



Piper Navajo PA-31 310, version 3.0

For Microsoft® Flight Simulator 2004

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1. Introduction

Thank you for purchasing the FriendlyPanels Piper Navajo PA-31-310 or just downloading this manual. Here you will find the description, installing and user instructions for this aircraft.

There are very good and complex planes you can acquire in the market but, often, 2D Panels of most of them require to be opening and closing a lot of windows all the time, some of them covering others without any kind of integration with the rest of the panel elements.

In this aircraft, we try to find a middle ground between complexity and **easiness of use**, as much as to the 2D Panel concerns, as to the aircraft itself. What it means is that, in our PA-31 2D Panel, you can see, read and handle all gauges in only one window, without opening and closing overlapping pop-up windows all the time: you've always got a clear landscape view (if the weather is fine) beyond your 2D Panel.

Two versions

This software contains two version for the aircraft instrumentation: One classic and one integrating modern avionics, with Meggitt® avionics PFD (Primary Flight Display), ND (Navigational Display) and EIDS (Engine Information Display System).

Besides, in this version 3.0, you can choose if you want just the plane with 2D Panel, 2D Panel + Virtual Cockpit or 2D Panel + Virtual Cockpit + Cabin for every type of instruments equipment (that's to say six variants), and also two liveries are available.

The classic 2D Panel have **just one windows**, whatever the avionics equipment you choose.

On the other hand, and concerning the aircraft model, you find in the market some of them that are really master pieces of design for Microsoft® Flight Simulator. The handicap is that you'll need the most powerful PC system you can find to make the most of those master pieces. When you turn to an outside view or go to Virtual Cockpit everything is so detailed that your flying will become a slide show as the frame rate is coming down, or have to wait a time while the textures are applied.

Our plane is not perfect, it has not all the pieces of the landing gear working (although it has the main ones and it works!), we didn't made a door or cowling that open or close and some other things which you usually use only once to see how they work and then forget them forever.

But our plane is good looking enough if you like to pan around it from time to time, you'll see realistic movements of essential parts that have to do with flying (ailerons, flaps, rudder, elevator, etc...) or you can see a complete VC (**in which you can manage ALL the gauges too, so you can put aside the 2D Panel, if you prefer VC**) and passengers cabin. In short, we try to avoid things not very useful which reduce substantially the frame rate in their respective views.

Just to give you an idea, even knowing that there are multitude of factors that affect frame rate, depending on system configurations, you get similar figures than with the default King Air 350 under FS2004 flying over the scenery default of Manhattan, in any view, in the same PC, of course.

What's new in version 3

In standard equipment model:

- New Davtron M877 digital clock with four modes: LT, GMT, elapsed time and flight time.
- New Garmin GNS 530 GPS
- New Bendix KR 87 ADF Silver Crown
- New Bendix KT 76C Transponder Silver Crown
- All gauges in an only 2D panel window
- New set of control engines gauges

In Meggitts equipment model:

- A completely vectorial new PFD with smoother tapes movements and some new features as airspeed trend indication.
- A completely vectorial new ND
- New Bendix KLN94 GPS
- Two new Bendix KX165 nav-com radios Silver Crown Line
- New Bendix KR 87 ADF Silver Crown Line
- New Bendix KT 76C Transponder Silver Crown Line
- New S-Tec AP annunciator
- New Davtron M803 digital clock with four time modes: LT, GMT, elapsed time and flight time, and E- Voltage (EMF), O.A.T. Fahrenheit or Centigrade indication.

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2. A brief history of the aircraft

The PA-31 was developed at the request of company founder William T Piper, and the program for a new larger twin was given the project name Inca. The first prototype PA-31 made the type's first flight on September 1964 and was Piper's largest aircraft to be built to that time.

Deliveries began in the first half of 1967. The first model was the PA-31-310, powered by two 230kW (310hp) turbocharged Lycoming TIO-540-A1A engines. The PA-31-310 had five cabin windows per side and Piper's distinctive Tiger Shark engine nacelles with optional nacelle lockers.

The Navajo six/eight seat cabin class twin has been adapted to a number of commuter, charter, air taxi, light freight and executive transport roles.

Production of the PA-31-310 had ceased in 1983.

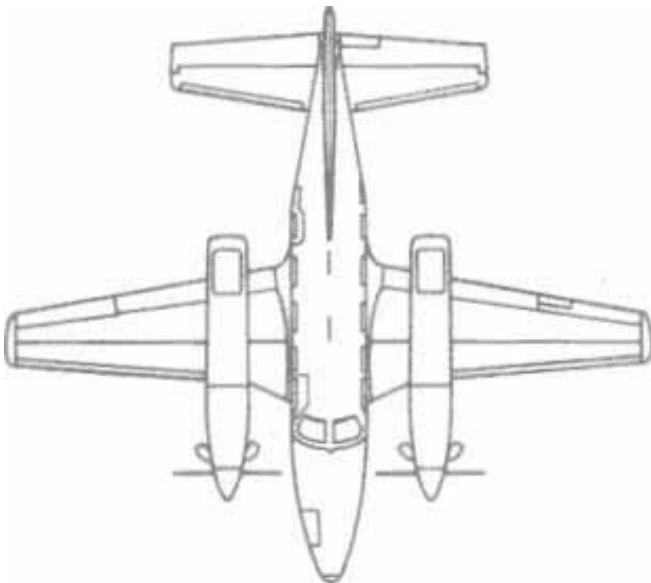
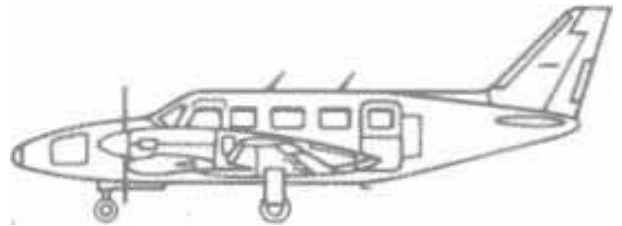
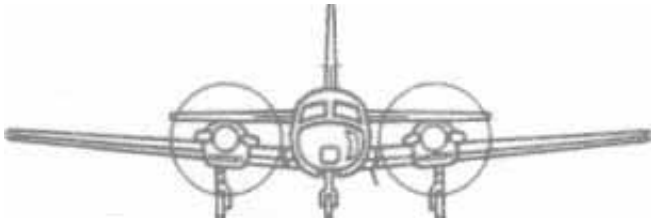
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3. Specifications

Type: 6-8 seat corporate transport and commuter airliner.

Period built: 1964-1983

Country of origin: United States



Aircraft Dimensions:

- Wing span: 40' 8"
- Length: 32' 8"
- Height: 13"

Weight:

- Empty: 4.062 lb.
- Max. Take off: 6.500 lb

Engines:

- Lycoming TIO-540-A turbocharged and fuel injected flat six piston engines driving three blade constant speed propellers, each of 310 hp.

