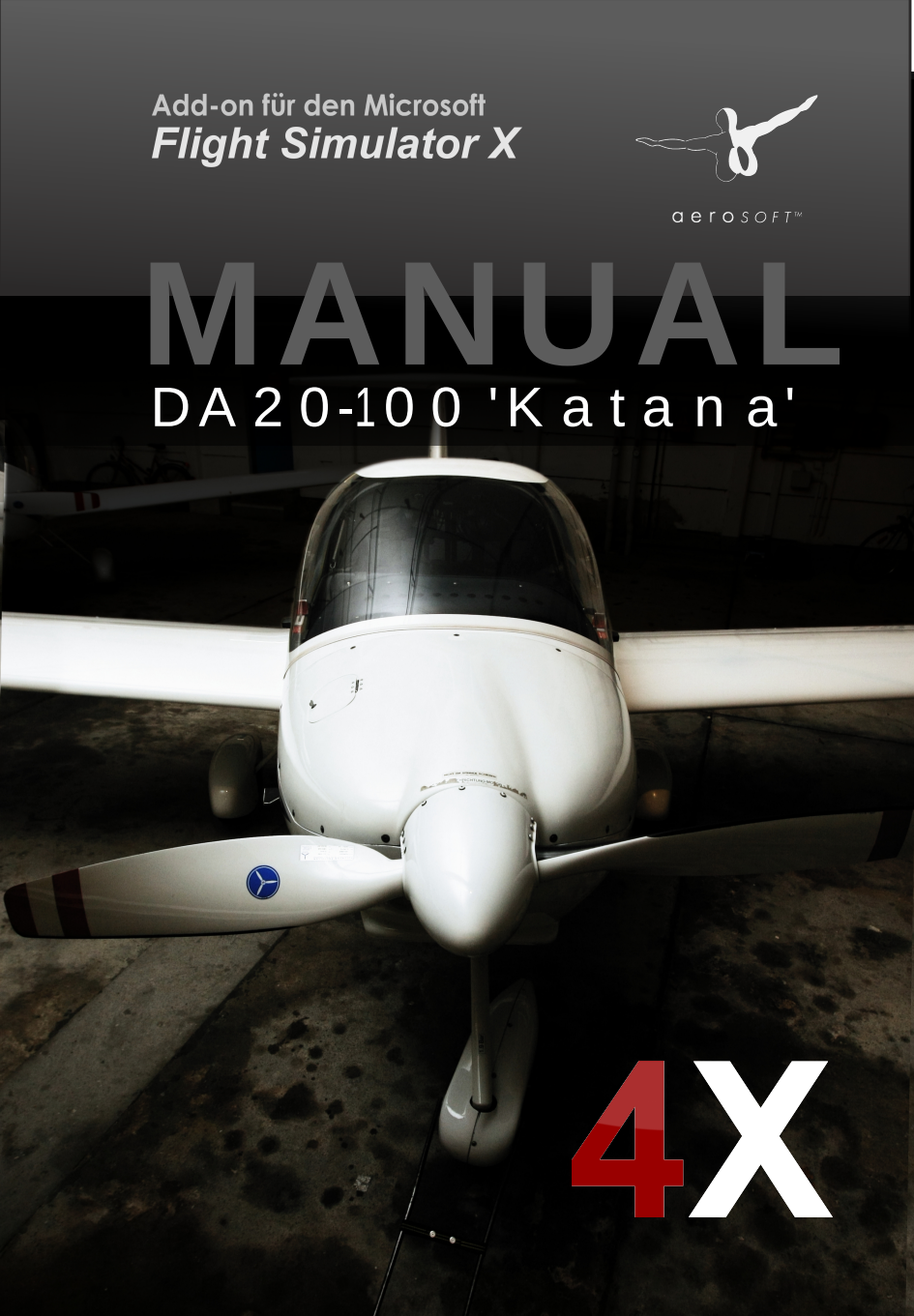
Add-on für den Microsoft
Flight Simulator X

aerosoft™

MANUAL

DA20-100 'Katana'



4X

Neither the software nor the documentation may be used for real aviation and training purposes.

1.2 DEVELOPMENT TEAM

1.2.1 DEVELOPERS

Marcel Felde	Models, Graphics, Sounds, Systems, Manuals
Alexander M. Metzger	Aerodynamics
Otmar Nitsche	Load/Save Modul

1.2.2 SUPPORT

Diamond Aircraft Industries GmbH, Wiener Neustadt
Diamond Aircraft Industries Deutschland GmbH, Egelsbach
Hanseatischer Fliegerclub Frankfurt e.V.

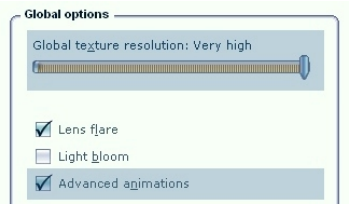
1.2.3 TEST TEAM

Thomas Wolff, Moritz Rudolph, Tim Scharnhop, Roland Pohl, Chris Schnaedelbach, Aidan Sandri, Andreas Paschen, Jan Böhling

A big thank you to all that supported us in our work on this project - the employees of Diamond Aircraft, Diamond Air Service, Hanseatischer Fliegerclub and Aerosoft, the pilots and testers, our families and friends that had to stand back from time to time, while we were working on this project.

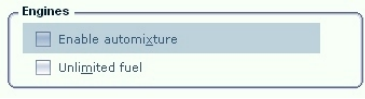
1.3 CONFIGURATION

1.3.1 FSX SETTINGS



Global texture resolution should be set to **Very high** to get sharp and detailled textures, especially in the virtual cockpit.

Advanced animations need to be enabled for skin animations and special effects.



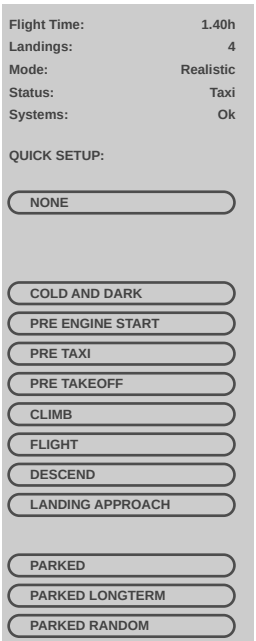
Enable automixture has to be untagged as the Katana features a carburetor simulation.

Many systems of the **Diamond DA20-100 'Katana' 4x** were implemented beyond the possibilities of FSX. So there are some keyboard shortcuts that won't work on the Katana. For example CTRL+E for autostarting the engine or SHIFT+M to turn on battery power.

1.3.2 STARTUP SITUATION

The startup situation of FSX is of major influence on the different systems of the Katana. In the first seconds after loading, the aircraft tries to interpret the actual situation and to configure itself accordingly. The **Initiation Window** will appear and offer further informations and options.

1.3.3 INITIATION WINDOW



The information part shows accumulated flight hours and landings in realistic mode, the operation mode, and the detected aircraft status. The **systems: ok** message indicates that the add-on modules are working properly.

If you do not want to change the systems setup click **None** to close the **Initiation Window**.

In case the aircraft status has not been detected correctly or you prefer to alter the situation, choose one of the different settings. The aircraft will be configured accordingly.

There are three status settings for parking situations.
Longterm: The aircraft has been parked for a long period.
Random: You don't when the aircraft has been flown for the last time and in which condition it has been left.

1.3.4 HARDWARE SETTINGS

It is of importance to ensure that there are no hardware signals for the propeller pitch, mixture or spoilers getting into the Katana system simulation!

Normally it is sufficent to move propeller and mixture levers to the most forward position and the spoiler lever to the position the spoilers are completely retracted. But if the hardware does have spikes in its signals, it will interfere the systems.

NOTE:
Even removed hardware can lead into trouble because FSX or FSUIPC may interprete the missing signal as the command to move the axis to the center position. Before using new or other hardware it is recommended to delete the functions on this device before changing to another. If the device is not available anymore, it may be the only solution to delete the settings in the config files.

If the Katana suffers low engine power, heavy drag or the engine won't even start or keep running also the aircraft has been maintained, it is possibly some hardware conflict and worth checking and removing some assignments in FSX or FSUIPC.

NOTE:
The propeller lever of the Katana can be assigned via FSUIPC with the 4X L:LEVER_PROPELLER_PITCH function. It is very important to ensure, that the same lever is not assigned to another FSX or FSUIPC setting. It is also possible in the Katanas settings to disable the propeller governor simulation and to use the hardware for changing propeller pitch like usual.

Further explanations on the FSUIPC options can be found at the end of this document.

1.4 ADD-ON OPERATION

1.4.1 4X MENU (SHIFT+3)

The SHIFT+3 keyboard shortcut opens the **4X Menu** to handle all those actions and options that can not be set from the pilots seat.

The first three entries will open submenu icons to handle further windows.

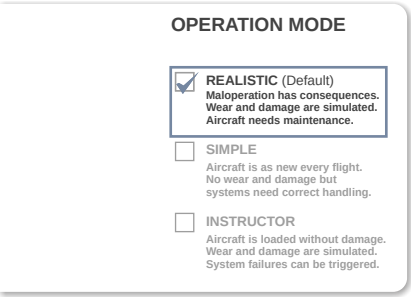
Preflight This menu offers options for preparing the aircraft before your flight, refueling and cleaning. Only available with parked aircraft.

Maintenance Maintaining the aircraft, servicing and changes of the equipment. Only available with parked aircraft.

Instructor These windows are only available if the add-on is operated in **Instructor Mode** and offer the possibility to influence the aircraft systems with a mouse click.

Settings All settings on how to use the add-on can be selected here, including effects and operation modes.

1.4.2 SETTINGS OPERATION MODE



The aircraft can be operated in three different modes to fit the different needs of virtual aviatiors. Some special features will only be available in **Realistic Mode** to reward the user willing to meet the challenge.

Simple does not mean that the Katana will behave like the default aircraft. The systems need to be operated correctly but there will be no damages and no wear.

The operation mode can be switched for one flight by a left click or permanently with a right click. Only one selection is possible without reloading or changing the aircraft.

Realistic

The aircraft has to be operated with care and should be maintained. Damages and wear may occur and will be stored with other data. Special features are enabled.

> **NOTE:**
> All damage and wear simulation within the Katana should be considered as effects aside the FSX crash detection. A FSX crash event will not influence the Katanas systems as this would mean a completely destroyed aircraft.

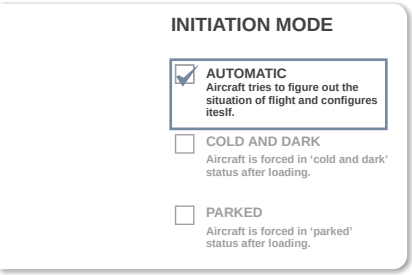
Simple

The aircraft is brand new every time when loaded. No damages and wear, no special features. No data stored.

Instructor

The aircraft is brand new every time when loaded. Damages and wear can occur but will not be stored. Systems can be influenced with a special user interface.

1.4.3 SETTINGS INITIATION MODE



As soon as the Katana has been loaded, the add-on tries to figure out the situation of the aircraft to configure itself. This mechanism can be overridden by selecting **Cold and Dark** or **Parked**.

Automatic The aircraft shall be set into the appropriate condition. If it is not able to figure out ist situation, it will be forced into a status with engine and all systems running.

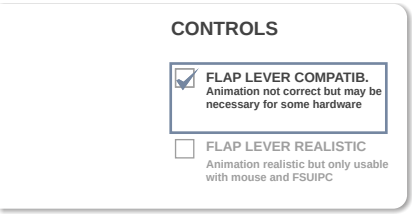
Cold and Dark The aircraft is ready to power up the systems and start the engine. It is advised to perform the walkaround check anyway.

Parked The aircraft has been parked for a while so you should check all the systems carefully and prepare the aircraft for the flight.

1.4.4 SYSTEM

Use this button to reload the aircraft. This may be usefull to reselect the operation mode or to reset the systems.

1.4.5 SETTINGS CONTROLS

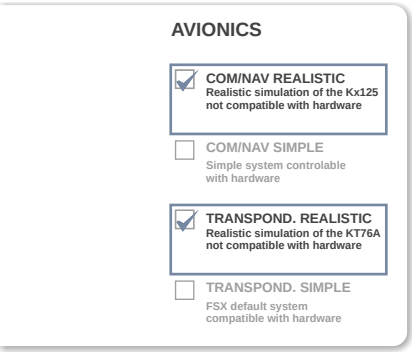


Selection whether the Flap Lever Handle should behave realistically or be compatible with your hardware.

