

Pilatus P.C.7 Mk II "Astra"

FLIGHT SIMULATOR MANUAL



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Designed by **Thinus Pretorius**
July 2014

Pilatus P.C.7 Mk II "Astra"

The model was designed with FSDS 3.5 Building for FSX using MakeMdl (This is not a FSX native model) It will however not work in FS2004.

It is an update of a previous model, with major redesigning of the VC and all panel gauges.

The airfile was done based on the PC7 manual, within the constraints of the FSX SDK

The aircraft features all the usual animations, custom sound, and a realistic 2d panel with PC7 specific gauges designed from the PC7 manual.

Please read the manual for the proper use of the instruments and flight characteristics of the model.

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The PC-7 MkII is an all-metal, single engine, low-wing, training aircraft with two seats in tandem. It is cleared for flight between -3.5g and +7g up to airspeeds of 300 KCAS or Mach 0.60. The aircraft can be flown in aerobatic manoeuvres and training exercises, up to its operating limit of 25,000 ft.

It is powered by a Pratt & Whitney PT6A-25C free turbine turbo-prop engine with a four-bladed propeller. The engine thrust is offset to minimise the effects of torque.

The aircraft is aerodynamically conventional, controlled by manual flight controls with electric trim. It has an unswept single-piece wing with 7° of dihedral from about one quarter span.

The aircraft is equipped with a retractable tricycle landing gear, electrically controlled and hydraulically operated, differential brakes and a nose wheel steering system.

AIRCRAFT DIMENSIONS

Wing span 10.19 m (33 ft 5 in)

Overall length 10.18 m (33 ft 4 in)

Height 3.26 m (10 ft 8 in)

Landing gear track 2.54 m (8 ft 4 in)

WEIGHT

Maximum Take-Off Weight (MTOW) 2250 kg (4961 lb)

Maximum Landing Weight (MLW) 2250 kg (4961 lb)

Max weight in baggage compartment 25 kg (55 lb)

Maximum Zero Fuel Weight (MZFW) 1900 kg (4189 lb)

SPEED

Max. level cruise speed (VH) at sea level 245 KTAS (454 km/h)

Max. level cruise speed (VH) at 10,000 ft 255 KTAS (472 km/h)

Stall speed

- flaps and gear up (Vs) 75 KEAS (139 km/h)

- flaps and gear down (Vso) 68 KEAS (126 km/h)

THE FS MODEL

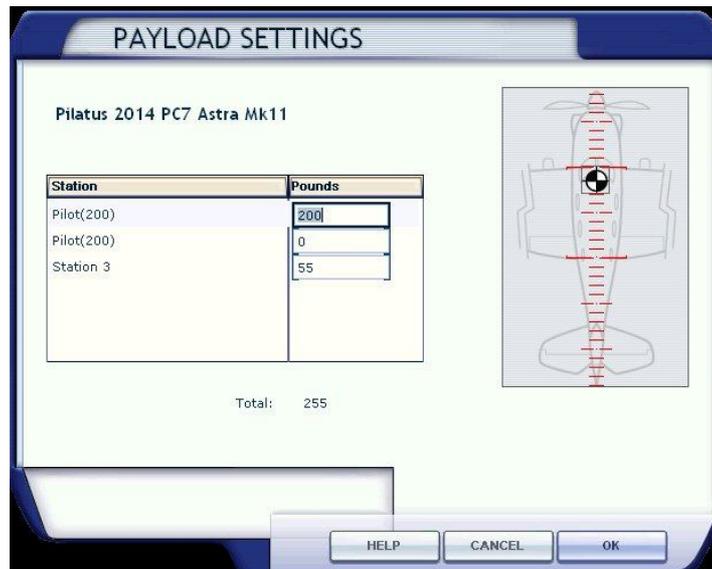
This package includes modifications to the exterior model and VC as well as a new glass cockpit. It features full animation and clickable Virtual Cockpit:

The models feature full moving parts (gear, flaps, spoiler) and has been animated to follow the real aircraft as close as possible.

