PC/Mac DVD ROM

Add-on for
XPLANE 10

aeroSOFT™

ATR 72-500

MANUAL

Aerosoft GmbH 2012

ATR 72-500

Manual

Add-on for

X-Plane 10

Content

Advisory

This manual contains everything the user needs to get started operating the ATR 72-500 for X-Plane 10. We do, however, encourage you to participate in the forums, where users will share and discuss their experiences with others.

** This manual is not endorsed by ATR and therefore not to be used for real world operations and is only applicable for the ATR 72-500 for X-Plane 10 **

All copyright remains the property of their respective owners. In-game shots are made by Alfredo Torrado.

Figure 1: An Air Austral ATR 72-500. In 2011 Air Austral operated 3 of these aircrafts. More freeware liveries can be found on the McPhat Studios website.

Introduction

The ATR 72-500 project is a project started by Alfredo Torrado and Juan Alcón Durán. Both worked on a Fokker 27 (freeware) in the past and one could say they have a love for regional turboprops.

The conception of the ATR 72-500 started in late 2010 and remained their project until mid 2011. At that time, they approached McPhat Studios with a proposition to bundle their strengths and together release not only a good looking model, but to top it off good looking textures as well. Both Alfredo and Juan expressed their wish to focus on their core tasks, which is modeling. McPhat Studios, at that time working on a DC-9 for a different publishing house and developer (and simulator), was also looking at the possibilities to enter the world of X-Plane and the ATR 72-500 was the right plane to do so.

At the end of 2011, McPhat Studios, while looking for a strong, supporting partner in the publishing world, approached Aerosoft. The reason for this was similar to why Alfredo and Juan approached them: To be able to focus on core tasks (graphics) and have the remainder taken care of by those who are best at it.

With more than 370 pixels per meter, the ATR has the highest px/m ratio of any aircraft available at the moment, commercial, military, X-Plane or Flight Simulator X.

Besides the 5 liveries that come with the release pack of the ATR 72-500, more liveries can be found on the McPhat Studios site (http://www.mcphatstudios.net/freeware/atr-72-500/view-category.php) as freeware.

Figure 2: American Eagle, a subsidiary of American Airlines, was once one of the biggest ATR 72 operators. Download is available on the McPhat Studios website.

1 Installation and Removal

Installation is simple. Start the exe file you downloaded and follow the instructions on your screen. Make sure X-Plane is closed and we do advise you to reboot your system before installing. Make sure you are logged on as Administrator on the machine! Removal should never be done manually but only using the software removal applet you will find the Windows Control panel.

How to remove the Scenery under Mac

For the de-installation under Mac, please go into the directory „X-Plane 10\Aircraft\Heavy Metal\ATR 72-500_ATR 72-500_ installation\" and execute the file „Change ATR 72-500 Installation" and select the option „Uninstall Product".

2 Performance

In order to see all detail of the textures make sure to follow the steps below:

- Go to the "Settings" menu
- Click on "Rendering Options"
- Change the texture resolution to "extreme res!"
- Check "3-D bump-maps"
- Check "draw per pixel lighting"
- Uncheck the option "compress textures to save VRAM"

N.B.: Changes take effect on restart

Figure 3: Rendering options menu

There are 3rd party plug-ins which affect the functioning of the ATR 72-500. To avoid problems, it is recommended that all plug-ins in the plug-in manager are disabled before loading the ATR 72-500 or even restart the simulator and then open the ATR 72-500.

3 3D Cockpit Navigation And Manipulation

3.1 Without PilotView Plugin

The ATR 72-500 is not equipped with a 2D panel, but a 3D cockpit only.

Keyboard	Action/Function
W	Look forward
Q	Look left
E	Look right
Arrow (down)	Look further down
Ctrl + E	Look to the overhead panel

Table 1: Different actions with its designated keyboard commands

Navigation in the 3D cockpit is very easy (having multiple ways to come to a certain view), but there a certain limitations to the 3D cockpit as well. One of them is the view on the com radios.
The 3D cockpit can also work properly as a 2D cockpit, but in order to do so some functions have to be assigned to the keyboard or –if available- to the joysticks buttons.
On pressing "Ctrl+9" the "3-D command look" mode will be activated and the mouse will be used to look around. Panning with the mouse is hard and therefore not recommended.

To use the joystick to pan around:

Go to Settings > Joysticks & Equipment > Buttons: Basic. There assign the "View: 3-D command look" to any key or button on your joystick. It is possible to assign 4 keys, 4 joystick buttons or, better, the 4 directions of the hat switch, which most joysticks have, to this functions: "View: tilt up", "View: tilt down", "View: pan right" and "View: pan left". Now when entering the 3-D command look, the joystick can be used to pan around, while the mouse can be used to give input to the flight instruments.