Compatible The flaps system can be triggered by special hardware or with keyboard and joystick commands. But if the flaps are not operative, the lever will be fixed in that position instead of being movable as in reality.

Realistic The lever can be moved although the flaps may not be operative. Hardware control can only be achieved by FSUIPC commands.

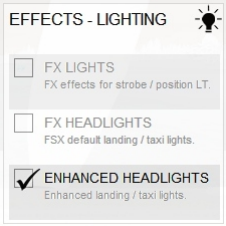
1.4.6 SETTINGS AVIONICS



The avionics can be switched to simple operation for autotune function or compatibility issues with hard- and software.

In simple mode all special functions will be disabled and the radio units operate like the default radios in FSX.

1.4.7 SETTINGS EFFECTS - LIGHTING

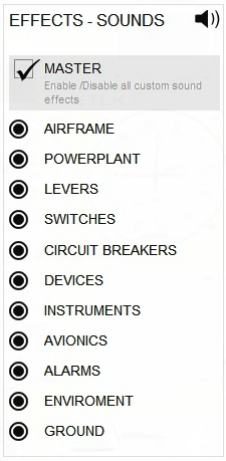


FX Lights
The Katana features lighted bulbs and subtle glow for all lights. Additionally the FSX default light effects can be enabled by activating FX Lights.

FX Headlights
By activating this option, the FSX default landing and taxi light cones are enabled.

Enhanced Headlights
More subtle and realistic headlights can be engaged with this selection.

1.4.8 SETTINGS EFFECTS - CUSTOM SOUNDS



This add-on comes with over 120 custom sounds to enhance the simulation experience.

You can enable/disable all or just some of the custom sound effects with this menu.

These options will not affect the sound engine of FSX.

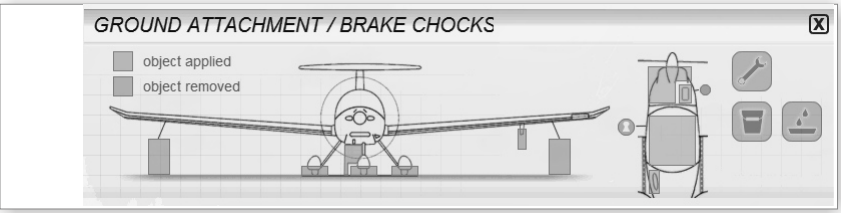
NOTE:
The custom sounds only work in the virtual cockpit.

1.4.9 SETTINGS EFFECTS - VIBRATION

Especially small airplanes get rattled and shaken by the engine and the propeller wind. This add-on features several vibration and motion effects that can be enabled and disabled in this menu section.

1.5 PREFLIGHT

1.5.1 PREFLIGHT - GROUND ATTACHMENTS



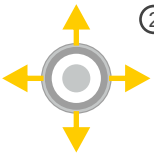
Brake Chocks, Fixations and Equipment can be applied or removed with this window.

Use this window to clear away everything at and around your aircraft for departure. Or secure it after your flight with brake chocks and/or fixations. Before getting into the cockpit, check for the cowling and the oil access door to be closed. That is indicated in blue color. No tools or equipment shall be lying around the aircraft. The pitot cover has to be drawn off as well. Those icons should be in blue color tagging them as removed.

1.5.2 PREFLIGHT - TOW BAR

After the area around the airplane has been cleared the Katana can be towed in proper position for further preflight preparations. Clicking on the Tow Bar button will open a circle icon in the middle of the screen. **Note: Through FSX limitations, moving straight forward after a turn is not possible anymore. It has to be moved in in curves to the desired position.**

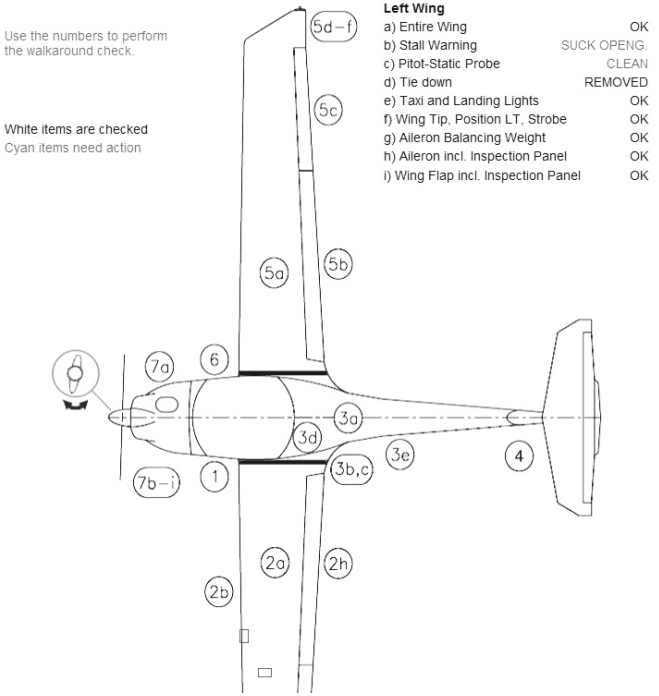
Left click the inner circle and drag the mouse cursor around the screen to move the aircraft.



While holding down the left mouse button, drag the cursor up or down to push or pull the aircraft and left or right to turn the tow bar. Release the button to stop.

Right click the inner circle to close the icon and remove the tow bar.

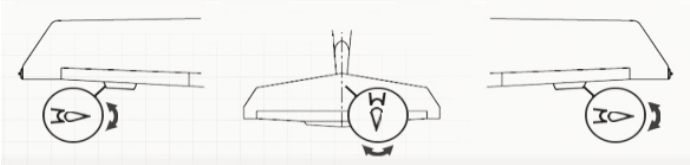
1.5.3 PREFLIGHT - WALKAROUND CHECK



The **Walkaround Check** window is a virtual inspection of the aircraft. Click on the circled numbers to open the respective checklist. Items that need attention are colored blue. Some of them can be done in this window, others are achieved through actions on other windows, for example the oil quantity check.

The propeller pitch can be tested via dragging the drawing of the blade in horizontal direction as indicated by the arrow.

1.5.4 PREFLIGHT - TRIM TABS



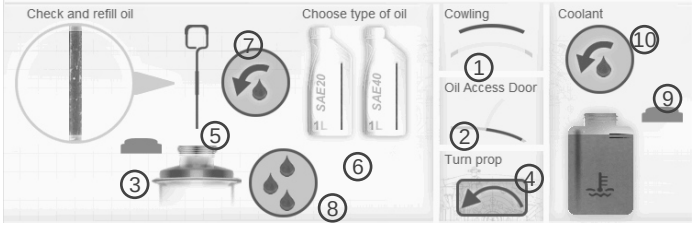
The **Trim Tabs** can be bend by dragging them with your mouse in the direction indicated by the respective arrows. Keep in mind that adjusting those tabs is only possible on ground at the parked aircraft.

1.5.5 PREFLIGHT - FUEL STATION

The **Fuel Station** is not only the place to refuel the aircraft but also to drain water out of the tank and to test the fuel quantity.

1. The Gas Pump is equipped with several indicators. Fuel costs can be altered by clicking the numbers on the **cost/liter** indicator. Right click will increase, left click will decrease the digit.
2. Choose the type of fuel you want to fill into the aircraft's tank.
3. Open the fuel tank cap.
4. Pull the fuel nozzle to the aircraft and into the tank filler neck.
5. Press and hold the button to refuel. It will automatically stop when the fuel reaches the maximum capacity. Remove the fuel nozzle when done.
6. Press the draining vent until there is fuel (yellow) fillling the bin and no more water (blue).
7. Press to dip the pipe into the tank. The pipe will be filled with fuel indicating the approximately fuel quantity. Close the fuel tank cap.

1.5.6 PREFLIGHT - OIL & LIQUIDS



The **Oil & Liquids** window is the place to check and refill oil and coolant liquid.

1 To reach the oil reservoir tank you can open the oil access door or remove the complete upper cowling. The latter action is necessary to access the coolant
2 reservoir bottle.

3 Remove the oil tank cap. Don't forget to close the tank after you are done.

4 Turn the propeller by dragging it with the mouse in normal operating rotation to transfer oil from the engine crankcase back into the oil reservoir tank. You can hear a gurgling sound when there is no oil but air drawn and the process is completed. Do not turn the propeller in the opposite direction! When the canopy is open, it is possible to turn the propeller from within the virtual cockpit.

5 Draw the dipstick into the tank and pull it out again after a few moments. On the enlarge view the oil should be running from within the flat and light gray area. That area indicates the maximum and minimum oil levels.

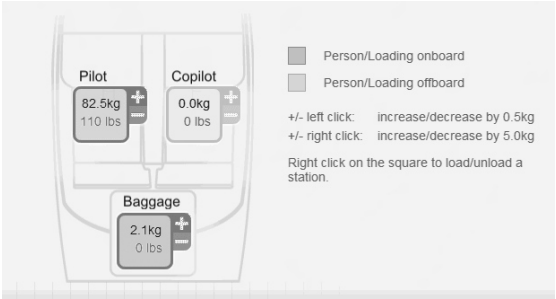
6 To refill oil first choose one of the oil cans and it will be highlighted. If there is no yellow stripe indicating the content, a right click on the can will make it a new and full bottle containing 1 litre. The stripe will become smaller indicating the reduced content during refilling.

7 Press the button to refill oil. Keep your eye on the bottles content indicator. Re-check oil content to not overfill the reservoir tank. If more oil is needed, click right on the can.

8 Press this button to drain oil out of the reservoir tank.

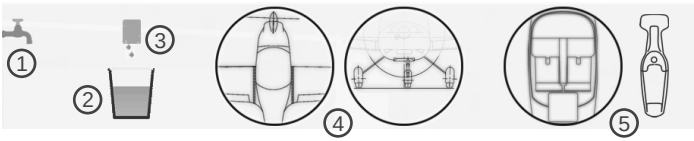
9 Open the coolant tank cap and press the button to refill coolant liquid. The minimum and maximum is indicated by two thin lines. Don't forget to close the cap
10 before closing the cowling.

1.5.7 PREFLIGHT - PAYLOAD



The **Payload** window is used to adjust the weights of the two pilots and their baggage. Each weight can be easily adjusted with the +/- buttons. The person or the baggage can be loaded or unloaded with a right click. The pilot will be loaded automatically if the aircraft is getting prepared for flight.

1.5.8 PREFLIGHT - CLEANING



1. Use the water faucet to fill the bucket.
2. Pull the bucket to the aircraft and below the sponge.
3. Move the sponge down into the bucket until it is full of water. Pull it up again.
4. As long as the sponge is wet, wipe with the mouse over the areas you want to clean. Some sorts of dirt need more work than others. For example oil is far more difficult to remove than insects and mud.
5. Turn on the vaccuum cleaner and move the mouse around in the cockpit to remove dirt from the cabin.

1.6 MAINTENANCE

1.6.1 MAINTENANCE - EQUIPMENT: AVIONICS

It is possible to replace the GPS500 unit with the GNS530 from RealityXP. That can be done directly in FSX without the need of editing cfg files or using an external installer. Of course, the GNS530 has to be installed properly before.

The installed unit is indicated by a hook and the word **Installed** next to the unit's name. By clicking the empty square of the desired device, the replacing icon will apear and the status bar should indicate the progress. As soon as the process has been finished the unit is available in the virtual cockpit.

NOTE:

Problems can occur on some systems if other radios from Reality XP are installed. In this case change this line

gauge47=rxpGNS!GNS530..

into

//gauge47=rxpGNS!GNS530..

in the panel.cfg which can be found here: [FSX]\SimObjects\Airplanes\ Diamond DA20-100 'Katana' \ panel

1.6.2 MAINTENANCE - EQUIPMENT: WHEEL FAIRINGS

Wheel Fairings are reducing drag of the landing gear and make the aircraft faster. But they are not suitable for all terrain. The fairings can be mounted or unmounted just by clicking on the corresponding position. Wait for the progress to be completed before starting another installation procedure.

1.6.3 MAINTENANCE - WORKSHOP

The **Workshop** is the place for all repairs and replacements of different systems and devices. It is advisable to visit this place from time to time if you are operating in **Realistic Mode**.

The first button can be used to start an inspection of all systems listed in the workshop window. The icon will start to move and the progress bar will indicate the status of the inspection. As soon as the bar is completed the icon will freeze and different systems may be marked with a yellow or red square.