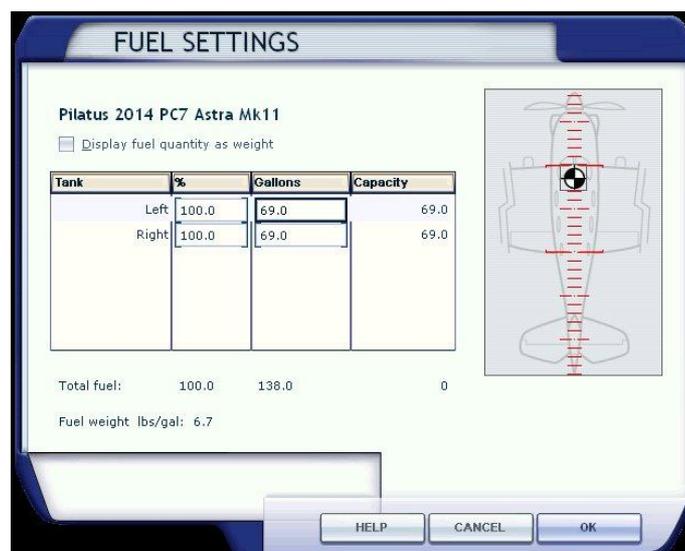
At engine off, all moving parts is open.

PILOTS

The aircraft opens in FS without pilots, select one or 2 pilots in the payload section of FS by entering the value of 200 (mass of pilot)



FUEL



The aircraft is modeled only with internal tanks, as the SAAF does not use external tanks

MAIN PANEL



1. EADI
2. GPS
3. PFD
4. ENGINE PANEL
5. WARNING
6. TOGGLE SWITCHES
7. TANK JETTISON

New 2D glass cockpit based on photos taken of the actual aircraft. All gauges are in xml format. All gauges have tooltip text, so if you move your mouse over a gauge, it will give you the name of the gauge.

The PDF and engine gauge have been designed from the real life manual and is accurate within the constraints of FS.

The aircraft is not equipped with an autopilot.

I have linked the HSI and ARC gauge to the GPS. When you enter a flightplan, the white needle in the HSI will indicate the direction of your waypoint. In the ARC window some airport info and a flightplan needle is included. If you enter more than one waypoint in the flightplan, the needle will automatically change when you fly over the first waypoint and will show all subsequent legs of the flightplan.

PFD FUNCTIONS



PFD

1	TFC	NA
2	EID	Toggle Bottom Engine window. (One click button, to change click HSI or ARC)
3	SPD	Toggle speed readouts. Right Click to open, Left click to close
4	C RST	NA
5	TM	Toggle NAV GPS (This function in real PDF differs)
6	NAV	Toggle NAV readouts . Right Click open, Left click close – Works with HSI
7	HSI	Toggle HSI window . (One click button, to change click ENG or ARC to change)
8	Toggle Needles	8 and 14 works together. 8 for 1 line needles, 14 for VOR2
9	CRS set	Set CRS (Use TDK degrees)
10	NA	
11	NA	
12	NA	
13	HDG Set	Set HDG (Use TDK degrees)
14	Toggle Needles	8 and 14 works together. 8 for 1 line needles, 14 for VOR2
15	ARC	Toggle ARC window (One click button, to change click ENG or HSI to change)
16	Range	Toggle Map range in ARC mode
17	Range	Toggle Map range in ARC mode
18	VS	NA
19	HT	NA
20	Baro	Set Baro in Altimeter
21	ALT	NA

PFD Engine Functions



Some functions in the engine panel is duplicated in the PFD

Flaps

- Flap readout appears just below the speed readout
- White in transit
- Green FLAPS TO when deployed 23 degrees
- Green FLAPS LDG when deployed 50 degrees

PFD ARC Functions



Displays GPS flightplan as well as Airport info

PFD VOR2 Functions



Use the toggle switch to add a VOR2 needle
Reset to normal needle switch left switch

ENGINE INSTRUMENT



Normal Engine info

Torque is maxed at 49.7
Prop RPM is maxed at 2000

Reset Used Fuel Counter (Press the button to zero the reading, at startup it shows a line)

Warning indicators on right side of panel



Declutter (removes the digital text from certain sections of the gauge)