To increase the speed of panning, do the following:

- Go to Settings > Joysticks & Equipment > Buttons: Adv

- Select "view" in the left column and assign 4 keys or the 4 hat switches directions to "pan_up_fast", "pan_down_fast", "pan_right_fast" and "pan_left_fast"

Keyboard	Action/Function
=	Zoom in
-	Zoom out
Up / down / left/ right (arrow)	Move point of view
Page up / Page down	Move forwards and backwards

Table 2: Different actions regarding panning and zooming with its designated keyboard commands

It is also possible to assign these commands to any other key or button in Settings > Joystick, Keys & Equipment > Buttons: Basic: these are the "General commands" to the right of the window.

3.2 Manipulators

#	Name	Icon	Function / operation
1.	Switch manipulator		Switch on and off functions with a single click
2.	Click manipulator		On each click, the corresponding value will increase, if the icon has a "+" sign, or decrease, if the icon has a "-" sign, more or less depending on the size of the icon
3.	Click and drag manipulator		click and drag right/left or up/down to increase or decrease the corresponding value

Table 3: The 3 different manipulators used on the ATR 72-500 with their names, icons and function

4 Aircraft Handling
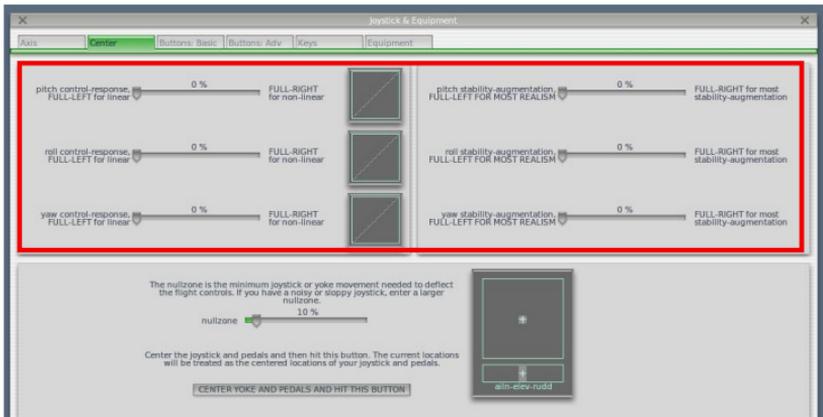
Figure 4: Joystick & Equipment menu

The model is designed to fly with default pitch control and stability settings. However, for some joysticks the simulation experience is better when non-linear control response is increased. In order to get more stability, the stability-augmentation can be increased (Go to: Settings > Joysticks & Equipment > Center)

The Aircraft
5 Introduction

The ATR 72-500, certified as ATR 72-212A, is a high wing, short range, twin engine turboprop that has capacity for up to 78 passengers (in a single class configuration) and is built by ATR (Avions de Transport Régional/Aerei da Transporto Regionale), an Alenia and EADS joint venture.

The ATR 72 is the stretched version of the ATR 42 (which has capacity for up to 48 passengers), and made its first flight in 27 October 1988.

The ATR 72-500 is powered by two Pratt & Whitney PW117 engines, using six-blade Hamilton Standard 568F composite propellers.

5.1 Specifications

General characteristics:

- Crew: 2
- Capacity: 68 to 74 passengers
- Length: 27.17 m (89 ft 2 in)
- Wingspan: 27.05 m (88 ft 9 in)
- Height: 7.65 m (25 ft 1 in)
- Wing area: 61.00 m² (656.6 sq ft)
- Aspect ratio: 12.0:1
- Empty weight: 12,950 kg (28,550 lb)
- Max takeoff weight: 22,500 kg (49,604 lb)
- Powerplant: 2 × Pratt & Whitney Canada PW117, delivering 2,475 shp each

Performance:

- Cruise speed: 511 km/h; 318 mph (276 kts)
- Range: 1,324 km (823 mi; 715 nmi)
- Service ceiling: 7,620 m (25,000 ft)
- Takeoff Run at MTOW: 1,165 m (3,822 ft)

5.2 Main Operators

Airline	Country	Units
American Eagle Airlines	USA	39
TRIP Linhas Aéreas	Brazil	33
Kingfisher Airlines	India	25
Jet Airways	India	20

Azul Brazilian Airlines	Brazil	20
Malaysia Airlines	Malaysia	20
Binter Canarias	Spain	19
Virgin Australia [operated by Skywest Airlines]	Australia	18
FedEx Express	USA	13
Swiftair	Spain	13
Air Algérie	Alger	12
Air Contractors	Ireland	12
Air New Zealand	New Zealand	11
Air Dolomiti	Italy	10

Table 4: Main operators of the ATR 72-500

6 Systems

6.1 Aircraft general dimensions

Figure 5: Aircraft general dimensions

6.1.1 Cockpit „Philosophy" and Panel Scan Sequence

6.1.1.1 Cockpit "philosophy"

Status and failure indications are integrated in the pushbuttons. Pushbutton positions and illuminated indications are based on a general concept with the "light out" condition for normal operation.

With a few exceptions, the light illuminates to indicate a failure or an abnormal condition.