Yellow markings indicate that the corresponding system is not in the best condition and should be maintained sooner or later.

Red markings indicate that the corresponding system is in bad condition and immediate maintenance is necessary.

Markings will disapear as soon as maintenance action has been started. So this does not mean that the system is back in good condition. Another inspection can be done to be sure.

The **Tool Button** is used to start the maintenance of a system. That is indicated my the moving icon and can be observed by the progress on the bar. There can only be one action at a time. The progress bar does not represent the status of the system nor is the system in perfect condition if the progress has been completed. It is just an indicator for working on the system. You can stop the action by clicking on the button again. The system is now at least in some better condition than before.

The **Replacement Button** is used to start the replacement of the corresponding system. The progress is indicated by the movement of the icon and the progress bar. In contrast to the maintenance action, the replacement has to be completed. Otherwise the system has not been exchanged. Replaced systems are always in perfect condition, new batteries are charged etc.

1.6.4 MAINTENANCE - SERVICE

Service is very similar to the workshop but deals with items such us fluids, brake pads etc. It is advisable to visit this place from time to time if you are operating in **Realistic Mode**.

The only button that has not yet been described in the maintenance section is for **Recharging** the battery. The action can be interrupted at every time but the battery may not be completely charged.

Depending on the type of fuel that is used in the aircraft, the **Oil Filter** should be changed regularly.

The **Inlet Baffle** should be installed at cold air temperatures.

If the fuel tank cap has not been closed it may get lost. Install a new one by replacing the **Tank Cover**.

1.7 INSTRUCTOR

The **Instructor Windows** are only available if the add-on is operated in **Instructor Mode**. They can be used to easily influence the aicraft's and system's status and conditions.

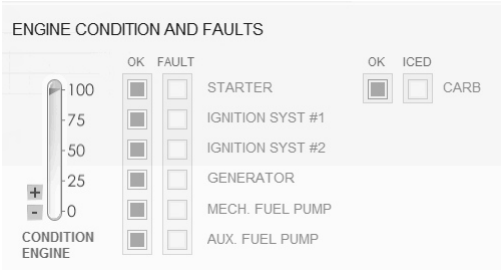
1.7.1 INSTRUCTOR - GENERAL

The upper area of the **General Window** displays the aircraft's position and speed and information about the environment and wind.

The **Aircraft Status** can be set with a single click on the different status boxes. The corresponding box will be colored blue for an active setting process and stays green for a few moments if the status has been successfully set. This will only affect aircraft settings, not the position, airspeed etc.

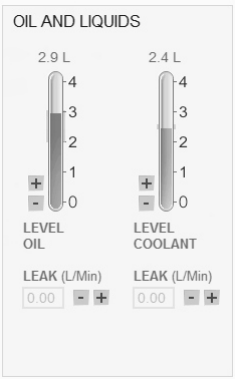
The **Systems Status** can be fixed easily with the the three boxes on the right. Within a second all systems can be repaired, liquids will be refilled or the batterycan be recharged.

1.7.2 INSTRUCTOR - ENGINE AND FUEL



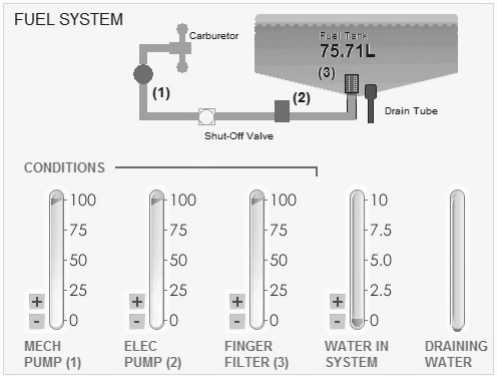
The **Engine Condition** can easily be set by dragging the condition bar or by using the +/- buttons.

Different systems of the engine can be set to **Fault** or back to **Ok** by clicking the corresponding box. Also the carburetor can be **Iced** and Deiced with a single click.



The content of the **Oil and Cooland Liquid** reservoirs can be changed by dragging the content bars or clicking the +/- button.

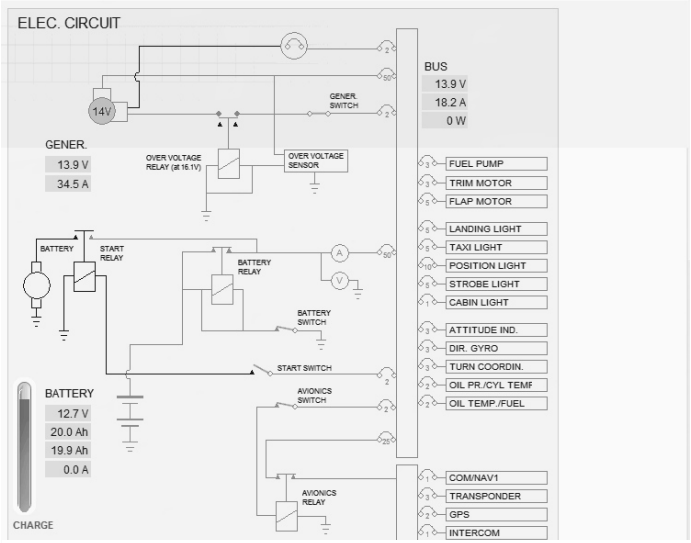
At the bottom it is possible to engage and set a **Leak** for each system. It can be adjusted by dragging the value display or by clicking the +/- buttons. A right click on the bar will set the optimum filling level.



The drawing of the **Fuel System** is interactive and can be influenced directly. The fuel content can be set by dragging and valves and pumps can be clicked. The fuel pipes will be colored to show if fuel is running through them.

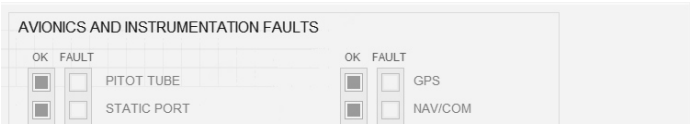
The **Conditions** of Pumps and the Filter can be be set by dragging the status bar or by using the +/- buttons. Additionally, the contamination by water can be adjusted in the same way. Clicking the Draining Water bar will drain away accumulated water at the bottom of the tank. Clicking a bar with the right mouse button will repair the corresponding system.

1.7.3 INSTRUCTOR - ELECTRIC CIRCUITS



The drawing of the **Electric System** is interactive: switches and circuit breakers can be set with a right click and the charge of the battery can be changed by dragging the status bar.

1.7.4 INSTRUCTOR - AVIONICS AND INSTRUMENTS



The pitot and and static system, gyros and avionics can be set to **Fault** or back to **Ok** by clicking the corresponding boxes.

1.8
COCKPIT HANDLING

This chapter is about how to control and handle elements of the cockpit with the help of the input devices.

1.8.1 CONCEPTS

2-POS SWITCHES

Left click : toggle switch position
Wheel down : move switch into the lower position
Wheel up : move switch into the upper position

Hint: a right click on the battery master switch will also move the generator switch to ON. If the battery switch is disengaged, the generator switch will also be toggled into the OFF position like in the real aircraft.

3-POS SWITCHES (Elevator trim switch)

Left click : click a side of the switch to hold it down

SELECTORS and ROTARIES with steps

Left click : turning knob left
Right click : turning knob right
Wheel down : turning knob left
Wheel up : turning knob right

ROTARIES without steps

Left Drag : turning knob left and right
Wheel down : turning knob left
Wheel up : turning knob right

ROTARIES pullout

Left click faceplate : push rotary in
Right click faceplate : pull rotary out

BUTTONS

Left click : push button
Right click : push button and hold

THROTTLE and PROP LEVER

Left Drag forward/back Move lever forward/backward
Wheel down : Fine movement backward
Wheel up : Fine movement forward

Hint: The friction wheel increases/decreases the dragging sensitivity.

Hint: The propeller lever may also be moved by dragging or rotating the mouse wheel over the RPM indicator.

LEVERS at the console

Left Drag forward/back : Move lever forward/backward
Right click : Move the lever to the opposite position
Wheel down : Fine movement backward
Wheel up : Fine movement forward

2-POS ELEMENTS (for example canopy locks)

Left click : toggle element position

ELEMENTS with stepless movement

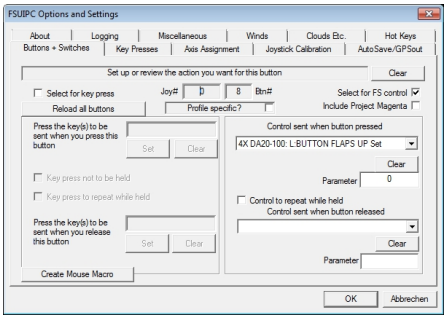
Left Dragging : Move the element in the corresponding direction

PROPELLER

Left Dragging : Rotating the propeller
Right Dragging : Moving the propeller pitch

1.A FSUIPC SETTINGS

Because the Katana is simulated beyond the possibilities of FSX, most keybord and hardware assignments will not work. If you own a registered version of FSUIPC, there are nearly 100 variables available to control the DA20-100 with buttons, switches and levers. All controls are named with ‚4X DA20-100' so they are easy to find.



Select the **Buttons + Switches**, **Key Presses** oder **Axis Assignment** window and activate the control. There are different ways to assign buttons and switches, please have a look into the documentation of FSUIPC for further information.

A few examples:

If you own a 5 position switch or a real starter key, you can set every position

A few examples:

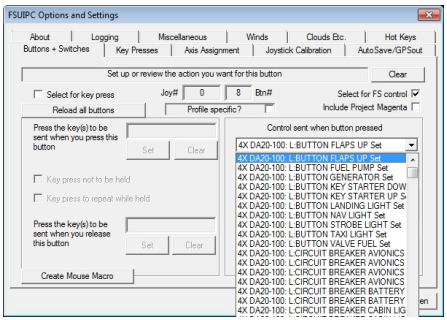
If you own a 5-position switch or a real starter key, you can set every position with variable **L:KEY_STARTER=SET** and the Parameters 0,1,2,3 and 4. **0** will be **OFF**, **4** will be **START**.

If you use a Joystick with a limited number of buttons, you may want to use one button to turn the key left or one to turn it right. In this case, use **L:BUTTON_KEY_STARTER_DOWN** and **L:BUTTON_KEY_STARTER_UP** .

You can use a 2-position toggle switch for the battery master switch with **L:SWITCH_BATTERY=SET** and using the Parameters 0 and 1.

Or you can use just one button to toggle it **ON/OFF** with **L:BUTTON_BATTERY_MASTER**.

It is possible to use a lever for the carburetor heat with **L:LEVER_CARB_HEAT**. Or to use two buttons to push and pull the lever with **L:BUTTON_CARB_HEAT** and the parameters 0 and 1. Or to use just one button: Assign the parameter 1 under **Control sent when button pressed** and parameter 0 in the **Control sent when button is released** field. That will engange the Carb Heat only as long as the button will be pressed.



2.0 OPERATING LIMITATIONS

2.1. INTRODUCTION

Chapter 2 of this Flight Manual addresses the operating limitations, instrument markings, airspeed indicator markings, and the limitation placards which are necessary for the safe operation of the airplane, its engine, and standard systems and equipment.

WARNING:

These limitations must be complied with for all operations.

2.2. AIRSPEED LIMITATIONS

	IAS			
IAS	kts	mph	km/h	Remarks
V_A Maneuvering Speed	104	120	193	Do not make full or abrupt control movement above this speed, because under certain conditions the airplane may be overstressed by full control movement.
V_{FE} Maximum Flap Extended Speed	81	93	150	Do not exceed this speed with flaps extended.
V_{NO} Maximum Structural Cruising Speed	118	135	218	Do not exceed this speed except in smooth air, and then only with caution,
V_{NE} Never Exceed Speed	161	185	298	Do not exceed this speed in any operation.

2.3. AIRSPEED INDICATOR MARKINGS

	IAS			
Marking	kts	mph	km/h	Explanation
White Arc	37-81	43-93	69-150	Operating range with extended flaps.
Green Arc	41-118	47-135	76-218	Normal operating range.
Yellow Arc	118-161	135-185	218-298	Maneuvers must be conducted with caution and only in smooth air.
Red Line	161	185	298	Maximum permissible speed for all operating modes.