Performance:

- Max. speed: 227 kt / 420 kph
- Max. cruising speed: 218 kt / 404 kph
- Long range cruising speed: 147 kt / 273 kph
- Initial rate of climb: 1,445 ft per min.
- Service ceiling: 27,300 ft
- Range: 1,295 nm / 2,398 km with reserves

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4. Installation

Run the installer and follow the indicated steps. The aircraft will be installed in FS2004\Aircraft\Navajo PA-31-310v3. There you'll find the aircraft's folders. Run FS2004. You'll find your new plane variants under the Aircraft Menu, Select Aircraft, Aircraft manufacturer = Piper, Aircraft model = Navajo PA-31-310 and Navajo PA-31-310 Meggitt, all variations beginning with "FP v3".

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5. PANELS

The FriendlyPanels Panel 2D Views



All gauges in sight, all the time, no pop-up windows

Virtual Cockpit classic view



Meggitts avionics panel



A new look for a classic aircraft

Virtual Cockpit Meggitts avionics view



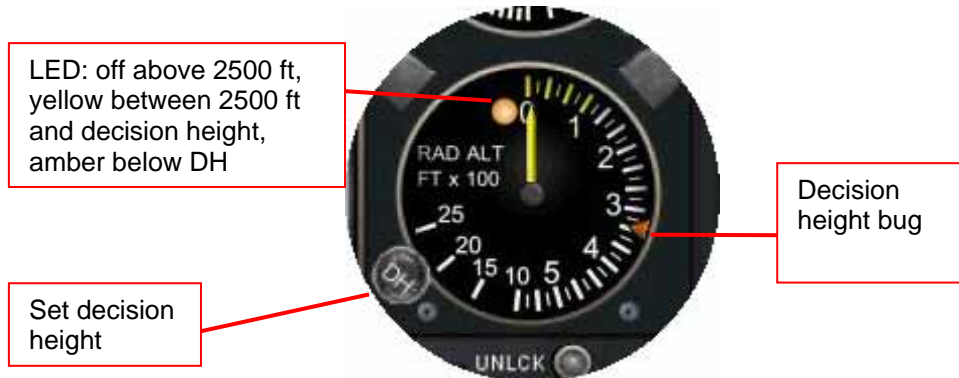
Cabin Views



6. Gauges

Most gauges are FP design for better visibility, although they work exactly like the ones included in FS2004, and no need further explanation. Here follows how to handle new gauges or those which may have some differences with the ones included in FS2004 or FS2002.

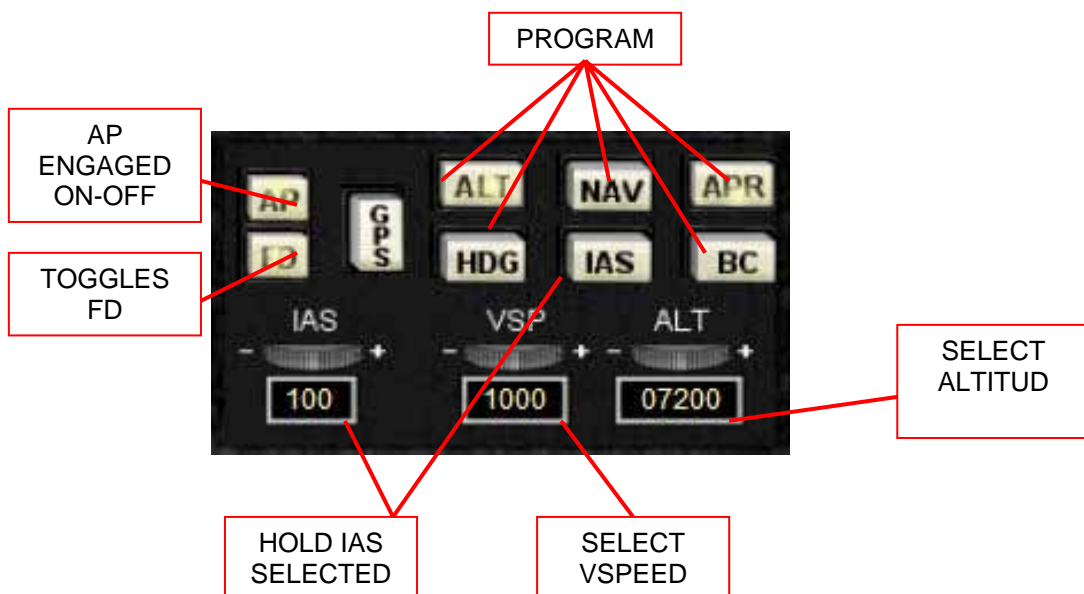
6.1 RADIO ALTIMETER



6.2 OUTSIDE AIR TEMPERATURE



6.3 AUTOPILOT



6.4 GARMIN GNS 530 GPS

This gauge is very alike to the default GPS included in FS9 in what concerns to its way of operation. We will talk here about the differences implemented by FriendlyPanels.

The main differences are:

1. Rose movement smoother
2. Included tuning features for COM1, COM2, NAV1 and NAV2 with their respective navigation information like distances, bearings, etc....(see pictures below) in left side of the screen.
3. Improved readability
4. Navaids displayed in map modes are now selectable (like in the real one), allowing you to have a clearer view if you need it.
5. Needles indicator VOR1 and VOR2

Clicking areas



1. Swap COM1/COM2 (the one showed in left panel) stand by and active frequencies
2. On / Off switch
3. Swap NAV1/NAV2 (the one showed in left panel) stand by and active frequencies
3. Ident switch
4. Displays COM1 / NAV1 or COM2 / NAV2 data in left panel.
- 6 and 16. Tune frequency highlighted integer figures
- 7 and 9. Tune frequency highlighted fractal figures
8. Swaps frequency to tune COM or NAV
10. Displays information concerning the radios or the flight plan.
- 11 and 15. Outer knob
- 12 and 13. Inner knob
14. CRSR

Selecting Nav aids to display

To do this push CRSR[1], the nav aids menu will appear, then use outer right knob[2] to select the type of nav aid and inner right knob[3] to select nav aid ON (displayed) or OFF (hidden). Then push CRSR again. You can clear your map view removing VORs, NDBs, AIRPORTS, INTERSECTIONS, AIRSPACES or even the flight plan route lines.



Swapping left panels



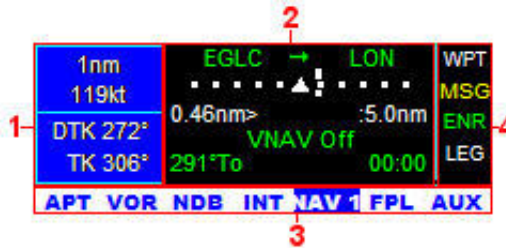
6.5 BENDIX KLN94 GPS



The FriendlyPanels KLN94 has two knobs and eleven buttons. The bottom left little knob is only used to turn on/off the gauge.

The outer right knob is used to select the pages group that can be displayed in the screen or to manage cursor. Inner right knob allows you moving trough pages inside a group.