6.1.1.2 Overhead panel scan sequence

Figure 6: Overhead panel scan sequence

6.1.1.3 Instruments panels scan sequence

Figure 8: Instrument panels scan sequence

6.1.1.4 Pedestal scan sequence
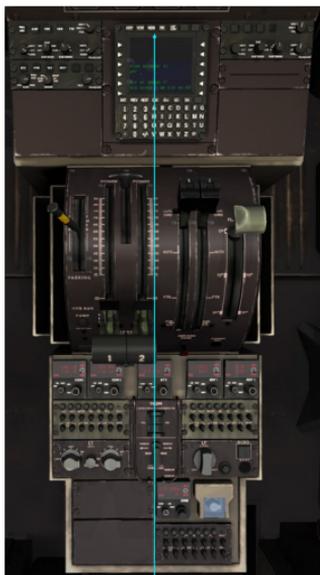
Figure 8: Pedestal scan sequence

6.1.2 Doors

The rear entry door and cargo door are simulated and animated on this ATR 72-500.
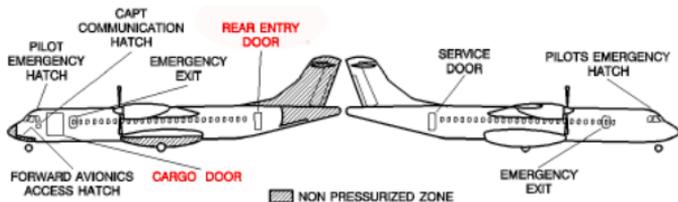
Figure 9: Overview (simulated) doors on the ATR 72-500

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6.1.3 Lights

6.1.3.1 Description
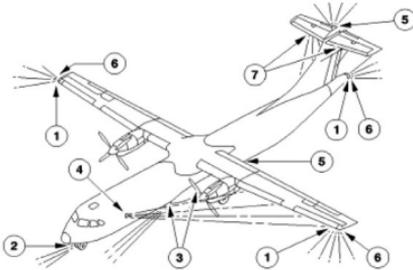
Figure 10: Overview (simulated) lights on the ATR 72-500

The following lights are simulated:

1. Navigation lights
2. Taxi and take off lights
3. Landing lights
5. Beacon lights
6. Strobe lights

6.1.3.2 Lights panel

Figure 11: Lights panel

1. Beacon light
2. Navigation lights

3. Strobe lights

4. Logo light

6. Taxi and Take off light

7. Landing lights

6.1.4 Signs

Figure 12: Passenger signs

1. No Smoking signs

2. Fasten Seat Belts signs

6.1.5 Annunciator Lights Test
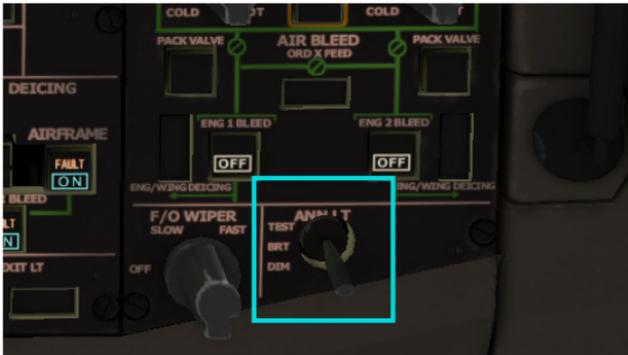
Figure 13: Annunciator lights test

6.2 Centralized Crew Alerting System (CCAS)

6.2.1 Crew Alerting Panel (CAP)

Figure 14: Crew alerting panel

1. Warning lights (level 1)

Red lights

2. Caution lights (level 2)

6.2.2 Master Warning And Master Caution Lights
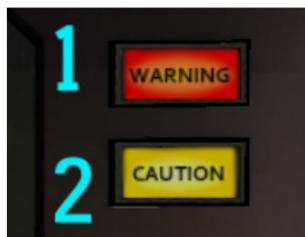
Figure 15: Master warning and caution lights

1. Master Warning light

2. Master Caution light

6.3 Air

The aircraft uses external air to supply the air conditioning and ventilation systems, the pressurization system and the de-icing system.

The air used for air conditioning and pressurization is pressurized by the engines, delivered through the bleed valves, conditioned by the packs and distributed to the pressurized zones. Part of this air is re-circulated. The de-icing system is described in 6. 14.

6.3.1 Pneumatic System

Compressed air is bled from the engine compressors at the low pressure (LP) or high pressure (HP) stages. Air is normally bled from the LP compressor but, at low engine speed, if pressure from the LP stage is not sufficient (on ground or during descent at flight idle), air source is automatically switched to the HP stage.