2.4. POWER PLANT LIMITATIONS

2.4.1 ENGINE

a) Engine Manufacturer : Bombardier Rotax,Gunskirchen/Austria

b) Engine Type Designation : 912S3

> **NOTE:**
> The propeller is driven by the engine via a reduction gear with a ratio of 2.43:1. 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.)	: 59.6 kW / 80 hp
Max. Permissible T/O RPM	: 2550 RPM
Max. Continuous Power	: 58 kW / 78 hp
MaMax. 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 bar (7.0)

(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	: 275°F (135°C)

(h) Fuel Specifications

Approved Fuel Grades	: AVGAS 100LL Unleaded Automotive Fuel 95 RON /91 AKI
(i) Oil Grades	: 4 stroke motorcycle oil of a registered brand with gear additives that meets or exceedes API classification SF or SG are highly recommended.

2.4.2 PROPELLER

(a) Propeller Manufacturer	: Hoffmann Propeller, Rosenheim/Germany
(b) Propeller Type	: HO-V352F/170FQ OR
(c) Propeller Diameter	: 1.70 m (5 ft 6.9 in)
(d) Propeller Pitch (at 3/4 radius)	: 10° - 35°

(e) Propeller Speed Limitations

Max. T/O RPM (max. 5 min.)	: 2385 RPM
Max. Continuous RPM	: 2260 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 Operat. Range	**Yellow Arc** Caution Range	**Red Line** Upper Limit
Tachometer	-	600-2260 RPM	2260-2385 RPM	2385 RPM
Oil Temperat. Indicator	122°F 50°C	122-266°F 50-130°C	-	266°F 130°C
Cylinder Head Temperature Indicator	-	-	-	275°F 135°C
Oil Pressure Indicator	12 psi 0.8 bar	29-73 psi 2 - 5 bar above 1440 RPM	12 - 29 psi 0.8 . 2 bar below 1440 RPM 73 - 102 psi 5 - 7 bar	102 psi 7 bar

* Recommended nominal idle speed = 950 RPM

2.6. MISCELLANEOUS INSTRUMENT MARKINGS

Instrument	**Red Line** Lower Limit	**Green Arc** Normal Operat. 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	: 750 kg (1653 lbs)
Maximum permissible weight in the baggage compartment	: 20 kg (44 lbs) 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.

Most forward CG (all weights)	: 250 mm (9.84 in) aft of RD
Most rearward CG (all weights)	: 390 mm(15.35 in) 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 NORMAL Category in accordance with JAR-VLA.
Permissible Normal Category Maneuvers:

a) All normal flight maneuvers

b) Stalls (except WHIP 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 ext. 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 day visual flight rules.

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:
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 litres)
Usable Fuel:	19.5 US gal. (74 litres)
Unusable Fuel:	0.6 US gal. (2 litres)

2.15. PLACARDS

Intentionally left out.

2.16. DEMONSTRATED CROSSWIND COMPONENT

The maximum demonstrated crosswind component is 15 kts (27 km/h).

2.15. TEMPERATURE LIMITS

Limits for outside air temperature and temperature of the structure for the operation of the airplane:

Maximum T/O Temperature : : 131°F (55°C)
Structural Temperature Limit

3.0 EMERGENCY PROCEDURES

3.1. INTRODUCTION

Chapter 3 of this Flight Manual deals with emergency procedures and contains check-lists and descriptions how to operate the aircraft in emergency situations.

3.2. AIRSPEEDS DURING EMERGENCY PROCEDURES

	IAS		
	kts	mph	km/h
Engine failure after take-off with flaps in T/O position	60	68	110
Manoeuvering Speed	104	120	193
Airspeed for best glide angle			
Wing Flaps in T/O Position 1653 lbs (750kg)	73	84	135
Wing Flaps in T/O-Position 1322 lbs (600kg)	66	76	121
Precautionary Landing (with power and Wing Flaps in LDG position)	57	66	106
Emergency Landing (with engine off and Wing Flaps in T/O or LDG position)	57	66	106
Emergency Landing (with engine off and 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.

b) Engine Failure during Flight

I. ENGINE RUNNING ROUGHLY

1.	Carburetor Heat	ON
2.	Electric Fuel Pump	ON
3.	Choke	check OFF
4.	Fuel Shut-off Valve	check OPEN
5.	Ignition Switch	cycle L - BOTH - R - BOTH
6.	Throttle	at present position
7.	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

II. 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}) 120 kts / 138 mph / 222 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 LANDINGS

a) Emergency Landing Approach with Engine off

1.	Airspeed (V_{IAS}) Flaps in T/O or LDG position Flaps UP	 57 kts / 66 mph / 106 km/h 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
3.	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 1653 lbs (750 kg) (V_{IAS})	73 kts / 84 mph / 135 km/h
3.	Glide Ratio 14, which means at 1000 ft/305m above ground, and with no wind the distance of glide is 2.3 NM (4.25 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 (GEN. Annunciator Illuminated)

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

b) Generator Failure

1.	Master Switch (Generator)	Cycle OFF - ON
2.	Gen. Circuit Breaker	If tripped, reset
3.	Gen. Control Circuit Breaker	If tripped, reset
4.	If Gen. can't be brought on-line	Switch OFF all non-flight essential electrical consumers. Monitor Ammeter and Voltmeter. Land at 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 remains 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.	Avionic Master Circuit Breaker	If tripped, re-engage and monitor status. If it trips again, land at nearest suitable airport
2.	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 it 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

1.	Rocker Switch, map light	ON
2.	Rocker Switch, I-panel lighting	Cycle 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 (2260 RPM) cannot be exceeded at any throttle setting and airspeed. However, maximum engine power may not be available.

4.0 NORMAL OPERATION

4.1. INTRODUCTION

Chapter 3 of this Flight Manual deals with normal operating procedures and contains checklists and descriptions how to operate the aircraft.

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.

	V_{IAS}		
TAKE-OFF	kts	mph	km/h
Climb Speed during normal take-off for 15 m (50 ft) obstacle	57	66	106
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

	V_{IAS}		
LANDING	kts	mph	km/h
Approach speed for normal landing (Wing Flaps LDG)	57	66	106
Balked landing climb speed (Wing Flaps LDG)	57	66	106
Max. demonstrated crosswind speed during take-off and landing	15	17	27

	V_{IAS}		
CRUISE	kts	mph	km/h
Max. permissible speed in rough air V_{NO}	118	135	218
Max. 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 temperature limitation is exceeded. The indicator need only be checked if the OAT exceeds 38° C (100° F).

The indicator is accessed by lifting the flap between the two seatback cushions. The indicator is visible through the cut out in the seat shell backs.

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 red "55" (° C) on a black background.

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.

FSX OPERATION:
The temperature sensor is accessed by clicking on the lower area between the two seatback cushions.

4.4. NORMAL OPERATION CHECKLIST

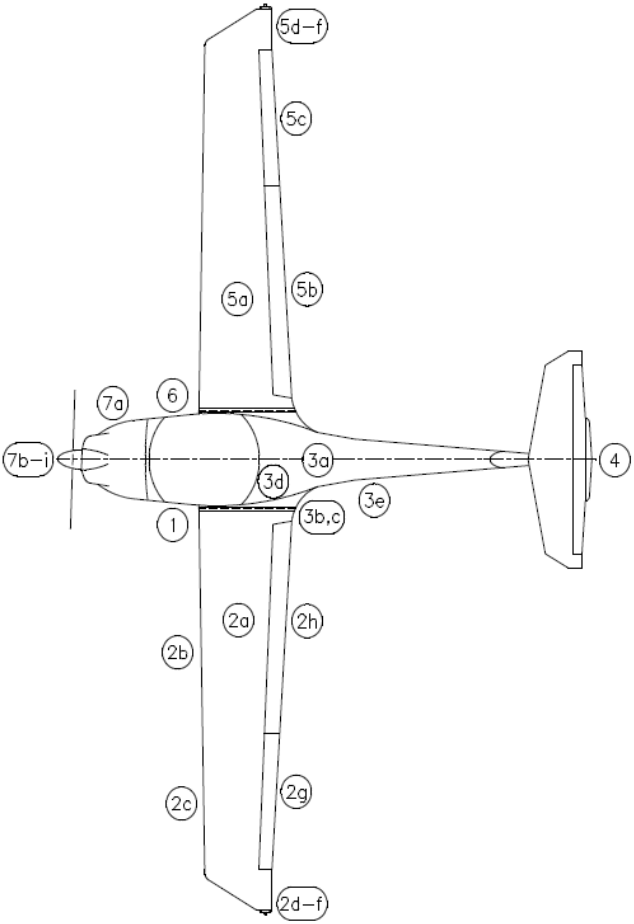
4.4.1 PREFLIGHT INSPECTION

I. In-Cabin Check

1.	Structural Temperature Indicator if OAT exceeds 38°C (100° F)	check that Structural Temp. does not exceed 55° C (131°F)
2.	Airplane Documents	check
3.	Flight Control Lock	removed
4.	Flight Controls	check for proper direction of movement
5.	Ignition Key	pulled out
6.	Carburetor Heat	free, OFF
7.	Cabin Heat	free
8.	Choke	free, self-resetting
9.	Parking Brake	free
10.	Throttle	free, IDLE
11.	Propeller Speed Control Lever	free, max. RPM
12.	Master Switch (Battery)	ON
13.	Warning Lights (Gen., Fuel Press., and Canopy)	illuminated
14.	Fuel Quantity	sufficient
15.	Engine Gauges, Ammeter and Voltmeter	check
16.	Circuit Breakers	pressed in
17.	Map Light	operational
18.	Instrument Lights	operational and dimmable

19.	Trim	NEUTRAL
20.	Wing Flaps (Indicator- and Flap Actuation)	check, extend and retract fully
21.	Trim and Flap Indicator Lights	operational and dimmable
22.	Exterior Lights	operational as required
23.	Master Switch (Battery)	OFF
24.	Foreign Object Inspection	done
25.	Emergency Locator Transmitter (ELT):	
	EBC Model 502	ARM
	EBC Model 102A	OFF
26.	Fire Extinguisher	check
27.	Baggage	stowed, baggage net attached
28.	Canopy	clean, undamaged

II. Walk Around Check and Visual Inspection



CAUTION:
Visually inspect for the following conditions: Defects, contamination, cracks, delaminations, excessive play, insecure or improper mounting and general condition. Additionally, check the control surfaces for freedom of movement.

CAUTION:
Set PARKING brake prior to removing wheel chocks

1. Left Main Landing Gear

a)	Landing Gear Strut	visual inspection
b)	Wheel Fairing	visual inspection
c)	Tire Pressure (33 psi / 2.3 bar)	check
d)	Tire, Wheel, Brake	visual inspection
e)	Wheel Chocks	remove

2. Left Wing

a)	Entire Wing	visual inspection
b)	Stall Warning	check (suck on opening)
c)	Pitot-Static Probe	clean, holes open
d)	Tie down	remove
e)	Taxi and Landing Lights	visual inspection
f)	Wing Tip, Position Lights and Strobe	visual inspection
g)	Aileron Balancing Weight	visual inspection
h)	Aileron including Inspection Panel	visual inspection
i)	Wing Flap including Inspection Panel	visual inspection

3. Fuselage

a)	Skin	visual inspection
b)	Tank Vent	check
c)	Tank Drain	drain water
d)	Fuel Quantity	visual inspection (use fuel pipette)
e)	Antennas	visual inspection

4. Empennage

a)	Stabilizers and Control Surfaces	visual inspection
b)	Tie down	remove
c)	Trim Tabs	visual inspection

5. Right Wing

a)	Entire Wing	visual inspection
b)	Wing Flap including Inspection Panel	visual inspection
c)	Aileron including Inspection Panel	visual inspection
d)	Aileron Balancing Weight	visual inspection
e)	Wing Tip, Position Lights and Strobe	visual inspection
f)	Tie down	remove

6. Right Main Landing Gear

a)	Landing Gear Strut	visual inspection
b)	Wheel Fairing	visual inspection
c)	Tire Pressure (33 psi / 2.3 bar)	check
d)	Tire, Wheel, Brake	visual inspection
e)	Wheel Chocks	remove

7. Nose

a)	Oil	check level by using dip-stick. min / max range is indicated by flat area of stick
	Coolant	Level must be between dip-stick markings, refill if required.
b)	Cowling	visual inspection
c)	Air Intakes (five)	free
d)	Propeller	visual inspection, Ground Clearance; minimum: approx. 25 cm (10 in).
e)	Propeller Blades	perform Pitch Check by Hand
f)	Spinner	visual inspection
g)	Nose Gear	visual inspection
h)	Wheel Fairing	visual inspection, towbar removed
i)	Tire Pressure (26 psi / 1.8 bar)	check
j)	Tire and Wheel	visual inspection
k)	Wheel Chocks	remove

4.4.2 BEFORE ENGINE STARTING

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	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:
Extremely low temperatures require that the engine be preheated prior to engine start. Satisfactory engine starts have been demonstrated at -31ºF (-35ºC) 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 Start	approx. 3/4 in (2 cm) forward
4.	Choke	Cold Start	ON, fully pulled and hold
		Warm Start	OFF
5.	Toe Brakes		Hold
6.	Propeller Area		Clear

WARNING:
Ensure that propeller area is clear!