Amber warning signs indicates Fuel is less than 60 LBS in each tank

The Green QTY readout turns to Amber

Side Panels

Opens via toggle switch on the main panel



LEFT

- 1 GEAR LEVER AND LIGHTS
- 2 TRIPLE TRIM INDICATOR
- 3 LANDING / TAXI LIGHT SWITCHES
- 4 BATTERY
- 5 GENERATOR
- 6 PROPELLER BLADE HEATING SWITCH
- 7 PROBES ANTI-ICE SWITCH
- 8 RUDDER TRIM SWITCH
- 9 FUEL CUT SWITCH
- 10 EMERGENCY FUEL CONTROL PANEL
- 11 PCL
- 12 FLAP SELECTOR SWITCH

RIGHT

- 1 MASTER BAT
- 2 GEN
- 3 RESET
- 4 EMER BAT
- 5 PARKING BRAKE
- 6 IGNITION
- 7 STARTER SWITCH
- 8 FUEL PUMPS CONTROL PANEL
- 9 U/W TANK FUEL PUMP CONTROL PANEL
- 10 NAV
- 11 LOGO DIM / BRT LIGHTS CONTROL PANEL
- 12 STROBE LIGHTS SWITCH
- 13 COCKPIT LIGHTS CONTROL PANEL
- 14 COCKPIT LIGHTS CONTROL PANEL
- 15 OXYGEN REGULATOR CONTROL PANEL
- 16 ECS CONTROL PANEL
- 17 VHF1 STANDBY CONTROL UNIT
- 18 NAV1 STANDBY CONTROL UNIT

GPS

Reworked version of the Garmin 500W (Only for the FSX Version of the PC7)

Please read the GPS manual (included in the documents folder)

Terrain can be displayed in "alert mode", to indicate terrain elevations relative to the plane's altitude.

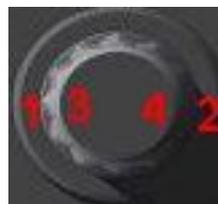
Green: Safe – At least 1,000 ft below the aircraft

Yellow: Warning – Between 1,000 ft and 100 ft below the aircraft

Red: Danger – From 100 ft below, and anything higher than the aircraft.



RADIO



Adjust Frequency

- 1 Whole INC
- 2 Whole EC
- 3 Frac INC
- 4 Frac DEC

LEFT

COMM ACTIVE STANDBY
COMM ACTIVE STANDBY SWOP

COMM2 ACTIVE STANDBY
COMM ACTIVE STANDBY SWOP

XPONDER

RIGHT

NAV1 ACTIVE STANDBY
NAV1 ACTIVE STANDBY SWAP

NAV 2 ACTIVE STANDBY
NAV2 ACTIVE STANDBY SWAP
ADF

STARTUP AND PROP SPINNING

The props don't start to spin when the starter turns.

The turboprop engine used on the PC7 is a P&W PT6 free turbine engine.

In essence you have a core engine that works very much like a normal jet engine. This core engine is the one you are starting when turning on the starter and injects fuel.

The exhaust from this core engine is used to drive another turbinewheel - the free turbine, which via the gearbox drives the propeller.

A certain amount of thrust must be produced by the core engine before the propeller starts to move. That's why you can hear the spin up and a whine from the engine although the propeller is standing still.

The starter and fuel cut switches in the VC is animated, first toggle the red cover switch (make sure your mouse is on that switch, see the tooltip), then press the starter. When the aircraft engine is running, close the switch and then the cover (same with the fuel cut switch)

ENGINE POWER CHANGES AND TORQUE

The aircraft's directional trim is sensitive to power changes. The selection of high power, without correcting rudder, results in yaw to the left and sideslip. Eventually, uncorrected yaw produces roll in the same direction.

Above approximately 35 TQ PSI, engine acceleration is rapid and closely follows movement of the PCL. To maintain balanced flight, it is necessary to anticipate the rate at which engine power changes.

At low airspeeds, typically in the range used during the approach to land, power settings below 3.5 TQ PSI produce propeller drag rather than thrust.