6.3.1.1 Air Bleed Panel
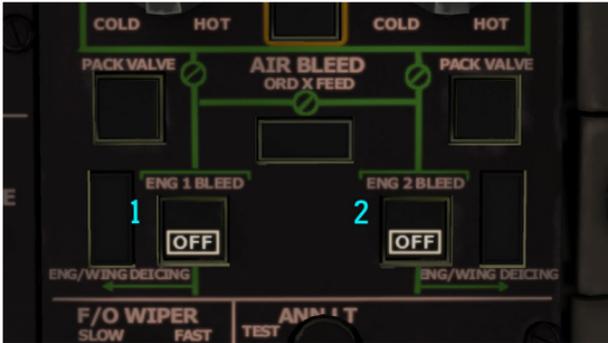
Figure 16: Air bleed panel

Engine bleed pushbuttons control the associated HP valve and bleed valve:

- When the pushbutton is pressed in (ON), the valve will open if pressure is available.

- When the pushbutton is released (OFF), the valve will close, the OFF light illuminates white.

6. 4 Automatic Flight Control System (AFCS)

The Automatic flight control system achieves the Autopilot (AP) function and/or yaw damper (YD) function, the flight director (FD) function and the altitude alerts.

Main components are: one computer, one control panel, one advisory display unit (ADU), three servo-actuators, one for each axis.

The computer receives data from the two Air Data computers (ADC), the two Attitude and Heading Reference Systems (AHRS), the two SGU, the radio-altimeter, the GPS (if installed) and some sensors.

6.4.1 AFCS Control Panel

Figure 17: AFCS control Panel

1. AP pushbutton

2. YD pushbutton

3. Pitch wheel

4. Vertical modes pushbuttons (from top to bottom):

- IAS Hold
- Vertical Speed Hold
- Altitude Hold

5. Lateral modes pushbuttons (from top to bottom):

- Heading Select
- Navigation
- Approach
- Back Course

6. Bank angle pushbutton

6.4.2 ADU

Figure 18: ADU

1. Display

2. Reset pushbutton (not simulated, but this button can be used to reset the altitude setting to 0)

6.4.3 CRS 1/HDG Panel

Figure 19: CRS 1 / HDG Panel

1. CRS 1 knob

2. HDG knob

6.4.4 ALT/CRS 2 Panel

Figure 20: ALT / CRS 2 Panel

1. ALT knob

2. CRS 2 knob

6.4.5 AP OFF Light

Figure 21: AP OFF light

6.4.6 EADI (see 6.10.10.1)

6.4.7 Auto Pilot Engagement And Disengagement

AP is engaged by pressing the AP pushbutton. When the AP is engaged, two white arrows will light up at both sides of the AP pushbutton. Pressing the AP pushbutton again will disengage the AP. In the real aircraft there also is a disengage button in the control wheel. It is recommended to map the autopilot disconnect ("autopilot mode down") button in the joystick. AP will be automatically disengaged if one of the engagement conditions is no longer met. It will also disconnect if the trim is used.

6.4.8 Flight Director (FD)

The purpose of the Flight Director (FD) is to provide information to the pilot through the command bars on the EADI to allow manual guidance of the aircraft, in pitch axis, if a vertical mode is selected, and in roll axis, if a lateral mode is selected. The FD commands are satisfied when the FD bars remain centered on the EADI.

6.5 Communications

The aircraft communication system provides radio communication between aircraft and ground stations.

6.5.1 VHF Communication System

Two systems are provided, each one having its own transceiver to provide communications on more than 2000 channels from 118.000 to 136.975, and is controlled by a VHF control box with dual channel selection.

6.5.2 Audio Control Panel
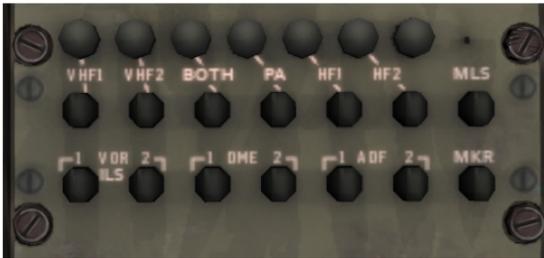
Figure 22: Audio control panel

1. Volume control knob

6.5.3 VHF Control Box
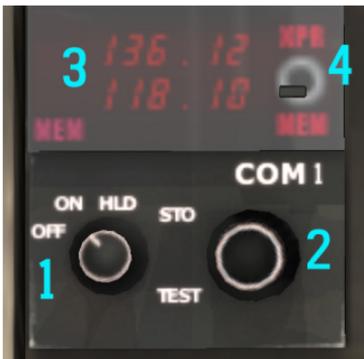
Figure 23: VHF control box

1. ON/OFF knob 3
2. Frequency selector
3. Frequency display

6.5.4 ATC Control Box

Figure 24: ATC control box

1. Power and mode switch

2. Code display

The numbers can be changed by positioning the mouse on the numbers, an up or down arrow will appear and the numbers can now be increased or decreased by clicking.

6.5.5 TCAS

The TCAS is shown on the ND (EHSI)

6.6 Electrical System

The electrical power is provided by the following sources:

- Main and emergency batteries. (The emergency battery is not simulated).