7.	Ignition Key	START

NOTE:
During extremely 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 12 psi (0.8 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.

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	1700-1800 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 diff. (L/R): 50 RPM Min. RPM diff. (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 2260 RPM to 2385 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 wheelbrakes. 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})	57 kts / 66 mph / 106 km/h

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

Lift-off Speed (V_{IAS})	54 kts / 62 mph / 100 km/h
Climb Speed (V_{IAS})	57 kts / 66 mph / 106 km/h

12.	Propeller Speed Control Lever	2260 RPM (after reaching safe height)
13.	Electric Fuel Pump	OFF

NOTE:
In order to avoid excessive noise, the propeller speed should be reduced to 2260 RPM as soon as a safe flight altitude has been reached.

4.4.8 CLIMB

1.	Propeller Speed Control Lever	2260 RPM
2.	Throttle	FULL
3.	Engine Gauges	within green range
4.	Wing Flaps	T/O
5.	Airspeed	65 kts / 75 mph / 120 km/h
6.	Trim	adjust

NOTE:
The best rate of climb speed decreases with increasing altitude.

NOTE:
Electric fuel pump ON above 13,000 ft.

	Speeds VIAS					
	Flaps T/O			Flaps UP		
ALTITUDE (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 -10,000	62	71	115	-	-	-
7000 -10,000	59	68	110	-	-	-

4.4.9 CRUISE

1.	Throttle	as required
2.	Propeller Speed Control Lever	1700 - 2260 RPM

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

NOTE:
Electric fuel pump ON above 13,000 ft.

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	1700 - 2260 RPM
4.	Carburetor Heat	as required

NOTE:
To achieve a fast descent:

Propeller Speed Control Lever	2260 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.

5.	Wing Flaps	UP
6.	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	UP
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	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 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 / sec
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.

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 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})

5.0 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 (15° C (59° F) and 1013.25 mbar (29.92 in. Hg) 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 %.

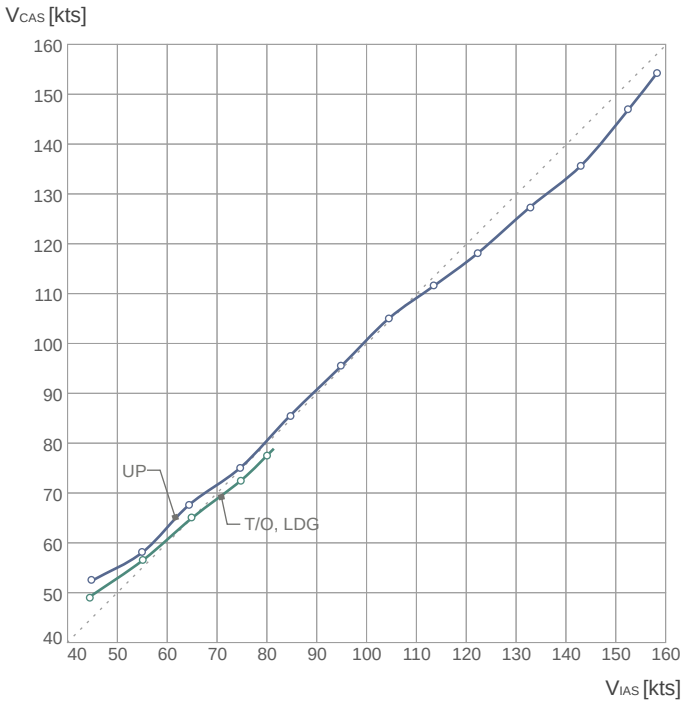
5.2. USE OF PERFORMANCE TABLES AND DIAGRAMS

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 AIRSPEED SYSTEM CALIBRATION

Assumes zero indicator error



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

5.3.2 CRUISING PERFORMANCE

Pressure altitude		Standard Temp.		Engine Power in % of maximum continuous power							
				55%				65%			
				RPM	MP	Fuel Flow		RPM	MP	Fuel Flow	
Ft.	M	°C	°F	X100	In.Hg	L/hr	Gal/hr	X100	In.Hg	L/hr	Gal/hr
0	0	15	59	19	24.7	13.6	3.6	20	25.7	15.6	4.1
2000	600	11	52	19	24.0	14.4	3.8	20	24.7	16.0	4.2
4000	1200	7	45	19	23.3	15.6	4.1	21	23.3	16.8	4.4
6000	1800	3	38	20	22.0	16.8	4.4	22	22.7	19.6	5.2
8000	2400	-1	31	21	21.0	18.0	4.8	22	21.7	21.2	5.6
10000	3000	-5	24	22	19.7	19.2	5.1	22.6	20.3*	22.4*	5.9*
12000	3600	-8	17	22.6	18.0*	20.4*	5.4*				
13000	4000	-11	12	22.6	17.0*	21.5*	5.7*				

Pressure altitude		Standard Temp.		75%				85%			
				RPM	MP	Fuel Flow		RPM	MP	Fuel Flow	
Ft.	M	°C	°F	X100	In.Hg	L/hr	Gal/hr	X100	In.Hg	L/hr	Gal/hr
0	0	15	59	21	27.0	18.0	4.8	22.6	27.7	22.0	5.8
2000	600	11	52	22	25.7	18.4	4.9	22.6	26.7	22.4	5.9
4000	1200	7	45	22.6	24.3	19.6	5.2	22.6	25.7*	25.2*	6.7*
6000	1800	3	38	22.6	23.3	23.2	6.1				
8000	2400	-1	31	22.6	22.0*	23.6*	6.2*				

Pressure altitude		Standard Temp.		Maximum Continous Power				Maximum Take-Off Power			
				RPM	MP	Fuel Flow		RPM	MP	Fuel Flow	
Ft.	M	°C	°F	X100	In.Hg	L/hr	Gal/hr	X100	In.Hg	L/hr	Gal/hr
0	0	15	59	22.6	28.3	26.0	6.9	23.8	29.7*	30.0	7.9*
2000	600	11	52	22.6	27.7*	26.8*	7.1*				
4000	1200	7	45	22.6	25.7*	25.2*	6.7*				
6000	1800	3	38								

Fuel flow is given in US-gal.

Data labelled * give a basis for interpolation. These values may not be attained at the stated altitude. 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 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	33	41	47	49	52	59	62

Stall speeds in mph

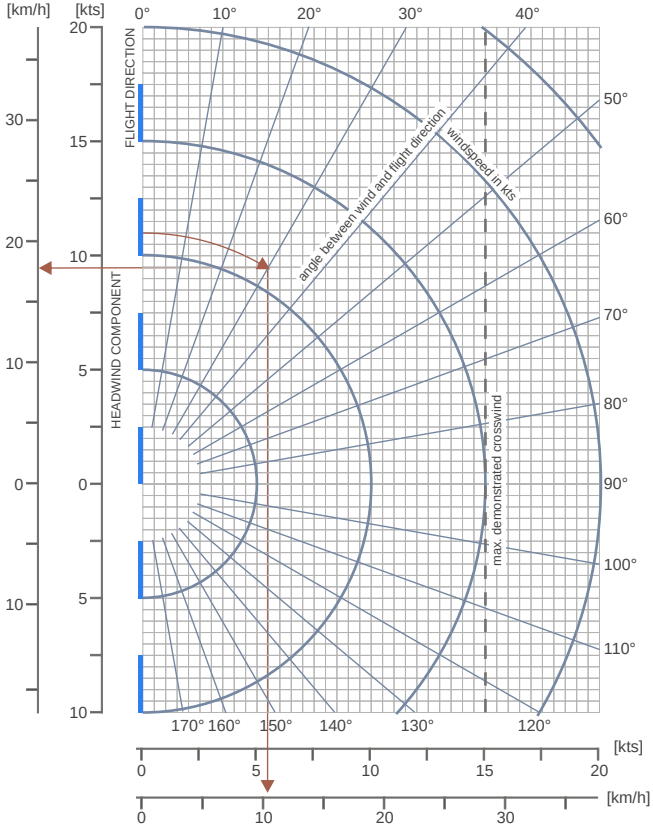
Flaps	Bank Angle							
	0°		30°		45°		60°	
	IAS	CAS	IAS	CAS	IAS	CAS	IAS	CAS
UP	47	57	53	62	63	68	79	81
T/O	45	52	51	56	59	62	72	75
LDG 	43	50	47	54	56	60	68	72

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 WIND COMPONENTS

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



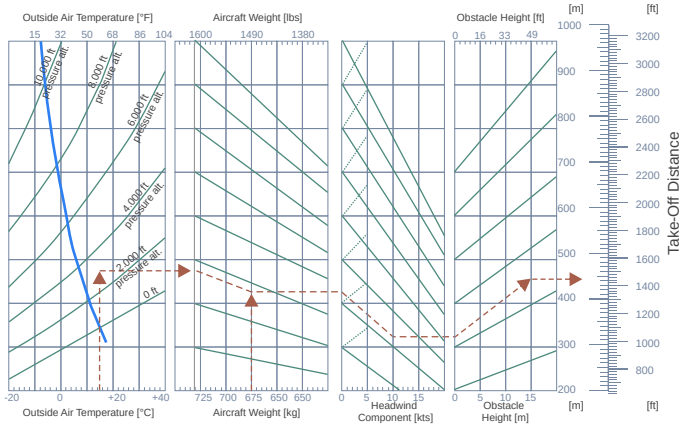
Example:

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 TAKE-OFF DISTANCE

Conditions:

- Maximum take-off power
- Lift-off speed 53 KIAS and speed for climb over obstacle 57 KIAS
- Level runway, paved
- Wing Flaps T/O



Example:

- Pressure altitude:	3000 ft
- Outside temperature:	15° C (59° F)
- Weight :	725 kg(1598 lbs)
- Wind:	10 kts

Result:

- Take-Off roll distance:	312 m (1025 ft)
- Take-Off distance to clear a 15 m (50 ft) obstacle:	434 m (1425 ft)

NOTE:

Poor maintenance condition of the airplane, deviation from the given procedures as well as unfavourable outside conditions (high temperature, rain, unfavourable wind conditions, including cross-wind) could increase the take-off distance considerably.

For take-off from dry, short-cut grass covered runways, the following corrections must be taken into account, compared to paved runways:

- Grass up to 5cm (2in) deep: 10% increase in take-off roll distance;
- Grass 5 to 10cm (2 to 4in) deep: 15% increase in take-off roll distance;
- Grass deeper than 10cm (4in): 25% increase in take-off roll distance.

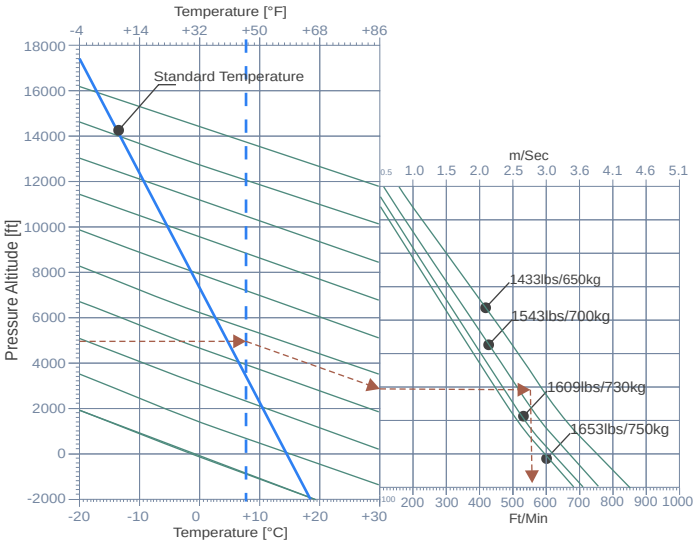
On wet soft grass covered runways with grass deeper than 10cm (4in), the take-off roll distance might be increased by as much as 40%.

This information is provided for guidance purposes only and has not been demonstrated.

The dashed lines in the above diagram (wind component) represents tailwind.