The KLN 94 uses a color LCD. In normal operation, the display screen is divided into four segments. When the map page (NAV 4) is displayed the page bar is removed to maximize the height of the map. Also, in some other cases such as Direct To page the segment dividers disappear and you have a full-screen page.



The top line of segment 1 always displays distance to the active waypoint. The identifier of the active waypoint is usually displayed on the second line. In cases when the active waypoint identifier is displayed on a segment 2 page, line 2 will display the current groundspeed. The third line of segment 1 displays the desired track (DTK). The aircraft's actual track (TK) over the ground is displayed on line 4.

Segment 2 shows aeronautical information in the form of pages, as described later ahead.

Segment 3 displays specific page which type and number is shown on the page bar at the bottom of the display. Seven page types are shown on the page bar, however, only the selected page type is shown in reverse video (white characters on a blue background). In figure above, the NAV1 page is being displayed in segment 2 and is announced as such on the segment 3 page bar.

Segment 4 displays annunciations associated with the operation of the KLN 94. Line 1 shows the WPT (waypoint alert) annunciation when approaching the active waypoint. Line 2 shows the message prompt, a large "M", when the KLN 94 has a message for you to view on the message page. Line 3 displays the ENR, TERM or APR. Line 4 will normally display "LEG" which is the default mode. "OBS" is displayed when the pilot has selected the OBS mode. A Line 5 will appear in map modes to show the page you're in NAV4 or NAV5



6.5.1 Clicking areas



1. Shows/Hide procedures page
2. On / Off
3. Shows/Hide message page
4. OBS or LEG mode
5. Shows/Hide flight plan list
6. Show nearest group pages
7. Shows/Hide Direct To page
8. Clear screen and shows super NAV1 page. Keep it pushed till it happens
9. Confirm options or enter data
- 10 and 13. Change page group shown. Move cursor
- 11 and 12. Change page inside a group
14. Shows/Hide Menu
15. Turn on/off cursor
16. Zoom in/out map.

6.5.2 The NAV pages

When you first turn on the KL94 the display shows shortly a little presentation of the gauge, followed by a screen with some data concerning your current position. Push ENT key to accept and you'll go into NAV1 page. Use the right inner knob to move through this NAV group.

NAV1: Segment 1 has been described above. Segment 2 displays active navigation leg in Line 1. Line 2 is a course deviation indicator (CDI) that graphically displays left and right deviation from desired course. Line 3 displays numeric crosstrack correction, the crosstrack distance (how far off course) and direction to fly to intercept the desired track. The numeric crosstrack correction distance display is especially handy when more than five nautical miles off of course. The CDI scale factor is also displayed on line 3. This is the full scale deviation. The CDI scale factor is ± 5 NM which means each dot represents 1 NM of deviation off course. Line 4 shows VNAV status (not implemented). Line 5 displays a data field which display bearing to the active waypoint (**To**). Line 5 also displays the estimated time en route (ETE) from present position to active waypoint.

1nm	EGLC →	LON	WPT
0kt			OFF
DTK 272°	0.40nm>	:5.0nm	ENR
TK 315°	VNAV Off	289°To	00:00
APT VOR	NDB INT	NAV 1	FPL AUX

NAV2: displays the aircraft's present position: the radial and distance from a nearby VOR and latitude and longitude.

1nm	PRESENT POSN	WPT
LON	Ref:LON	OFF
DTK 272°	291° To 1.4 nm	ENR
TK 315°	N 51°28.91'	LEG
	W 000°25.94'	
APT VOR	NDB INT NAV2 FPL	AUX

NAV3: The Navigation 3 page shows you several important times pertaining to your flight. Line 1: The current local time. Line 2: The time of departure. This is the time when a valid groundspeed was first greater than 30 knots (typically during takeoff). Line 3: The elapsed flight time, which will be the hours and minutes since the departure time. Line 4: The estimated time en route to next waypoint. Line 5: Estimated time of arrival (ETA) at next waypoint.

1nm	Time	LCL	10 : 18	WPT
LON	Depart		10 : 11	OFF
DTK 272°	Flight		00 : 07	ENR
TK 315°	ETE LON		00 : 00	LEG
	ETA LON		10 : 18	
APT VOR	NDB INT NAV3 FPL			AUX

NAV4 and 5: Segment 2 displays map, with different orientation: track or north, flight plan route and nav aids.

1nm	↑ TK	BUR	CHT	WPT
LON		EGLD		OFF
DTK 272°		EGWU		ENR
TK 315°				LEG
0kt	10			NAV4

1nm	↑ N	EGWU	WPT
LON			OFF
DTK 272°			ENR
TK 315°			LEG
0kt	10		NAV5

You can select, while in NAV4 or NAV5, what nav aids you want to be displayed in the map. To do this push CRSR, the MAP-DATA will appear, then use outer right knob to select the type of nav aid and inner right knob to select nav aid ON (displayed) or OFF (hidden). Then push CRSR again.



6.5.3 The Airport, Intersection, NDB and VOR pages

There are ten pages in this group 6 APT, 2 INT, 1 VOR and 1 NDB displaying info about their respective facilities. You can use the outer and inner knob and CRSR to manage through them. Here are a few screenshots.

1nm	EGLL Public	80 ft	WPT
LON	Heathrow		OFF
DTK 272°	London		ENR
TK 315°			LEG
APT 1 VOR	NDB INT NAV FPL	AUX	

1nm	EGLL		WPT
LON	N 51°28.65'		OFF
DTK 272°	W 000°27.68'		ENR
TK 315°	262° To	1.1nm	LEG
APT 2 VOR	NDB INT NAV FPL	AUX	

1nm	EGLL		WPT
LON		09R-27L	OFF
DTK 272°	11978ft	HRD L	ENR
TK 315°			LEG
APT 4 VOR	NDB INT NAV FPL	AUX	

1nm	EGLL		WPT
LON	Approach	119.73	OFF
DTK 272°	Approach	120.40	ENR
TK 315°	Approach	127.53	LEG
	Approach	134.98	
APT 5 VOR	NDB INT NAV FPL	AUX	

1nm	EGLL		WPT
LON	ILS 09L		OFF
DTK 272°	VECTORS		ENR
TK 315°			LEG
APT 6 VOR	NDB INT NAV FPL	AUX	

1nm	D093A		WPT
LON	Ref: BVS		OFF
DTK 272°	Rad: 324°		ENR
TK 315°	Dis: 157.3nm		LEG
APT VOR	NDB INT 2 NAV FPL	AUX	

1nm	HRW	424.0	WPT
LON	HEATHROW/LONDON		OFF
DTK 272°	N 51°28.73'		ENR
TK 315°	W 000°27.57'		LEG
	265° To	1.0nm	
APT VOR	NDB INT NAV FPL	AUX	

1nm	LON	113.60	WPT
LON	LONDON		OFF
DTK 272°	N 51°29.23'		ENR
TK 315°	W 000°28.00'		LEG
	289° To	1.3nm	
APT VOR	NDB INT NAV FPL	AUX	

From these pages, anytime you highlight a frequency (using right CRSR and knob), it can be sent to the NAV COM radio or ADF clicking on ENT button.