A torque limiter limits the engine torque to 49.7 +/-0.5 psi

TAXIING

At sea level the PC7 MkII produces sufficient power with PCL at Idle in order for it, once the brakes are released, to start moving under its own power. If not, a small increase of power will be sufficient to start moving forward. With the PC7 MkII you will find that even at idle power, the aircraft will accelerate on a level, smooth, hard surface

Taxi speed is controlled by using the toe brakes, which are activated by flexing your ankles to depress the upper sections of the rudder pedals. Like all brakes, the higher the foot pressure, the higher the brake pressure applied. Even brake application is required to maintain a straight line of advance whilst slowing down.

FLAPS

Flap readout appears just below the speed readout on the PDF
White in transit
Green FLAPS TO when deployed 23 degrees
Green FLAPS LDG when deployed 50 degrees
Red Damage to flaps due to high speed with flaps not retracted

FUEL TANKS

The integral wing tanks hold a usable total of 518 litres, approximately 922 lb (418 kg), of fuel.

Under wing tanks can be attached to the underside of each wing. The tanks can be jettisoned. Each tank has a usable fuel capacity of 154 litres, approximately 273 lb.

Fuel Quantity Set/Reset

The FUEL QTY display shows the fuel quantity LB in the wing fuel tanks.

The FUEL USED display is automatically set at zero LB on aircraft power up. It is indicated by a line on the EID. Pushing the FUEL RESET key sets the FUEL USED display on the EID to zero LB.

When the QTY in each tank reached 60lb, yellow warning indicators will go on, and the QTYlb readout will change colour from green to amber.

If external fuel tanks are used, the additional fuel quantity can be added to the FUEL QTY display by pushing the FUEL QTY + softkey. Pushing the FUEL QTY - softkey decreases the displayed fuel quantity. Pushing and holding the FUEL QTY + or - softkey will adjust the fuel quantity in steps of 10 instead of 1.

External tanks has not been added to the model as it is not used in the SAAF

LIGHTING SYSTEMS

The aircraft has been fitted with the following lights:

The aircraft navigation, strobe and logo lights are:

- * A combined red navigation and white strobe light on the forward part of the left wingtip
- * A combined green navigation and white strobe light on the forward part of the right wingtip
- * A white light on the rear part of each wingtip
- * Two logo lights on the tailplane

All lights are toggles via a switch on the 2d side panels and in the VC

Landing and Taxi Light

The landing light is installed on the LH landing gear leg. An identical light installed on the RH landing gear leg is used as a taxi light. The two switches that control these lights are located on the LH console in the front cockpit (LDG LIGHT and TAXI LIGHT).

The landing and taxi lights will operate only when the landing gear is down and locked and the applicable switch is set to the ON position.

AIRSPEED VS. POWER SETTING

The model is flown with the throttle and specific torque settings for specific speed readings.

All the aircraft in the PC7 MkII fleet have very similar performance regarding the straight and level speed obtained at a particular power setting. The following data is an approximate guide to airspeed obtained at a particular power setting in the clean configuration:

10 psi - 100 KCAS
12 psi - 120 KCAS
17 psi - 140 KCAS
21 psi - 160 KCAS
26 psi - 180 KCAS
35 psi - 200 KCAS

BANKING

When entering into a bank, it would be necessary to add trim (2 degrees +) to keep the aircraft nose up. This is normal in the real aircraft

VIRTUAL COCKPIT

The VC has been designed with MakeMDL.parts.xml and codes were written specifically for the model. It features clickable switches and working parts. Some buttons (ie the CRS and HDG) has a left right mouse function.

The functions are the same as those on the 2d panel

ACKNOWLEDGEMENT

Thanks to all who morally and otherwise supported me.

A SPECIAL THANKS TO:

My awesome wife Retha and son Friedrich who allowed me to work all the hours on the model, thaks for the encouragement, chats and all the coffee! Love you!

Barend Bezuidenhout:	Providing valuable information and assistance
Milton Shupe	Providing valuable assistance with the airfile
Ryno Potgieter:	Testing
Johan Jacobs	Testing (http://www.fsworld.co.za/community/Homepage.php)
Dean Wingrin	Pictures of the panel (http://www.saairforce.co.za/)
Kronzky	GPS (Available at www.kronzky.info/fs/500wx)

SAAF Pilots and staff: Thanks for your help! We can only dream of what you have achieved!