5.3.6 CLIMB PERFORMANCE / SERVICE CEILING

Service Ceiling (in standard conditions):	17600 ft (5365 m)
Best Rate-of-Climb Speed with Wing Flaps T/O:	65 kts / 75 mph / 120 km/h

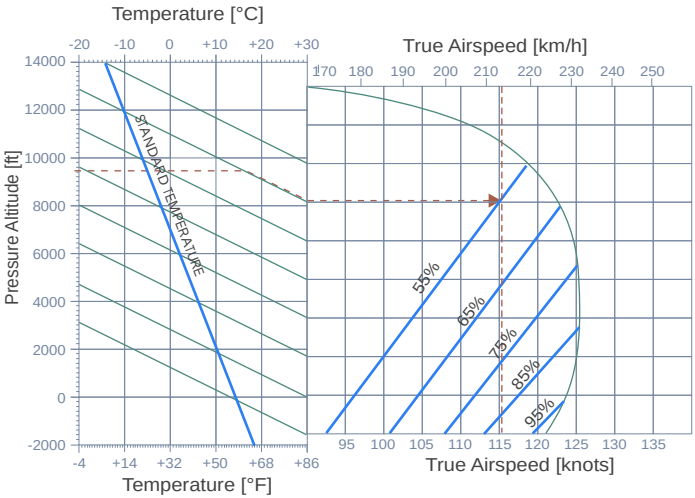


Example:	Pressure Altitude:	5000 ft (1524 m)
	OAT:	46°F(8°C)
	Weight :	1477 lbs (670 kg)
Result:	Climb performance:	554 ft/min (2.82 m/s)

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

5.3.8 CRUISING SPEED (TRUE AIRSPEED)

Diagram for true airspeed (TAS) calculation at selected power level.
Flight mass 1653 lbs (750 kg) and Flaps UP.

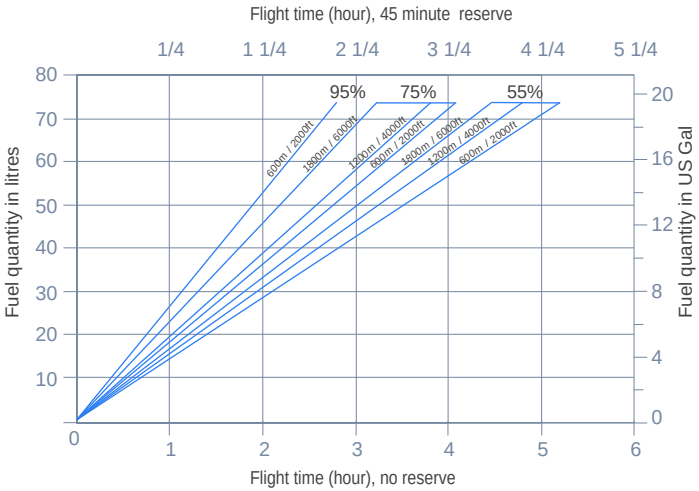


Example:	Pressure altitude:	9500 ft
	Temperature:	57° F (14° C)
	Power setting:	55 %
Result:	True airspeed (TAS):	116 kts (215 km/h)

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

5.3.9 MAXIMUM FLIGHT DURATION

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

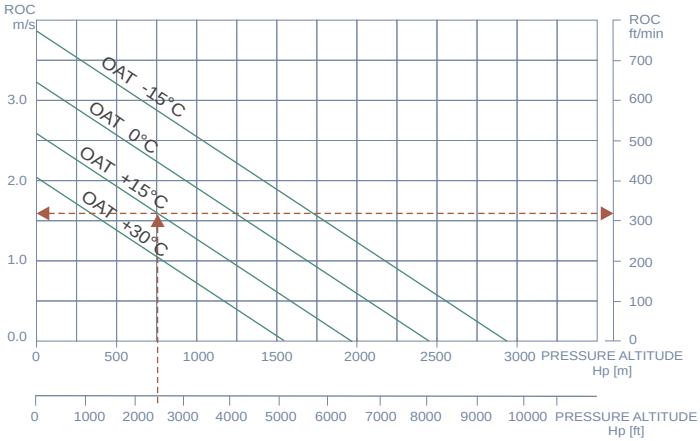


Example:	Fuel quantity:	13.2 US gal (50 liters)
	Pressure Altitude:	6000 ft
	PowerSetting:	75%
Result:	Possible flight time without reserve:	2:11 h:min
	Possible flight time with reserve of 45 mins:	1:26 h:min

5.3.10 CLIMB PERFORMANCE DURING BALKED LANDING

Conditions:

Speed = 57 kts / 66 mph / 106 km/h
Wing Flaps in Landing Position (LDG)
Weight 1653 lbs (750 kg)
most forward center of gravity
max take-off power



Example: Pressure altitude: 2250 ft (685 m)
Outside temperature: 59° F (15° C)

Result: Climb performance during balked landing: 320 ft/min. (1.63 m/sec)

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

5.3.11 LANDING DISTANCE

Conditions:
- Throttle: Idle
- Maximum T/O Weight
- Propeller Speed Control Lever: max RPM
- Approach Speed 57 kts / 66 mph / 106 km/h
- Level Runway, paved
- Wing Flaps in Landing position (LDG)
- Standard Setting, MSL

Landing distance over a 15 m (50 ft) obstacle: approx. 1532 ft (467 m)
Landing roll distance: approx. 790 ft (241 m)

Height above MSL	ft. (m)	0 (0)	1000 (305)	2000 (610)	3000 (915)	4000 (1220)	5000 (1524)
Landing Distance	ft. (m)	1490 (454)	1550 (472)	1609 (491)	1669 (509)	1728 (527)	1788 (545)
Landing Roll Distance	ft. (m)	748 (228)	770 (235)	793 (242)	817 (249)	842 (257)	868 (265)

NOTE:

Poor maintenance condition of the airplane, deviation from the given procedures as well as unfavourable outside conditions (high temperature, rain, unfavourable wind conditions, including cross-wind) could increase the landing distance considerably.

For landings on dry, short-cut grass covered runways, the following corrections must be taken into account, compared to paved runways:

- Grass up to 5cm (2in) deep: 5% increase in landing roll distance;
- Grass 5 to 10cm (2 to 4in) deep: 15% increase in landing roll distance;
- Grass deeper than 10cm (4in): 25% increase in landing roll distance.

On wet soft grass covered runways with grass deeper than 10cm (4in), the landing roll distance might be increased by as much as 40%.

This information is provided for guidance purposes only and has not been demonstrated.

5.4. NOISE DATA

a)	Noise limit according to FAR 36, Appendix G:	75.0 dB (A)
	Noise value measured:	63.8 dB (A)
b)	Noise limit according to ICAO Annex 16, Chapter 10:	79.1 dB (A)
	Noise value measured:	71.7dB (A)

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).

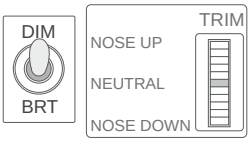
7.3. FLIGHT CONTROLS

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

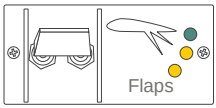
The flaps are driven by an electric motor. The flaps are controlled by a three position flap operating switch on the instrument panel. The three positions of the switch correspond to the position of the flaps, where the top position of the switch is used during cruise flight. When the switch is moved 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.

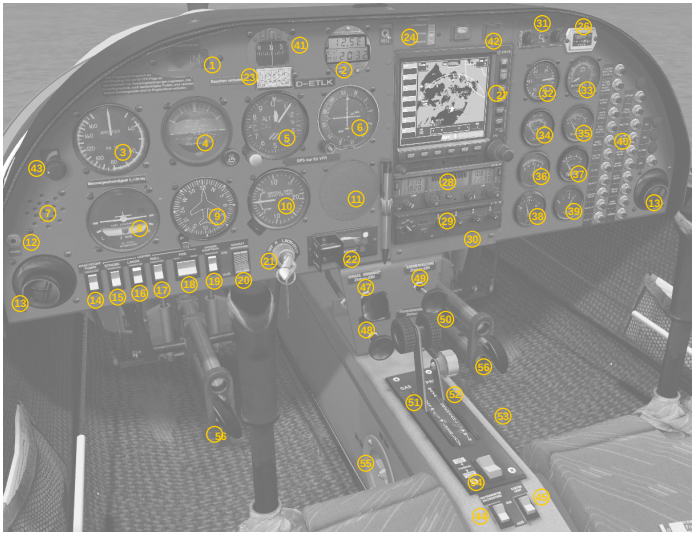
NOTE:

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.

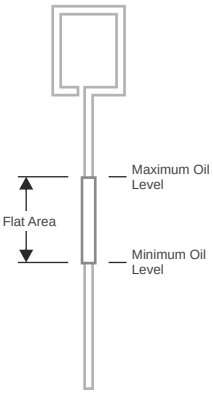
The propeller governor is mounted on the engine. It is driven directly by the engine. The propeller governor oil circuit is part of the engine oil circulation system. A defect in the governor or oil system will cause the blades to run to the minimum pitch position. The pitch of the blades can be rotated 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.

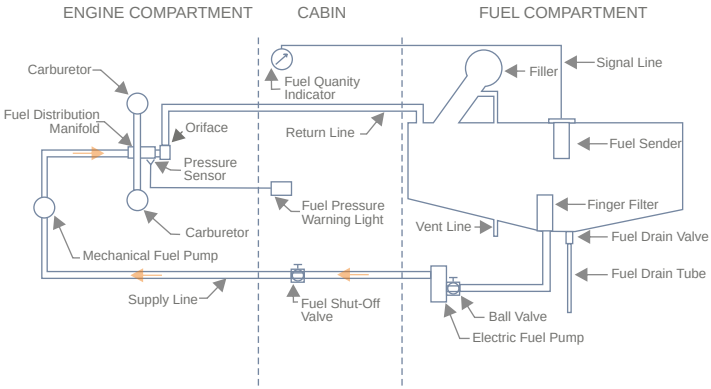
NOTE:

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 .

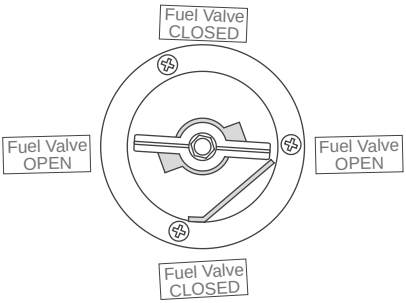
A finger filter is installed at the bottom of the tank. From there, the fuel is fed to the electric fuel pump, and from there, through the middle tunnel to the fuel shut-off valve. From the fuel shut-off valve it is fed to the firewall breach, and further to the mechanical fuel pump. From there, the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

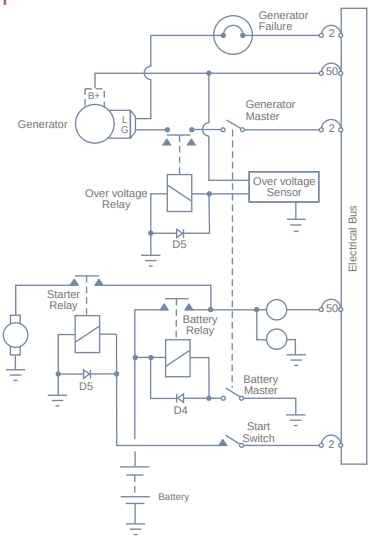
Electric fuel gauges may malfunction. Check fuel quantity with fuel pipette before each flight.

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.

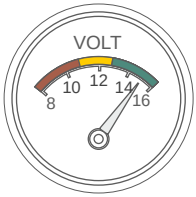
! WARNING:

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

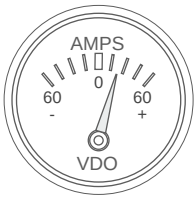


The voltmeter indicates the status of the electrical bus. It consists of a dial that is marked numerically from 8 - 16 volts in divisions of 2.

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)

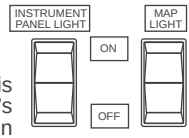
7.11.7 FUEL PRESSURE INDICATOR

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

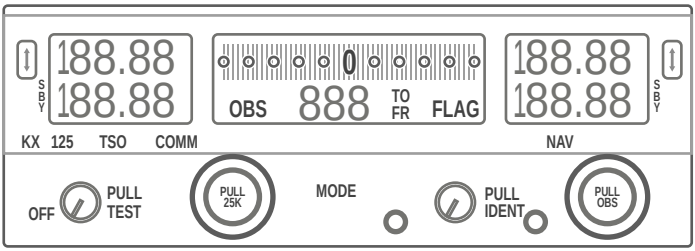
The center of the instrument panel contains the radio and navigation equipment. The microphone key for the radio is installed in the control stick. There are two connectors for headsets on the backrest of the seat.