- Two engine-driven DC starter/generators.

- Two AC wild frequency generators (not simulated).

- Two external power units (AC and DC). (Only DC external power unit is simulated).

In addition, two static inverters (supplied by the DC system) provide constant AC power. The electrical distribution is ensured by busses which feed equipment. Two separate networks (left and right) run individually and can be connected in case of generation failure thanks to bus tie contactors (BTC).

6.6.1 DC POWER

6.6.1.1 Generation

The 28 VDC (Volts of Direct Current) can be provided by:

- Two engines driven starter/generators,
- A ground external power unit

6.6.1.1.1 Battery

A 24 V Ni-Cd battery of 43 Ah (main BAT) is provided for engine starting and for emergency power supply including propeller feathering

6.6.1.1.2 Starter/generators

The two DC starter/generators are driven by the engine accessory gear boxes. Each generator delivers a nominal output power of 12 KW (400 A) and a normal operating voltage of 21-31 V (nominal setting 30 V).

Starter mode:

In starter mode, the starter/generator is connected by the start contactor to the main battery through a battery start contactor or to the external power through an external power contactor. In starter mode, the starter/generator cranks the engine to the point of self sustaining (associated engine START ON lt illuminated on the ENG START panel). At the end of the start sequence (at 45% NH), the start contactor opens (associated START ON lt extinguished).

Generator mode:

When the engine reaches 61.5% NH, the starter/generator is acting as a generator. Provided associated DC GEN pushbutton is selected and EXT POWER is not used, each generator feeds associated DC BUS through a generator contactor (GC)

The BUS TIE CONTACTOR (BTC) allows DC BUS 1 and 2 on line when only one generator is operating or when the aircraft is powered from EXT PWR.

6.6.1.2 Distribution

The aircraft DC distribution network consists of 11 busses. Only the 2 main busses, DC BUS 1 and 2, are simulated.

The DC BUS 1 is normally supplied by the left engine driven generator and the DC BUS 2 by the right engine driven generator. In case of generator failure, the associated DC BUS will be automatically supplied by the other generator by the BUS TIE CONTACTOR.

6.6.1.3 Controls

6.6.1.3.1 Generation

Figure 25: Electronics panel

1. DC GEN pushbutton   3. EXT PWR pushbutton

2. BTC pushbutton

6.6.1.3.2 Distribution

Figure 26: Electronics panel

1. DC BUS OFF lights

2. BAT toggle switch

3. DC AMP indicator

6. 6. 1. 4. External power mode
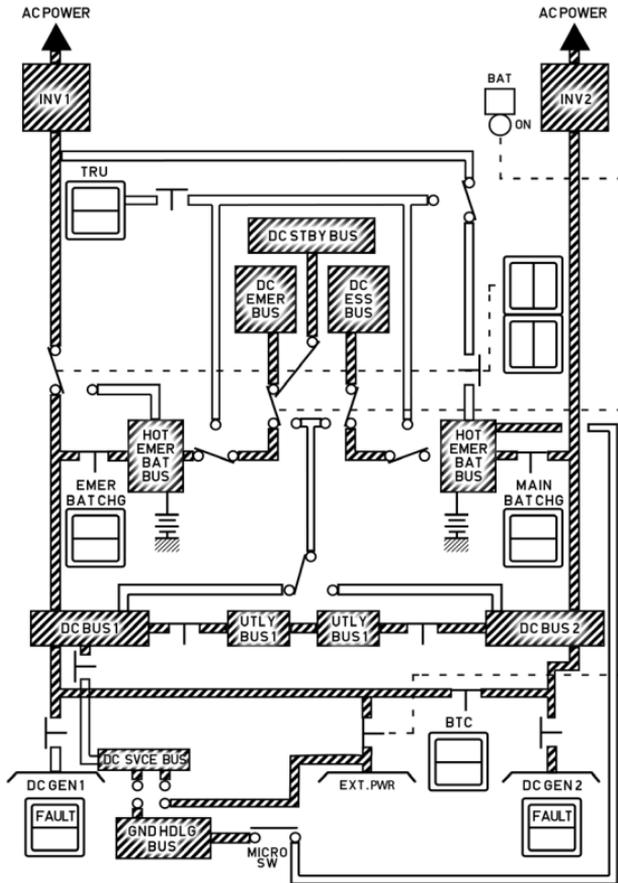
Figure 27: External power mode