1nm	EGLL		WPT
LON	Approach	119.73	OFF
DTK 272°	Approach	120.40	ENR
TK 315°	Approach	127.53	LEG
	Approach	134.98	
CRSR	APT 5	*CRSR*	

6.5.4 The Nearest pages

Push NRST button to access this five pages group which displays info about their respective nearest facilities. You can use the outer and inner knob and CRSR to manage through them. Here is a couple of screenshots.

1nm	NRST Airspace		WPT
LON	LONDON CTR		OFF
DTK 272°	Inside of airspace		ENR
TK 315°	LONDON/CITY CTR		LEG
	Inside of airspace		
APT VOR	NDB INT NAV FPL	NAIR	

1nm	NRST Airports		WPT
LON	EGLL	12776ft	OFF
DTK 272°	265°	1.2nm	ENR
TK 315°	EGWU	5515ft	LEG
	011°	4.4nm	
APT VOR	NDB INT NAV FPL	NAPT	

6.5.5 The Auxiliary pages

This pages group has three pages and shows additional information. Use the outer knob to reach them and inner knob to browse them.

1nm		AIR DATA (1/2)		WPT
LON	TAS		0kt	OFF
DTK 272°	Mach		0.04	ENR
TK 316°	Headwind		10kt	LEG
	Wind	29°	23kt	
APT VOR		NDB INT NAV FPL		AUX 1

1nm		AIR DATA (2/2)		WPT
LON	SAT		11°C	OFF
DTK 272°	TAT		11°C	ENR
TK 316°	Prs		1824ft	LEG
	Den		1829ft	
APT VOR		NDB INT NAV FPL		AUX 2

1nm		FUEL DATA		WPT
LON	Endur		5 : 37	OFF
DTK 272°	Range		612nm	ENR
TK 329°	nm / gal		6.8	LEG
	Res		90 GL	
APT VOR		NDB INT NAV FPL		AUX 3

AUX1: Line 1 displays True Air Speed, Line 2 MACH speed, Line 3 tailwind speed (TWIND) or headwind speed (HWIND) and Line 4 wind direction and speed.

AUX2: Line 1 displays static air temperature, Line 2 total air temperature, Line 3 pressure altitud and Line 4 density altitud

AUX3: displays fuel data: Line 1 endurance, Line 2 range, Line 3 nm per gallon for current condition and Line 4 fuel left.

6.5.6 The Direct To page

Push Direct To button to show this page. In segment 2 you can see and select the Facility to Direct To and its data. Use knob to manage this page and confirm with the ENT key.

20A		DIRECT TO:		WPT
Robbins		3801.1nm	299°	OFF
Oneonta, Alabama				ENR
FPL: LEZL	NRST: LEZL			LEG
			Activate?	
CRSR		DIRECT TO		*CRSR*

6.5.7 The Flight Plan page

Click in the FLP button to get the Flight Plan List page. CRSR and outer knob allow you scrolling through this page. Clicking in FLP button again get out from this page to NAV1 page, whatever was the page you were in before.

1nm	0.EGLC	WPT
109kt	1.LON	OFF
DTK 272°	2.GST	69nm
TK 329°	3.NITON	124nm
	4.CAE	177nm
CRSR FLIGHT PLAN *CRSR*		

6.5.8 The Message page

Push MSG button to show/hide message page. It displays Airspaces Alert messages if any. A blinking MSG alert will show in segment 4 if there is a message. This blinking alert can be inhibited keeping MSG button pushed until the M letters in segment 4 change to OFF. To recover the alert mode keep pushed MSG again until M letters appear.

1nm	*Airspace Alert	WPT
109kt	Inside Airspace	OFF
DTK 272°		ENR
TK 329°	Press MSG to continue	LEG

6.5.9 The Procedures page

Push PROC button to show/hide message page. CRSR and knob allow you to manage these pages.

1nm	Activate Vectors-To-Fina	WPT
LON	Activate Approach?	OFF
DTK 272°	Select Approach?	ENR
TK 329°	Press PROC	LEG
	Button To Return	
CRSR PROC *CRSR*		

1nm	VORDME 16	WPT
LON	VORDME 34	OFF
DTK 272°	ILS 10	ENR
TK 329°	ILS 16	LEG
	ILS 28	
CRSR APPROACH *CRSR*		

6.6 BENDIX KR 87 ADF



The Bendix KR 87 ADF has two knobs and five buttons. It displays active and stand by frequencies and integrates two timers.

Clicking areas



1. ADF / ANT modes. This version displays ADF station ident.
2. BFO mode (just the letters)
3. In frequency mode transfer stand by frequency to active. Returns to frequency mode from timers modes.
4. Go into timers mode.
- 5 and 6. Controls timers modes (described below).
7. On Off
- 8, 13, 14. Decrements frequency
9. Increments fractal frequency
- 10, 11, 12. Increments frequency

Display modes

Frequency mode



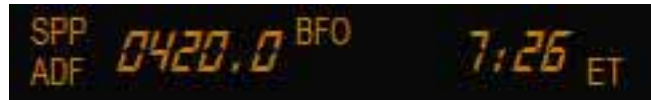
Use knob and swap button to manage this screen.

FLT timer Mode



From frequency mode push FLT/SET button once to go into this mode. This timer begins to count when you turn on the gauge and stops when you turn it off.

ET timer Mode



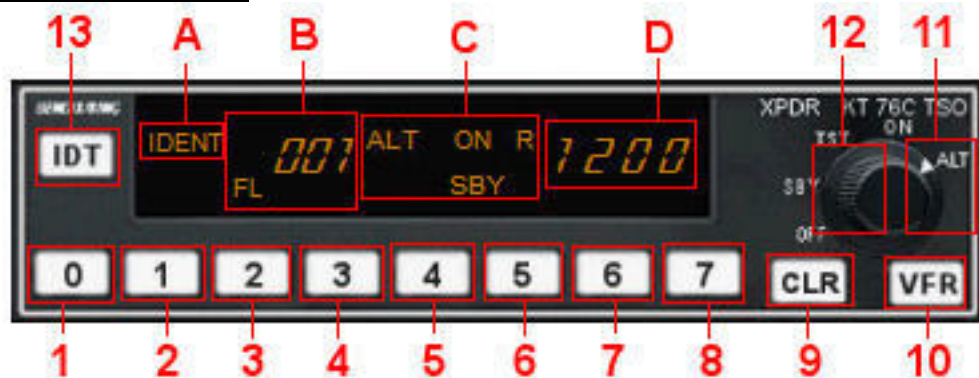
From frequency mode push FLT/SET button twice to go into this mode. This timer starts to count when you turn on the gauge, but you can control it. Clicking on SET/RST button once stops the timer. When it is stopped clicking again reset the timer and starts to count from zero. Clicking to the right of the button (area 7 above) will reset it to zero and ET begin to blink, you can use the knob to set a countdown (up to 59 minutes and 59 seconds), push SET/RST to start the countdown. After the countdown timer reaches zero, the counter will come up, whatever the mode you are in, and will begin to count upwards indefinitely while flashing for a few seconds, returning then to the mode you were before, if it was different. The Audio Alert is then sounded.