CHECKLIST (FOR USE IN FS ONLY)

PRE-STARTING CHECKS

1. PARK BRAKE.....On
2. BAT MASTER.....ON, DC VOLT above 24 V
3. COCKPIT LIGHTS.....As required
4. External lightsAs required
5. FLAPS.....UP
6. TRIM INT RPT.....Guarded NORM, thread unbroken
7. ANTI-ICE PROBES / PROP BLADES OFF
8. LDG / TAXI LIGHT.....OFF
9. AVIONICS MASTER.....BAT and GEN OFF
10. Landing gear handleLG DOWN, 3 green lights
11. EIDCondition, no failure captions
12. FUEL USED.....RESET, QTY SET if necessary

Right Console

1. BAT MASTER.....As required
2. GEN MASTER.....OFF
3. EMER BAT.....OFF
4. IGNITION.....OFF
5. STARTER.....OFF
6. FUEL PUMPS.....OFF
8. COCKPIT LIGHTS.....As required
9. External lightsAs required
10. VHF1 STBY / NAV1 STBYOFF

ENGINE START

1. Master cautionCancel
2. NAV LIGHT / LOGOFLASH and BRT NAV, or as required
3. DC VOLT24 V or above
4. FUEL PUMPS.....On
5. IGNITION.....On
6. STARTER..... Switch On
7. PCL (Throttle)IDLE
8. NG.....Above 52% and stable
9. STARTER.....OFF
10. Engine parametersChecked

AFTER START CHECKS

1. GEN MASTER.....ON, 28 V and charging
2. AVIONICS MASTER.....BAT ON / GEN ON
3. VHF1 STBY / NAV1 STBYCheck operation, set as required, OFF
4. GPSOn, check and set as required
5. PFD.....On, BRT as required, G-RST, set up
6. EIDNo red / amber indications except PROBES caption

TAXI CHECKS

1. External lightsAs required
2. Brakes.....On
4. Flight instrumentsCheck in turn, cross check PFD / SFD
5. Nav aids.....Check tracking

PRE-TAKEOFF CHECKS

1. TRIMSet for takeoff (green sector)
2. AIRBRAKE.....IN
3. FLAPS.....TO, FLAPS TO caption on in PDF
4. ANTI-ICE PROBES ON
5. Canopy.....Closed, locked
6. EIDAll green pointers / digits, no red / amber captions;
8. FUEL.....Contents, balance

TAKEOFF BRIEFING

1. Nav aidsSet as required
2. LDG / TAXI lightsON
3. STROBEOn, or as required
4. EIDIn limits, no red / amber indications

AFTER TAKEOFF CHECKS

1. Landing gearLG UP, lights out
2. FLAPS (above 110 KCAS)UP

IN-FLIGHT CHECKS (EFOL)

1. Engine parametersIn limits, EID no red / amber indications
2. FUEL.....Contents, balance

BEFORE-LANDING CHECKS

1. Airspeed.....Below 150 KCAS
2. AIRBRAKE.....IN
3. Landing gear.....LG DOWN, 3 greens
4. FLAPS.....TO (or as required)
5. FUEL.....Contents and balance
7. LDG / TAXI lightsAs required

FINAL CHECKS

1. Landing gear.....LG DOWN, 3 greens
2. FLAPS.....LDG (or as required)
3. AIRBRAKE.....As required

AFTER-LANDING CHECKS

1. FLAPS.....UP
2. AIRBRAKE.....IN,
3. ANTI-ICE switches.....PROBES / PROP BLADES OFF
4. LDG / TAXI lightsAs required
5. ATC switch (ARCDU)XPDR SBY
6. STROBEOFF (clear of runway area)

SHUTDOWN CHECKS

1. PCL.....IDLE
3. PARK BRAKE.....On
4. FLAPS.....UP
6. LDG / TAXI lightsOFF
8. AVIONICS MASTER.....BAT OFF / GEN OFF
10. FUEL PUMPS..... OFF
11. GEN MASTER.....OFF
12. PCL.....OFF
13. COCKPIT LIGHTS.....As required
17. NAV LIGHT / LOGOPropeller stopped, OFF
18. BAT MASTER.....OFF
19. EMER BATOFF