6. 6. 1. 5. Normal supply
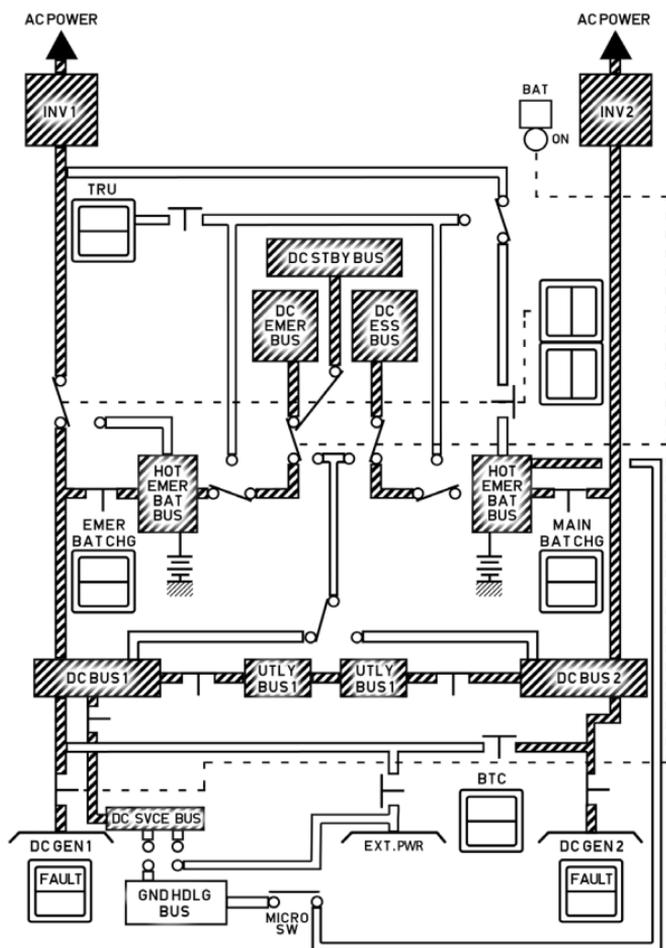
Figure 28: External power mode – Normal supply

6. 7. 1. 6. Gen 1 failed
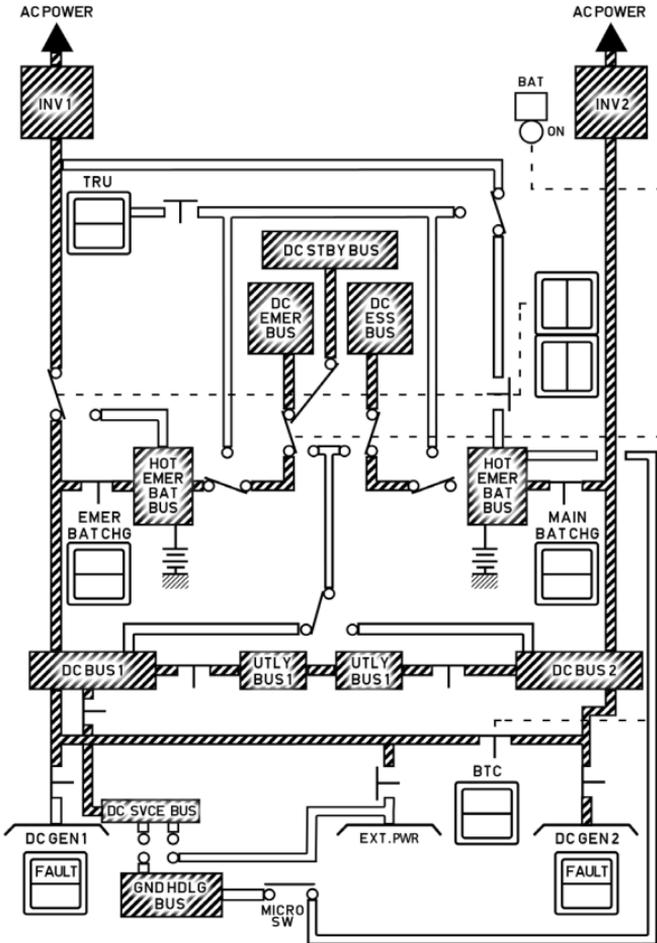
Figure 29: External power mode – Gen 1 failed

6.6.2 AC Constant Frequency

6.7.2.1 Generation

The source of constant frequency (400 Hz) AC (Alternating Current) power consists of two static inverters (INV).

The static inverters characteristics are:

- Power: 500 VA

- Output voltage: 115 V and 26 V

- Frequency: 400 Hz

- Type: single phase

The two inverters are powered respectively from DC BUS 1 and DC BUS 2.

6.6.2.2 Distribution

INV 1 normally supplies AC BUS 1. INV 2 normally supplies AC BUS 2. In event of inverter failure or input power loss, the associated AC BUS is isolated from affected inverter and, provided the BTC pushbutton is not in ISOL position, the AC BUS 1 and 2 are automatically tied together.

6.6.2.3 Controls

1. INV FAULT light

2. BUS OFF light

3. BTC pushbutton

6.7 Fire Protection

The fire protection system is provided in order to ensure detection and extinguishing fire for each engine. Other functions are not simulated.

6.7.1 Engine Fire Detection System

The detection principle is based on the variation of resistance and capacitance of the detection cable (fire signal). Red ENG FIRE illuminates on CAP in case of fire detection.