6.7 BENDIX KT 76 C TRANSPONDER



The Bendix KT 76 C Transponder has one knob and eleven buttons.

Clicking and display areas



1 to 8. ATRBS Code Selector Knobs

9. Clear button

10. VFR Button

11 and 12. Function Selector Knob

13. Ident Pushbutton

A. Ident Push button

B. Encoding Altimeter Altitude Window

C. Mode Annunciation and Reply Indicator

D. Ident Window

Operation

We describe below the operation of the KT 76C. The display is emulated but, in FS9, the gauge always works in the same manner. What you see in the display are the screens you see in the real KT 70

IDENT Button

Marked IDT, the KT 76C Ident button is pressed when ATC requests an "Ident" or "Squawk Ident" from your aircraft. When the Ident button is pressed, the reply indicator, an "R" annunciator light will glow for approximately 18 seconds.

ID Code

The ATRBS Transponder Identification code (squawk code) for the aircraft is displayed in the Ident Window on the right side of the display. Each of the four Transponder Code Selector Knobs selects a separate digit of the identification code.

Reply

The lighted "R" reply indicator blinks when the transponder is replying to a valid interrogation and illuminates for 18 seconds after the initiation of the Ident.

Altitude Display

The KT 76C display Flight Level Altitude, marked by the letters “FL” and a number in hundreds of feet, on the left side of the display (A). For example, the reading “FL 071” corresponds to an altitude of 7,100 feet.

VFR

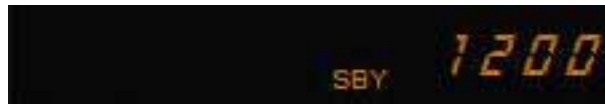
Pressing the VFR Pushbutton recalls the preprogrammed VFR code, superseding whatever code was previously entered.

Function Selector Knob

The Function Selector Knob on the right side of the KT 76C enables you to choose from among the following operating modes:

OFF - The unit is not receiving power.

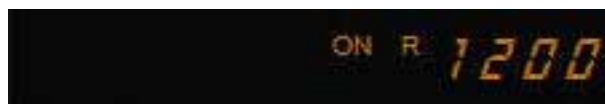
SBY (STANDBY) - In Standby the unit is energized but is inhibited from replying to any interrogation. “SBY” is shown on the display, while the altitude display is disabled.



TST (TEST) - Replies are disabled in test mode, and the unit illuminates all segments of the display for at least four seconds. A series of internal tests is performed to check the KT 76C integrity, verifying all EEPROM data and making hardware and squitter checks.



ON - The KT 70 is able to reply to all valid Mode A, C and S interrogations. However, the altitude information will not be transmitted. In the ON mode, the altitude window is left blank, the ID code is shown on the right and the “ON” annunciation is shown on the display.



ALT - In the “ALTITUDE” mode, the KT 76C replies to all valid Mode A, C and S interrogations. The ID code is displayed in the right window and altitude information (in hundreds of feet) is shown on the left.



6.8 EDU SCREEN AND SEUDO WEATHER RADAR

In this gauge Heading, Wind data and Pages 1 and 2 are real. The weather is just a moving picture.



These are pages 1 and 2:



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6.9 PFD - Primary Flight Display



The **BARO** control is used to input the barometric correction. The clicking areas are:

- 1.- Decrements baro press
- 2.- Sets the barometric correction to standard barometric pressure
- 3- Toggles between IN HG or MB
- 4.- Increments baro press

The information presented in the PFD screen includes:



1. Artificial Horizon Indicator: The Artificial Horizon Indicator moves with respect to the aircraft symbol to display actual pitch and roll attitude.
2. Aircraft Symbol: This symbol is a fixed representation of the aircraft. The relationship between it and the Artificial Horizon Indicator provides pitch and roll information.
3. Flight Director (FD) Command Bars: These bars display the computed steering commands from the autopilot. When the desired flight path is being flown, the Flight Director Command Bars are aligned with the Aircraft Symbol wing edges. They are removed if the computed data is unavailable, or the flight director is de-selected.
4. Roll Angle Indication: This indication displays the roll attitude by means of a moving pointer and fixed scale. The scale is marked at 0° , $\pm 10^\circ$, $\pm 20^\circ$, $\pm 30^\circ$, and $\pm 45^\circ$.
5. Marker Beacon Indication: This indication displays **O** (outer marker), **M** (middle marker), or **I** (inner marker) upon detection of the respective airport marker beacon.
6. Airspeed Scale Tape: This tape provides an indication of present airspeed.
7. Airspeed Operating Ranges: Colored vertical bands provide indication of Stall Range (Red), Flap Operating Range (White), Normal Operating Range (Green), and Overspeed Range (Red).
8. Airspeed trend.
9. Airspeed Digital Readout: This readout displays airspeed. It turns red at the maximum operating airspeed (**VMO**).
10. Barometric Altitude Scale Tape: This tape provides barometric altitude markings with respect to the barometric correction.
11. Barometric Altitude Digital Readout: This readout displays barometric altitude with respect to the barometric correction.
12. Metric Altitude Digital Readout: This readout displays barometric altitude in meters, with respect to the barometric correction.
13. Barometric Correction: This indication annunciates the barometric correction used in the calculation of the Barometric Altitude Readout. The units are in inches of mercury (inHg) or millibars (MB).
14. RAD ALT Indication: This indication displays the radio altitude from 0-2500 ft. It is removed when the radio altitude is greater than 2500 ft.
15. Decision Height (DH) Flag: This indicator will be in view when the current Radio Altitude is below the selected **DH** (an external **RAD ALT** controller is required to set **DH**).
16. Vertical speed indicator.
17. Vertical Speed Scale: This scale displays the vertical speed by means of a moving thermometer(16) tape on a fixed scale. The scale is marked in increments of ± 1000 fpm, and has a range of 0 to ± 3200 fpm
18. Vertical Speed Digital Readout: This two-digit readout is provided either above or below the scale when the vertical speed is at least ± 500 fpm.
19. Heading Scale Tape: This tape provides magnetic heading markings.
20. Heading Digital Readout: This readout displays the magnetic heading.
21. Localizer Deviation Indication: This indication displays the localizer deviation by means of a fixed scale and moving pointer. The scale comes into view automatically upon selecting an **ILS** navigation source.

22. Localizer Sensing Indication: This indication annunciates ILS when a valid ILS Approach is selected. If the valid signal is lost an LSEN annunciation will be displayed.

23. Glideslope Deviation Indication: This indication displays the glideslope deviation by means of a fixed scale and moving pointer. The scale comes into view automatically upon selecting an **ILS** navigation source. The Glideslope Deviation Indication is removed when the **ILS** approach is back-course.

