pressure is measured by the same probe using two holes in the lower edge and rear edge of the probe. For protection against water and humidity, water sumps are installed within the line. These water sumps are accessible beneath the left seat shell.

The error of the static pressure system is small enough to be neglected for the measuring of the altitude. For the error of the airspeed indicating system refer to Chapter 5.

The pitot static pressure probe should be protected whenever the aircraft is parked to prevent contamination and subsequent malfunction of the aircraft systems relying on its proper functioning.

7.13. STALL WARNING SYSTEM

When the airspeed drops below 1.1 times the stall speed, a horn sounds in the left instrument panel. The horn grows louder as the speed approaches the stall speed. The horn is activated by suction on a hose that leads from a hole in the leading edge of the left wing to the horn. The hole is marked by a red circle.

The stall warning hole should be plugged whenever the aircraft is parked to prevent contamination and subsequent malfunction of the stall warning system.

7.14. AVIONICS

The center of the instrument panel contains the radio and navigation equipment. The microphone key for the radio is installed in the control stick. There are two connectors for headsets on the backrest of the seat.

Operating instructions for individual avionics equipment should be taken from the manuals of the respective manufacturers.