6.7.2 Engine Fire Extinguishing System

The engine fire extinguishing system includes two extinguishers' bottles which can be used for both engines. The bottles are located on each side of the fuselage. Dual squibs are installed in the discharge heads on each bottle. For fire extinguishing, the squibs are ignited by depressing the corresponding illuminated AGENT pushbutton on the ENG FIRE panel. The extinguishing agent (Freon or Halon) is pressurized by nitrogen.

6.7.2.1 ENG Fire Panel

Figure 30: Eng fire panel

1. ENG FIRE handle (colored red)

An ENG FIRE warning light integrated into the handle illuminates red and the CCAS is activated as long as the respective engine fire warning is activated. Light turns off when the temperature detected drops bellow warning threshold.

The handle has two positions:

- • 1. Normal position (mechanically locked)
- • 2. Pulled position

Pulling the handle electrically causes the following (for the respective engine):

- • PROPELLER: feathering
- • FUEL: ENG LP VALVE closure

2. Fault Test

The engine fire panel can be tested using the fault test.

6.8 Flight Controls

The control of the aircraft along the x-, y- and z-axis by:

- One aileron and one spoiler (flight spoiler, not ground spoiler; not simulated) on each wing.

- Two elevators

- A rudder

- Ailerons, elevators and rudder are mechanically actuated.

6.8.1 Roll

Roll control is achieved through control wheels.

6.9.1.1 Roll trim position indicator

(The picture has been partially blurred on purpose)

Figure 31: Roll trim position indicator

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6.8.1.2 Roll trim control switch

Figure 32: Roll trim control switch

It is recommended to map the roll trim functions to the joystick.

6.8.2 Pitch

The elevators are mechanically driven by the control column

6.9.2.1 Pitch trim position indicator

(The picture has been partially blurred on purpose)

Figure 33: Pitch trim position indicator

A green sector (from 0° to 2.5° UP) identifies the take off range.

6.8.2.2 Pitch trim rocker switches

On each control wheel, two pitches trim rocker switches are installed.
(It is recommended to map the elevator trim functions to the joystick).
Manual trim will disengage the AP.

6.8.3 Yaw

Yaw control system consists of rudder pedals, rudder damper and trim.
Rudder is mechanically actuated by the rudder pedals.

6.8.3.1 Yaw trim position indicator

(The picture has been partially blurred on purpose)

Figure 34: Yaw trim position indicator

6.8.3.2 Yaw trim control switch

Figure 35: Yaw trim control switch

6.8.4 Flaps

Lift augmentation is achieved by two flaps on each wing linked mechanically. The flaps control lever has 3 positions: 0, 15 and 30 degrees. It is not possible to select an intermediate position. The lever and the flaps positions electrically control the flap valve which hydraulically actuates the 4 flap actuators.

6.8.4.1 Flaps control lever

Figure 37: Flaps control lever

6.9.4.2 Flaps position indicator

Figure 37: Flap position indicator

Gust lock is not simulated

6.9 Flight Instruments

6.9.1 Air Data System

The flight environment data are provided by three independent air data systems: two main systems and one standby system. Only one of the main systems is simulated.

AIR DATA COMPUTER 1 (ADC1) supplies all flight instruments (altimeter, airspeed indicator, vertical speed indicator) and other systems (AHRS1, GPWS, pressurization, etc.)

6.9.2 Airspeed Indicator

Figure 38: Airspeed indicator

1. Airspeed pointer

IAS is displayed by a pointer on a scale graduated from 60 to 400 kts:

- In 2 kts increments from 70 to 310 kts,
- In 5 kts increments from 210 to 250 kts,
- In 10 kts increments from 250 to 400 kts

2. VMO pointer. (In this model, the VMO pointer doesn't move)

3. Movable indices (BUGS)

4. Speed selector

5. Speed bug

6.9.3 Standby Airspeed Indicator

Figure 39: Standby airspeed indicator

The standby airspeed indicator displays the airspeed as calculated from standby static and standby pitot pressures. The scale is graduated from 40 to 320 kts:

- in 5 kts increments from 40 to 200 kts
- in 10 kts increments from 200 to 320 kts

6.9.4 Altimeter

Figure 40: Altimeters

1. MB and INHG counters: Display baroset value in millibars and inches Hg

2. BARO knob
Sets the barometric reference in the MB and in the IN HG counters.

3. Altitude pointer

4. Altitude counter

6.9.5 Standby Altimeter

Figure 41: Standby altimeter

1. Altitude pointer

2. Altitude counter

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6.9.6 TCAS Vertical Speed Indicator (TCAS VSI)

TCAS is displayed in the EHSI

Figure 42: Vertical speed indicator

1. Vertical speed pointer
2. Vertical speed arc

6.9.7 TAT/TAS IND

Figure 43: TAT / TAS indicator

1. TAT indicator indicates Total Air Temperature in °C
2. TAS indicator indicates Total Air Speed in knots

6.9.8 Radio Magnetic IND (RMI)

An RMI is installed on each pilot's panel. Each includes a compass rose, showing magnetic heading and 2 pointers, switching to present VOR or ADF bearings.