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

9.0 AVIONICS

9.1. KX125 COM/NAV

> **NOTE:**
> The manual of the KX125 unit only describes the functions in realistic mode. Otherwise the device operates like the FSX default radios.



The KX 125 TSO unites a communication and navigation radio.

9.1.1 DESCRIPTION

The Bendix King KX125 COM/NAV unites a transmitter/receiver for communications and a navigation radio featuring a Course Deviation Indicator (CDI). The frequency range for communications from 118.00 MHz to 136.975 MHz consists of 760 channels within a 25 kHz raster. Frequency range for navigation from 108.00 to 117.95 MHz consists of 200 VOR/LOC-channels within a 50 kHz raster.

The COM/NAV unit is mounted in the center instrument panel, the communications antenna on the vertical tail and the antenna for navigation within the elevator.

Both, the navigation and the communication part of the unit feature two frequencies. One active and the other one on standby to be activated with a click of a button.

All frequencies are saved if the unit is switched off and are avaible if it is back online.

9.1.3 PROTECTION

The COM/NAV circuit breaker protects the on-board power supply from high voltage in the case of a short circuit.

9.1.4 HANDLING

Engage main battery, generator and avionic switches.

Integrated lighting can be switched with the Instruments Light switch on the center console.

9.1.5 TURNING ON

Turning the ON-OFF-Volume knob out of the OFF-position will engage the radio. The unit will be instantly be operational displaying the frequencies that have been set before.

9.1.6 TUNING

Turning the COM and NAV rotaries will set the standby frequencies. The larger rotary will set the frequency in 1 MHz steps, the smaller one in 50 kHz steps. The COM frequency can also be set in 25 kHz steps if the rotary is pulled.

Pressing the frequency transfer buttons will exchange standby and active frequencies.

9.1.6 DIRECT TUNING

Pressing the frequency transfer buttons longer than 2 seconds will engage the direct control of the active frequency. The standby frequency will disappear from the display. A short press on the transfer button will quit direct tuning.

Direct tuning works independently for COM and NAV.

9.1.7 STATION IDENTIFICATION

The NAV volume knob can be pulled to enable the identification of the tuned station via morse code.

9.1.8 OPERATION MODES

If a VOR frequency has been tuned as active frequency, the NAV mode button can be used to cycle the three available modes for Nav information window:

Course Deviation Indicator	(CDI)
Bearing	(BRG)
Radial	(RAD)

When the unit has been switched on CDI is the default mode.

CDI MODE

While operating in CDI mode a course deviation indicator will be displayed in the nav information window. The deviation will be displayed vertical bars. Every circle on the scale represents three degrees of deviation.

Below the deviation indicator there is a three-digit display for OBS.

OBS can be set by pulling the small NAV frequency selection knob. OBS display will start flashing to indicate the OBS selection mode.

Additionally To (TO) and From (FR) flags are displayed of a station is tuned.

In the case the unit does not receive a signal, FLAG appears on the screen and all bars of the deviation indicator will be displayed.

BRG MODE

The Bearing Mode (BRG) displays the direct course to the tuned station. Neither the course deviation indicator nor OBS will be displayed. Instead the TO marker will appear and a three-digit number will indicate the direct bearing/direction to the station.

In the case the unit does not receive a signal, three dashes (---) will be displayed instead of the bearing digits.

RAD MODE

Selecting the Radial mode allows "radial from" information to be shown. Neither the course deviation indicator nor OBS will be displayed. Instead the FR marker will appear and a three-digit number will indicate the radial.

In the case the unit does not receive a signal, three dashes (---) will be displayed instead of the radial digits.

AUTO-TO

Pressing the nav mode button longer than two seconds will activate the Auto-TO mode no matter which navigation mode has been active before. CDI Mode will be activated and the OBS is set with direct course to the tuned station.

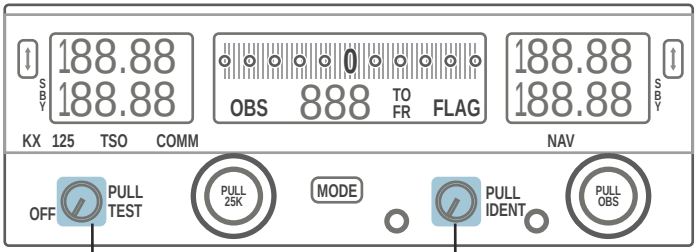
LOCALIZER

In the case a localizer frequency has been tuned only CDI-mode will be displayed. OBS, TO and FR markers will be hidden and the OBS windows displays the LOC marker.

If the unit receives a signal, the deviation will be indicated by the vertical bars. If there is no signal, all bars will be shown and the FLAG marker will appear.

NOTE:
Power surges at engine startup can damage the avionic devices. So it is necessary to ensure the avionic to be switched off before starting the engine.

9.1.9 FSX OPERATION



COMM Volume/
Pull Test Knob

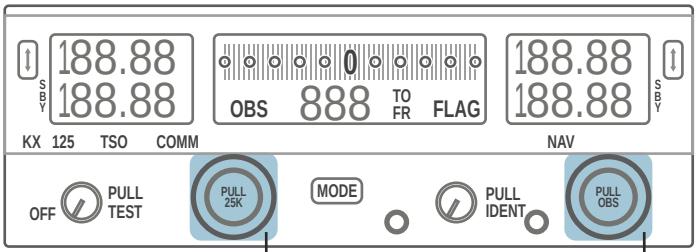
NAV Volume/
Pull Ident Knob

Left and Right Drag:

Turn knob left and right.

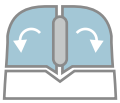
Left and Right Drag:

Turn knob left and right.



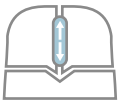
COMM Frequency
Selection Knobs

NAV Frequency
Selection Knobs



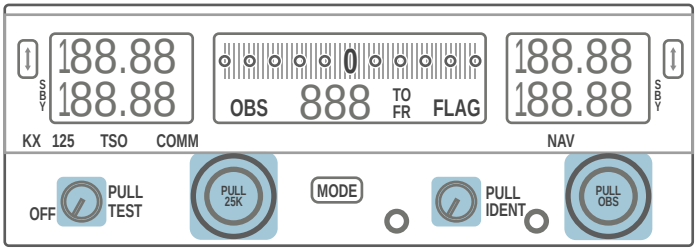
Left : Turn knob left

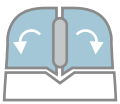
Right : Turn knob right



Up : Turn knob right

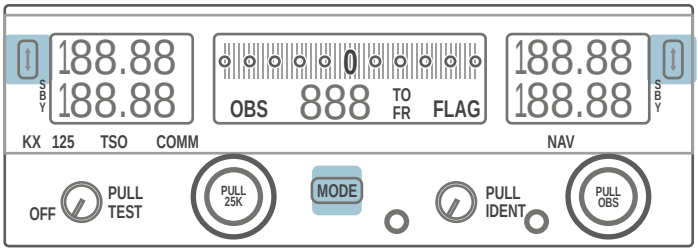
Down : Turn knob left





Left : Push knob in
Right : Pull knob out

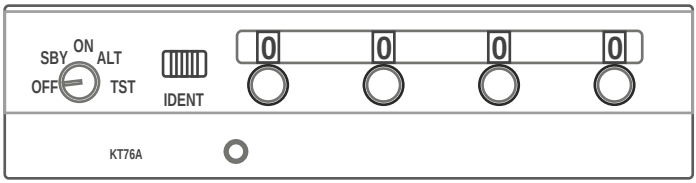
All marked knobs can be pulled out or pushed in by a click on the faceplate.



Left : Press and/or hold buttons

9.2. KT76A TRANSPONDER

NOTE:
The manual of the KT76A unit only describes the functions in realistic mode. Otherwise the device operates like the FSX default transponder.



The KT76A unit is very common in aircraft cockpits.

9.2.2 DESCRIPTION

The Bendix King KT76A is a radio transmitter and receiver working on the basis of radar frequencies. It receives radar signals from ground stations at 1030 MHz and send them back. Encoding in the range from "0000" to "7777" results in 4096 possible combinations.

The KT76A transponder unit is mounted in the center instrument panel. The antenna is placed at the bottom of the fuselage between the wings.

9.2.3 PROTECTION

The XPDR circuit breaker protects the on-board power supply from high voltage in the case of a short circuit.

9.2.4 HANDLING

Engage main battery, generator and avionic switches.

Integrated lighting can be switched with the Instruments Light switch on the center console.

9.2.5 SELF-TEST

a) Turn mode-selector knob from OFF to SBY. Operate the transponder about 60 seconds in SBY mode for warming up and stabilizing the radio tube. Skipping the SBY knob position will not reduze the warming time.

b) Turn and hold mode-selector knob to the TEST position. The Reply-light should illuminate.

c) Return mode-selector knob to the SBY position.

9.2.6 MODE A

a) Use the coding switches to set the necessary Mode A code.

NOTE:
The coding switches shall only be operated in SBY mode to avoid the accidently setting and transmitting of an emergency code.

b) Turn mode-selector knob from SBY to ON.

The transponder will now reply to requests with the set code.

9.2.7 IDENT BUTTON

On request of Air Traffic Control (squawk IDENT) the IDENT-button has to be pressed. That transponder will now transmitt a signal of 20 seconds with e special identification impuls that will allow an immediate identification of the aircraft on the radard screen.

9.2.8 RELEVANT INFORMATION

To extend the life time of the transponder it should be switched off while starting up or shutting down the engine. These operations could lead to voltage peaks in the on-board power supply that may damage the device.

NOTE:
The coding switches shall only be operated in SBY mode to avoid the accidently setting and transmitting of an emergency code.

The transponder shall not be operated with code number "75..", "76.." and "77..".Those are reserved for special purposes, for example emergencies.

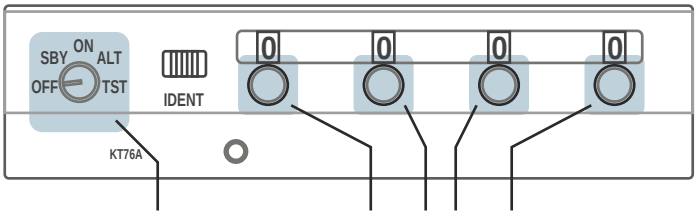
The transponder shall not be operated with code number "0000".

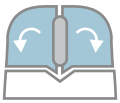
Following codes are reserved for emergencies:

7500	Air piracy
7600	Loss of communication system
7700	Emergency

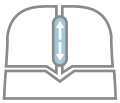
9.2.9 FSX OPERATION

The transponder knobs can be operated with left and right clicks as well with the mouse wheel. A right click will increase, left click will decrease selection. Rotating the wheel upwards will increase, turning downwards will decrease selection.





Left : Turn knob left
Right : Turn knob right



Up : Turn knob right
Down : Turn knob left

NOTE:
The warming of the radio tube is simulated. ATC may complain about not receiving a signal also the code is set correctly. Watch out for the IDENT lamp indicating the proper operation of the device.

9.2.10 LIGHTING

The transponder integrated lighting is linked to the instrumentation lighting and is toggled with the switch on the center console.

9.3. GPS500

9.3.2 DESCRIPTION

The GPS500 is a 3d version of the FSX default GPS and is nearly identical in function. For operation instructions please refer to the FSX documentation.

9.3.3 PROTECTION

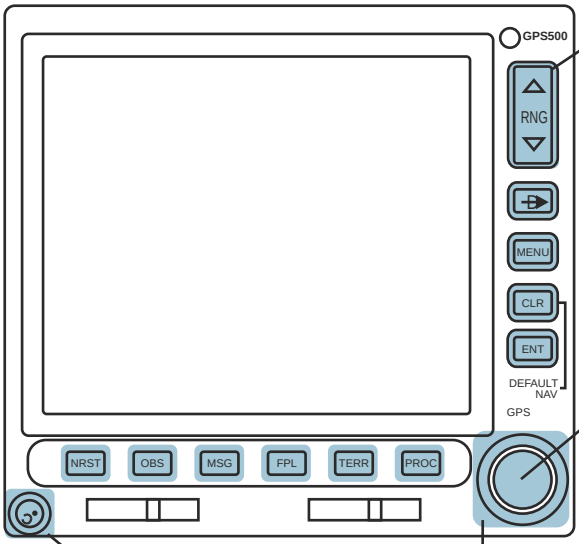
The GPS circuit breaker protects the on-board power supply from high voltage in the case of a short circuit.