24. Altitude Alert: The amber Altitude Alert (ALT) provides a visual indication of approach to and departure from a preselected altitude on the cockpit installed altitude alerter.

25. Ground speed digital readout.

26. Course.

27. Selected heading.

28. Ground Reference Indicator: This indicator displays a Radio Altitude of 0 ft (ground height), by means of a brown line on the Barometric Altitude Scale Tape.

6.10 ND - Navigational Display



The **CRS** control is used to input the selected course. The clicking areas are:

- 1.- Decrements course
- 2.- Aligns the course selected to the current **CDI** bearing source for the **VOR**
- 3.- Increments course

The **HDG** control is used to input the selected heading. The clicking areas are:

- 4.- Decrements selected heading
- 5.- Aligns the selected heading to the current aircraft heading.
- 6.- Increments selected heading

The **SEL** button is used for menu mode selection. When the menu is not active the **SEL** button is used to cycle the Screen Format as follows:

HSI Screen Format >> MAP Screen Format >> ARC Screen Format >> HSI Screen Format

ARROWS buttons

When the menu is active, the button is used for menu navigation. When the menu is not active, in **MAP** or **ARC** Screen Formats, the button is used to increment the displayed range to the next higher or lower value.

The **MNU** button is used to display and remove the menu.



In HSI mode you can select which signal commands each needle. Use the arrows buttons to navigate through the options, press SEL to select and then MNU to return to the main screen.

CDI: This option is used to select the **CDI** source The selection of **CDI** displays the next menu level, which in turn allows for selection of the **CDI** source. .The available **CDI** sources are: **VOR1 / VOR2 / GPS**. When selected, it displays in the upper left side of the **ND** in magenta.

RMI1: This option is used to select the **RMI1** needle source The selection of **RMI1** displays the next menu level, which in turn allows for selection of the **RMI1** source. The available **RMI1** sources are: **OFF / VOR1 / GPS / ADF**. When selected, it displays in the upper right side of the **ND** in white.

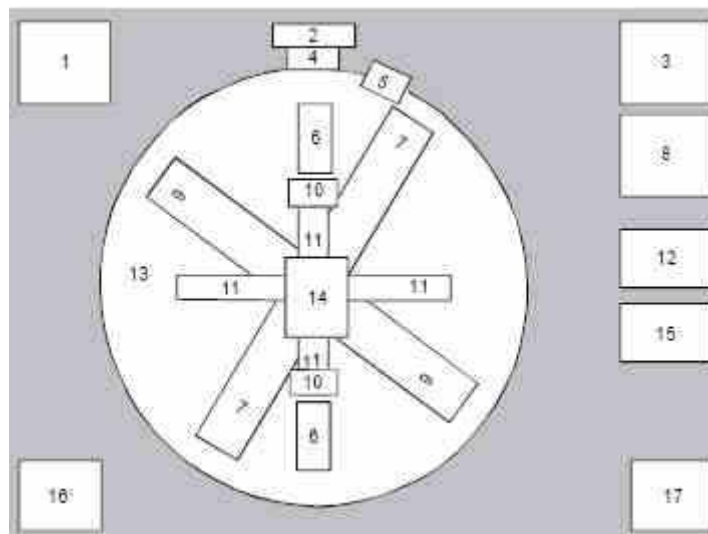
RMI2: This option is used to select the **RMI2** needle source The selection of **RMI2** displays the next menu level, which in turn allows for selection of the **RMI2** source. .The available **RMI1** sources are: **OFF / VOR2 / GPS / ADF**. When selected, it displays in the right side of the **ND** in green, under RMI1.

HSI Screen Format



The **HSI** Screen Format, shown above, displays the aircraft's situation in the horizontal plane. Heading, track, navigation source deviation, and direction are presented. Also included are two selectable **RMI** needles providing magnetic bearings to **GPS** waypoints and **VOR / ADF** stations.

The information presented in the HSI screen format includes:



- | | |
|--|---|
| 1. Selected CDI Source | 10. TO / FROM Display |
| 2. Magnetic Heading Indicator | 11. CDI |
| 3. RMI1 Bearing Pointer Source | 12. DME1 Readout |
| 4. Heading Bug | 13. Compass Card |
| 5. Actual Track Bug | 14. Aircraft Symbol |
| 6. Selected Course / Desired Track Pointer | 15. DME2 Readout |
| 7. RMI2 Bearing Pointer | 16. Selected Course / Desired Track Digital Readout |
| 8. RMI2 Bearing Pointer Source | 17. Selected Heading Digital |
| 9. RMI1 Bearing Pointer | |

MAP Screen Format



The different information presented in the **MAP** Screen Format includes:

- Map Range Display and Track Digital Readout
- Navigation Route Data
- Aircraft Symbol
- Range Readout Indication
- CDI
- ARC / MAP-TO / FROM

ARC Screen Format

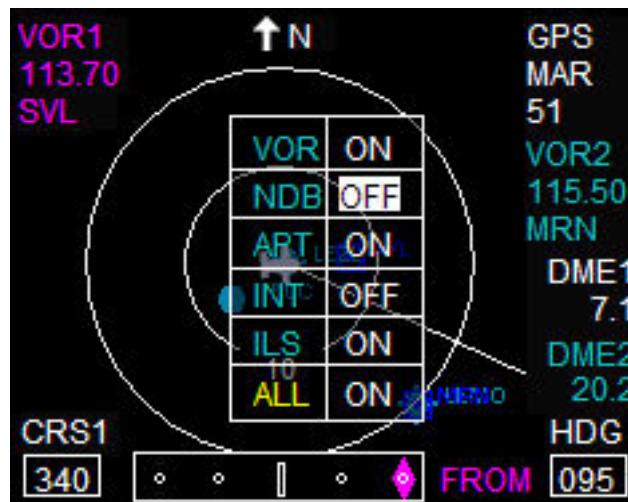


The different information presented in the **ARC** Screen Format includes:

- Magnetic Heading Indicator
- Heading Bug
- ARC Range Display and Digital Navigation Route Data
- Selectable NavAids
- Actual track bug
- Range Readout
- CDI
- Aircraft Symbol
- ARC / MAP-TO / FROM

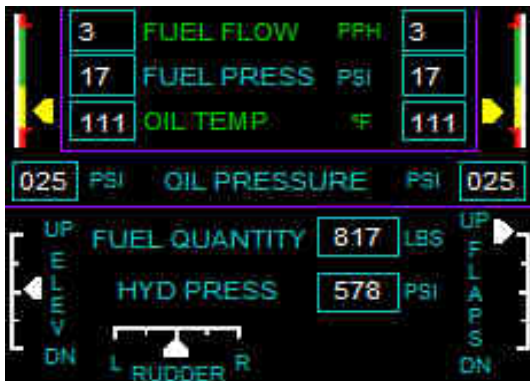
Selecting Nav aids to display

You can select, while in modes MAP or ARC, what nav aids you want to display. Use the MNU key, then arrows key to select a nav aid type and then SEL to turn it OFF or ON. ALL will hide all nav aids if OFF and show nav aids which are set to ON.