9.3.4 HANDLING

Engage main battery, generator and avionic switches. The unit can be switched off/on and dimmed with the master knob.

Integrated lighting can be switched with the Instruments Light switch on the center console.

9.2.9 FSX OPERATION



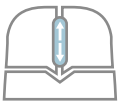
Buttons
All buttons can be pressed by a left click.

Button
The smaller rotary can be pressed by a click on the faceplate.

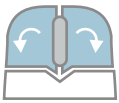
Master Knob

Left and Right Drag:
Decrease/increase brightness and turn on/off the GPS unit.

Rotaries

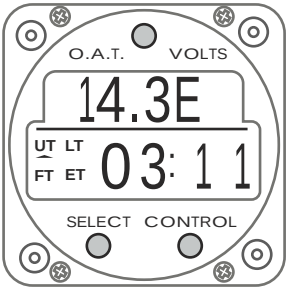


Up : Turn knob right
Down : Turn knob left



Left : Turn knob left
Right : Turn knob right

9.5. M803



9.5.1 DESCRIPTION

The Model 803 Digital Clock features two displays for the outside air temperature, system voltage and 4 different clock modes.

9.5.2 HANDLING

The clock is connected to the main bus and will be operative as soon as the master switch is enganged. Three buttons are available for operation and settings:

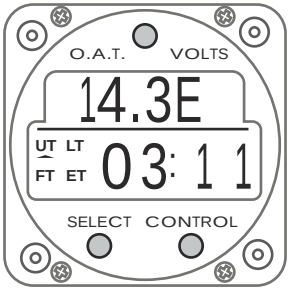
Red button: Cycle through: Voltage (E), Outside Air Temperature Fahrenheit (F) and Outside Air Temperature Celsius (C).

SEL button: Selection what is displayed: Universal Time (UT), Local Time (LT), Flight Time (FT) and Elapsed Time (ET).

CTL button: Control what is displayed: Resetting Flight Time, starting and resetting Elapsed Time, setting Universal and Local Time.

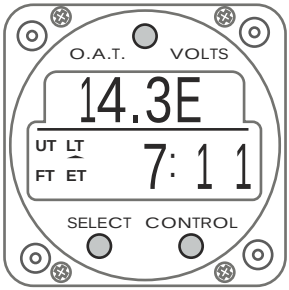
9.5.3 SETTING UNIVERSAL TIME

Use the SEL button to select the UT display. Press both, the SEL and the CTL button, at the same time to enter the set mode. The tens of hours digit will start flashing. Increase the flashing digit by one with the CTL button. Once a number is set, use the SEL button to switch to the next digit. After the last digit has been set, pushing the SEL button will exit the set mode and the clock is running.



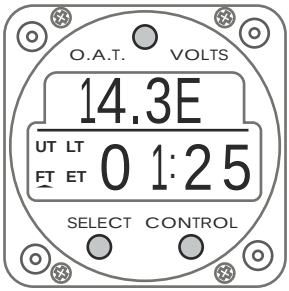
9.5.4 SETTING LOCAL TIME

Use the SEL button to select the LT display. Press both, the SEL and the CTL button, at the same time to enter the set mode. The tens of hours digit will start flashing. Setting the time is the same as descriped at LT except that the minutes are synchronized with UT and can not be set.



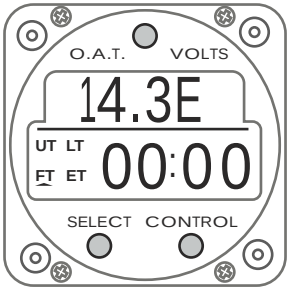
9.5.5 SETTING FLIGHT TIME ALERT

Use the SEL button to select the FT display. Press both, the SEL and the CTL button, at the same time to enter the set mode. The alarm time is entered the same way as the UT setting. When the FT is equal to the alarm time, the display will start flashing and the alarm sound will be activated. The display will automatically change to FT if another mode was selected. Pressing either SEL or CTL button will eliminate the alarm and alarm time.



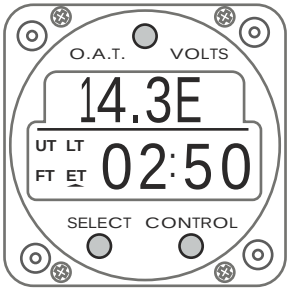
9.5.6 FLIGHT TIME RESET

Use the SEL button to select the FT display. Press and hold the CTL button for 3 seconds or until 99:59 appears on the display. FT will be reset to 00:00.



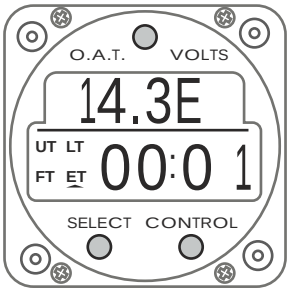
9.5.7 ELAPSED TIME COUNT UP

Use the SEL button to select the ET display. Press CTL button to start ET counting. ET will count up to 59 minutes and 59 seconds and will then be switched to hours and minutes, counting up to 99 hours and 59 minutes. Pressing the CTL button again will reset ET to zero.



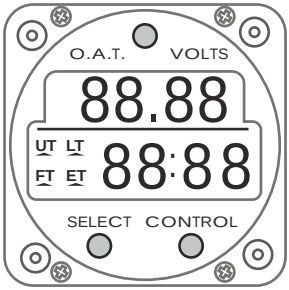
9.5.8 ELAPSED TIME COUNT DOWN

Use the SEL button to select theET display. Press both, the SEL and the CTL button, at the same time to enter the set mode. A countdown from a maximum of 59 minutes and 59 seconds can be set and will start counting as soon as the last digit has been left with the SEL button. As the count down gets zero the alarm will be activated and the display starts flashing. Pressing either SEL or CTL button will reset the alarm. As the display reaches zero, it will count up.



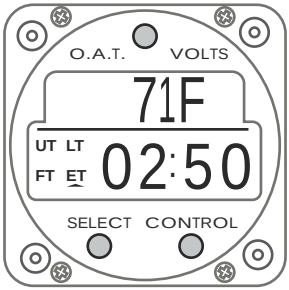
9.5.9 TEST MODE

Press and hold the SEL button for three seconds and the display will change into test mode.



9.5.10 OAT AND VOLTAGE

Pressing the red button will cycle through E, F and C displays. Voltage will always be displayed when the clock is powerd up.



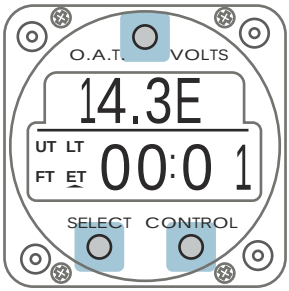
9.5.11 FSX OPERATION

Left:

Press or hold the button until release

Right:

The button will be hold for 3 seonds. Necessary to press two buttons at the same time.



10.0
PAINTKIT

10.1. PAINTING THE EXTERIOR


MF_DA20_EXT_FUS_0...


MF_DA20_EXT_FUS_0...


MF_DA20_EXT_FUS_0...


MF_DA20_EXT_FUS_0...


MF_DA20_EXT_WNG_...

Painting the exterior is pretty simple because nearly all details are objects in the 3d model. A set of blank textures has been the basis for all Katana paintings adding color and details with different layers and blending modes.

MF_DA20_EXT_FUS_000.bmp
Cowling, spinner, propeller and wheel fairings.

MF_DA20_EXT_FUS_001.bmp
Left fuselage and details.

MF_DA20_EXT_FUS_002.bmp
Right fuselage and details. Letterings has to be mirrored.

MF_DA20_EXT_FUS_003.bmp
Elevator.

MF_DA20_EXT_WNG_001.bmp
Both wings. The lightly shaded sides or bottom textures. A jpeg shows position and orientation of typical lettering.

10.2. PAINTING THE INTERIOR

Most parts of the panel are on one texture so you can easily add your aircraft its very own character.

MF_DA20_INT_PNL_001.psd
Nearly all textures needed for the mainpanel. The file contains one layer with german and one with english lettering. The export should be a normal bitmap file. The alpha channel is not used.

MF_DA20_INT_PLQ_001.psd or MF_DA20_INT_PLQ_001.cpt
Aircraft ID and some more labels in german and english. There are 4 position frames at the top for the aircrafts ID label. Every frame stands for another position on the panel and you can choose which one to use. Don't forget to create an alpha mask for all lettering objects and export as psd file. The alpha channel is used for transparency.

10.3. CONVERTING FILES

Once the graphical work has been completed, the bitmaps and psd-files can easily be converted into dds-textures.

1. Copy the imagetool.exe of the FSX SDK to both folders: DXT1 and DXT3.

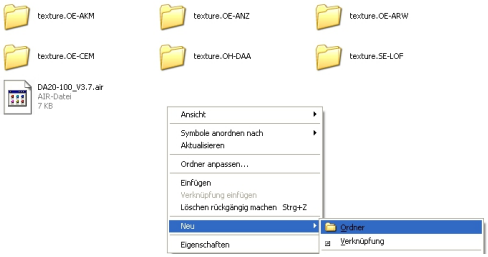
2. Copy bitmaps into the DXT1 folder and execute DXT1.bat. The textures will automatically be created.

3. Copy psd-files into the DXT3 folder and execute DXT3.bat. The textures will automatically be created.

10.4. COPYING FILES TO FSX

1. Create a texturefolder for your painting. It is advised to use the naming convention **texture.AIRCRAFT-ID**. For example texture.D-ECHO or texture.N311AK.

   The folder has to be in the [FSX main directory]\ simobjects\airplanes\Diamond DA20-100 'Katana' folder.



2. Copy all the dds files you created into the new texture folder.

3. Copy the texture.cfg and thumbnail.jpg from the texture.XXXX-folder of the paintkit into the new texture folder.

NOTE:

If the nose or tail of your repaint are just white, it is not necessary to copy **MF_DA20_EXT_FUS_000.dds** and **MF_DA20_EXT_FUS_003.dds** into the folder of your livery. Missing textures in your folder will be loaded from the main texture folder. This will keep filesizes small.

If you want to have german panel labeling even the **MF_DA20_INT_PNL_001.dds** does not have to be in your texture folder.

10.5. AIRCRAFT.cfg Editing

```
344
345 [fltsim.18]
346 title=Diamond DA20-100 C-GDAI
347 sim=DA20-100_V3.7
348 model=
349 panel=
350 sound=rotax
351 texture=C-GDAI
352 kb_checklists=DA20_check
353 kb_reference=DA20_ref
354 atc_id=C-GDAI
355 ui_manufacturer=Diamond Austria
356 ui_type=DA20-100 Katana
357 ui_variation=C-GDAI
358 ui_typerole="Single Engine Prop"
359 ui_createdby="Marcel Felde"
360 description=FSX Diamond Aircraft Katana DA20-100\
361 atc_id_color=0000000000
362 visual_damage=0
363
364
365 [fltsim.19]
366 title=Diamond DA20-100 D-ECHO
367 sim=DA20-100_V3.7
368 model=
369 panel=
370 sound=rotax
371 texture=D-ECHO
372 kb_checklists=DA20_check
373 kb_reference=DA20_ref
374 atc_id=D-ECHO
375 ui_manufacturer=Diamond Austria
376 ui_type=DA20-100 Katana
377 ui_variation=D-ECHO
378 ui_typerole="Single Engine Prop"
379 ui_createdby="Marcel Felde"
380 description=FSX Diamond Aircraft Katana DA20-100\
381 atc_id_color=0000000000
382 visual_damage=0
383
384
```

Open the aircraft.cfg in the Diamond DA20-100 'Katana' folder and copy the last aircraft entry.

Increment the [flightsim.xx] number by one and change the ID at the 4 marked positions.

Now you can open the aircraft selection menu in FSX and your fresh painted Katana should be ready to fly.

Be carefull, the color could still be wet!

10.6. LAST STEP

As a last step you can add an image of your painting into the thumbnail.jpg. This picture will be shown in the aircraft selection menu.

10.7. PUBLISHING

You are not allowed to publish any other files than those textures and files in the texture folder of your painting. You may only publish the short section of the aircraft.cfg that belongs to your painting. The productname 'DA20-100 Katana 4X' shall be mentioned in the description and documentation of your repaint.