6.11 EIDS - Engine Instrument Display System

This gauge has five screens that you can navigate through the page button. They don't need further explanation.



6.12 BENDIX KX 165A RADIO



The Bendix KX 165A Nav Com radio has four knobs and four buttons. Its display is divided in two segments. The left portion of the digital display readout is allocated for COMM ACTIVE and COMM STANDBY frequencies channels stored (this is a dummy function in this version). The right portion of the display is allocated to NAV receiver information and much more as shown below.

Clicking areas



1. On Off switch
2. Display Channel
- 3 and 4. Tune COM fractal frequencies
5. Ident
6. Select screen right segment mode
- 7 and 9. Tune NAV fractal frequencies
8. Centers OBI if OBS mode is active
- 10 and 11. Tune NAV integer frequencies / controls stop watches / OBS
12. Swaps NAV frequencies / controls stop watches
- 13 and 14. Tune COM integer frequencies. Change Ch stored if Ch is visible
15. Swaps COM frequencies
16. Reset Timers

Left segment pages

Two modes are available, though Channel mode is a dummy mode, by now.



Pushing Channel button will show channels number stored for a few seconds. The big left knob will browse through the channels stored. When Ch is not visible this knob tune COM frequencies.

Right segment pages

The right segment of the screen can display 9 different modes, you can browse with the MODE button.

ACTIVE / STAND BY mode



In this mode you can tune stby frequency with the right knob and swap frequencies with the transfer button

ACTIVE / CDI mode



Pushing MODE button will take you to this mode. The vertical “needle” moves side to side similar to a mechanical CDI. When the needle is centered, the aircraft is on the selected OBS course. When the active frequency is tuned to a VOR frequency, the center of the CDI scale displays the “TO” or “FROM” indicator.

The CDI needle may be automatically centered with a “TO” indication clicking on center of the knob. The CDI is displayed on the line below the frequency/OBS. When the ACTIVE frequency is tuned to a VOR frequency, the standby frequency area is replaced by a three digit OBS (Omni Bearing Selector) display. The desired OBS course can be selected with the right knob. When the ACTIVE window is tuned to a localizer frequency, the standby frequency area is replaced by “LOC”. When the received signal is too weak to ensure accuracy the display will flag.

ACTIVE / BEARING mode



Pushing MODE once more cause the NAV display to go to bearing mode of operation, the right hand window of NAV display shows the bearing TO the station.

ACTIVE / RADIAL mode



Another push of the MODE button will cause the NAV display to go from the ACTIVE/BEARING mode to the ACTIVE/RADIAL mode. The right hand window of NAV display shows the radial FROM the station.

TIMER mode



Another mode button click will cause the unit to go into the TIMER mode. When the unit is turned on the elapsed timer begins counting upwards from zero. The timer can be stopped by pushing the NAV frequency swap button or reset to zero clicking on area 16 (see above) causing the ET on the display to flash. In this state the timer can be set as a countdown timer or the elapsed timer can be restarted. If you click on swap button again the counter will restart from zero. If you use the knob in the right side countdown timer can be set to the desired time (while ET is blinking) and then pushing the NAV swap button countdown will start. The top side of the knob

selects minutes, the bottom side of the knob selects seconds. After the countdown timer reaches zero, the counter will come up, whatever the mode you are in, and will begin to count upwards indefinitely while flashing for a few seconds, returning then to the mode you were before, if it was different. The Audio Alert is then sounded.

ACTIVE / GPS modes

The following GPS modes are not described in the KX 165 guide but we have considered useful to include this modes. You go into these modes pushing MODE button as well.



GPS CDI and desired track



Next waypoint distance and ident



Bearing to next waypoint distance and ident



Next waypoint ident ETE and ETA

6.13 DAVTRON DIGITAL CLOCK M877



Operation

The SEL button selects what is to be displayed, and the CTL button controls the timers.

Pressing SEL sequentially selects to display Local Time, GMT , Flight Time, Elapsed Time, and back to Local Time. In the bottom segment of the display a dot points to the selected display LT, GMT, FT or ET.



FT starts counting when a valid groundspeed was first greater than 30 knots (typically during takeoff) and it will stop when that speed come down to less than 30 knots. ET starts counting when you click on control button while ET is selected (the red dot is above ET)

When FT is being displaying (the red dot is above FT) clicking twice the CTL button resets Flight Time, FT, back to zero. One more click will start it again. The CTL button also stops, resets and starts again Elapsed Time when clicked sequentially, if ET is selected.

Flight Time and Elapsed Time counts up to 59 minutes, 59 seconds, and then switches to hours and minutes.

6.14 DAVTRON DIGITAL CLOCK M803



Operation

The OAT / VOLTS button controls the upper display and cycles among OAT °F, OAT °C or E- Voltage (EMF)



The SEL button selects what is to be displayed in the lower part of the display, and the CTL button controls the timers.

Pressing SEL sequentially selects to display Local Time, UT, Flight Time, Elapsed Time, and back to Local Time. In the left segment of the lower display LT, UT, FT or ET will show underlined indicating what it's displayed in the right segment.



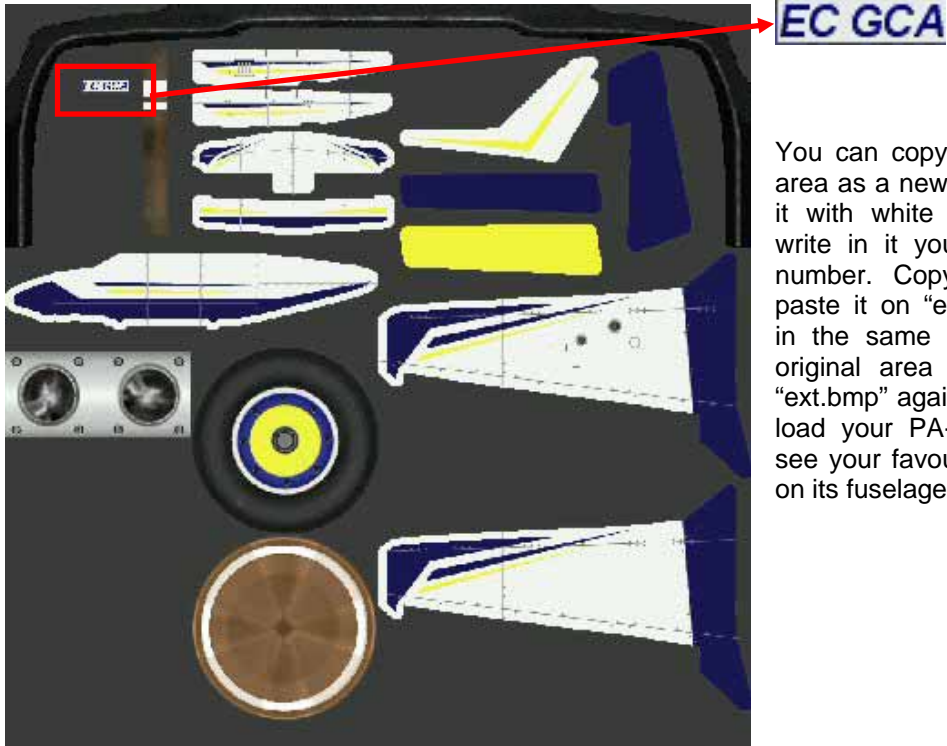
FT starts counting when a valid groundspeed was first greater than 30 knots (typically during takeoff) and it will stop when that speed come down to less than 30 knots. ET starts counting when you click on control button while ET is selected (ET shows underlined in the left side)

When FT is being displaying (FT shows underlined in the left side) clicking twice the CTL button resets Flight Time, FT, back to zero. One more click will start it again. The CTL button also stops, resets and starts again Elapsed Time when clicked sequentially.

Flight Time and Elapsed Time counts up to 59 minutes, 59 seconds, and then switches to hours and minutes.

7. Changing the Tail Number

If you want to change the tail number you'll need some computer painting knowledge. Go to the Texture folder of this plane and edit (make a backup first) with a painting program that can manage DXT3 textures the file "ext.bmp". Replace the little area showed in the picture below with one of exactly the same size, created by yourself, and place it exactly in the same spot.



You can copy and paste that area as a new picture, then fill it with white color and then write in it your preferred tail number. Copy it again and paste it on "ext.bmp", exactly in the same spot where the original area was. Save the "ext.bmp" again and when you'll see your favourite tail number on its fuselage.

8. Checklist (you can see this list in your knee board whilst flying)

Pre-Start Checklist

Parking Brakes **SET**
Throttle **IDLE**
Avionics Master Switch **OFF**
Landing Gear Lever **CHECK DOWN**
Flaps UP
Propeller **HIGH RPM**
Fuel Flow / Mixture **CUTOFF**
Battery Switch **ON**
Panel Light **ON if required**
Fuel Quantity **CHECK**
Flight controls **CHECK**
Avionics Master Switch **ON**
Check Weather
Request Clearance
Transponder **SET**
Beacon **ON**

Startup Checklist

Fuel Flow / Mixture **FULL RICH**
Throttle **IDLE**
Magnetos and Engine Start Switch **START**
Oil Pressure **CHECK**
Alternator **ON**
Voltmeter **CHECK for CHARGE**
Throttle **IDLE**

Before Taxi Checklist

Strobe Light **ON**
Nav Lights **ON**
Heading Indicator / Altimeter **SET**
Instruments **NORMAL OPERATION**
Radios and Avionics **CHECKED and SET**
Autopilot **OFF**
Request Taxi Clearance

Taxi Checklist

Taxi Lights **ON**
Parking Brake **RELEASE**
Brakes **CHECK during taxi**
Taxi to assigned runway **SPEED Maximum 20 knots**

Before Take-off Checklist

Parking Brake **SET**
Landing Lights **ON**
Fuel Quantity **CHECK**
Throttle **IDLE**
Propeller **HIGH RPM**
Mixture **FULL RICH**
Elevator Trim **SET for takeoff**
Flaps **CHECK UP**
Engine Instruments **CHECK**
Radios and Avionics **SET**
Request Takeoff Clearance

Take-off Checklist

Smoothly increase thrust to **FULL**
Brakes **RELEASE**
V1 = 85 KIAS (decision)
Vr = 90 KIAS (rotate)
Pitch 10 degrees
At Positive Climb Rate **RETRACT** Landing Gear
Trim for climb to maintain **110 KIAS**
Annunciator Lights **CHECK OFF**
Engine Instruments **CHECK**

Climb-out Checklist

Throttle **FULL**
Autopilot **CHECK and SET**
Taxi Lights **OFF**
Landing Lights **OFF**
Airspeed 135 KIAS
Engine Instruments **MONITOR**
ATC AS REQUIRED
At Transition Altitude (FL180) set Altimeter to 29,92"

Cruise Checklist

Accelerate to cruise speed **180 KIAS**
Service Ceiling **20,000 ft**
Engine Instruments **CHECK**
Engine Temperatures **STABILIZE** at cruise conditions.
Fuel Quantity **CHECK**
Autopilot **CHECK and SET**
Radios **TUNED and SET**
Lights **as required**

Descent Checklist

Atis and Airport Information **CHECK**
Altimeter **CHECK**
Radios **SET**
Descent Speed **160 KIAS**
Flaps **CHECK UP**
Landing Gear **CHECK UP**
Fuel Balance **CHECK**
At Transition Altitude (FL180) **reset Altimeter to local**
Check Weather

Approach Checklist

Localizer Level Flight:
Propeller **HIGH RPM**
Mixture **FULL RICH**
Speed: Establish **140 KIAS**
Landing Lights **ON**
Flaps **SET FIRST POSITION**
Speed: Establish **120 KIAS**
Landing Gear **DOWN**
Final Glideslope Descent :
Turning toward runway: set flaps **FULL DOWN**
Speed:- Establish **100 KIAS**
Elevator Trim **AS DESIRED**
Parking Brake **VERIFY OFF**

Landing Checklist

Landing Gear **CHECK DOWN, 3 GREEN**
Autopilot **OFF**
Landing Speed **95 KIAS**
Touchdown **MAIN WHEELS FIRST**
Landing Roll **LOWER NOSE WHEEL**

Taxi To Ramp

Flaps **RETRACT**
Taxi Lights **ON**
Landing Lights **OFF**
Speed Max. **20 knots**
Elevator Trim **TAKEOFF SETTING**
Avionics/Radios **AS REQUIRED**
Transponder **1200**

Shutdown Checklist

Parking Brake **SET**
Throttle **IDLE**
Avionics Switch **OFF**
Taxi Lights **OFF**
Nav Light **OFF**
Strobe Light **OFF**
Fuel Flow / Mixture **CUTOFF**
Magnetos **OFF**
Beacon **OFF**
Alternator Switch **OFF**
Panel Light **OFF**
Battery Switch **OFF**

Securing Aircraft

Parking Brake Verify **SET**
Throttle Verify **IDLE**
All Switches Verify **OFF**

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9. Requirements

This panel requires Windows XP with at least SP1 and .Net Framework 1.1 and a screen resolution of 1024 x 768 or higher (1240 x 1024 recommended). No other special requirements are needed, if your PC can handle the default planes, it can handle these ones.

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10. Remarks

Some of the effects you can see in the aircraft depend on the settings you use in FS2004, such as illumination in VC cabin, that depends on Options > Settings > Display > Hardware > Hardware-Rendered Lights.

11. Technical support

If you have any question, please contact FriendlyPanels at:

fpanels@arrakis.es

Web page:

www.friendlypanels.arrakis.es

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