Figure 44: Radio magnetic indicator

1. Compass card

Displays heading information

2. Bearing pointers

3. VOR/ADF selectors

6.9.9 Standby Horizon

Figure 45: Standby horizon

1. Attitude Sphere

2. Aircraft Symbol

6.9.10 EFIS

The EFIS (Electronic Flight Instruments System) is an electronic system which processes data supplied by different sources and displays them on two Cathode Ray Tubes in front of each pilots.

6.9.10.1 EADI (Electronic Attitude Director Indicator)

Figure 46: Electronic attitude director indicator Figure 46a: Electronic attitude director indicator

1. Aircraft Symbol

2. Roll attitude (white)

3. Horizon and pitch scale

4. Turn slip indicator

5. AP MSG annunciator

6. Lateral armed mode annunciator (white)

7. Lateral active mode annunciator (green)

8. Vertical armed mode annunciator (white)

9. Vertical active mode annunciator (green)

10. Flight Director Command bars (Magenta)

11. Glideslope and Localizer indication

12. Decision Height indication and annunciator

13. Radio altitude indication

14. Marker beacon information

6.9.10.2 EHSI (Electronic Horizontal Situation Indicator)

FULL MODE:

Figure 47: Electronic Horizontal situation indicator

1. Selected heading bug (blue)

Selected heading is also displayed digitally in blue (C)

2. Aircraft Symbol (white)

3. Course pointer (yellow)

4. Course deviation (yellow)

5. TO/FROM annunciator (Magenta)

6. NAV source annunciation (white)

7. Blue pointer (O)

Selection is indicated in (A)

8. Green pointer (<>)

Selection is indicated in (B)

9. Distance counter

10. Ground speed

ARC MODE:

Figure 48: Electronic Horizontal situation indicator – arc mode

1. Quadrant Heading Scale

2. Digital Heading display

6.9.11 EFIS Control Panel (ECP)

Figure 49: EFIS control panel

1. FULL/ARC pushbutton
2. Display airport pushbutton
3. Display VOR pushbutton
4. Display NDB pushbutton
5. Display fix pushbutton
6. AP source selector

7. ADF1/VOR1 selector
8. Map mode selector
9. Map range selector
10. ADF2/VOR2 selector
11. Display weather radar
    selector (on/off)

6.10 Clocks

Figure 50: Clock

1. Hours pointer (time)

2. Minutes pointer (time)

3. Second pointer (chrono)

Minutes pointer (chrono)

4. Revolving bezel

5. Chronometer pushbutton

6.11 Fuel System

The fuel system includes:

- Two tanks with one electrical pump and one jet pump in each tank

- vent system

- fuel quantity indicating system

- refuel/defuel system with associated controls and indicator

6.11.1 Fuel Planner

Figure 51: Fuel panel

1. PUMP pushbutton

2. LP VALVE position indicator

3. FEED LO PR light

6.11.2 Fuel Quantity Panel

Figure 52: Fuel quantity panel

1. Left tank fuel quantity indicator (in lb)

2. Right tank fuel quantity indicator (in lb)

6.11.3 Fuel Flow Indicator

Figure 53: Fuel flow indicator

1. FF indication in KG/hour x 100

Note: In the real plane the numerical display is a Fuel Used indicator. In this model it is a Fuel flow indicator in pounds per hour.

Fuel temperature indicator is not simulated.

6.12 Hydraulic System

The aircraft has two hydraulic systems, designated blue and green. The common hydraulic tank is located in the hydraulic bay, in the landing gear fairing.

Each system is pressurized by an ACW electric motor driven pump. Normal operating pressure is 3000 PSI.

Note: In this model there is only one electrical pump (Plane-Maker doesn't allow to have more than one).

The hydraulic system supplies:

- Wing flaps
- Spoilers
- Nose wheel steering
- Landing gear extension/retraction

Note: Flight controls are mechanically driven

6.12.1 Hydraulic Power Panel
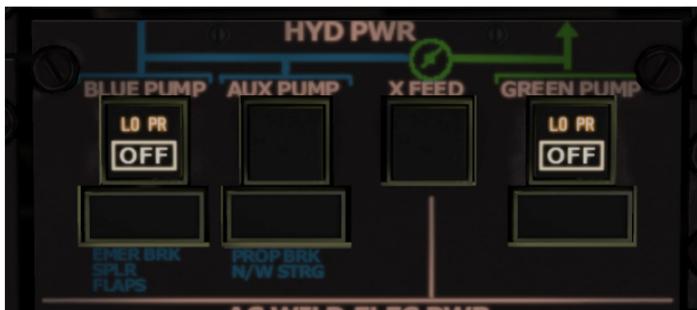
Figure 54: Hydraulic power panel

1. Main pumps pushbutton

6.12.2 Press Indicator

Figure 55: Press indicator

1. HYD SYST indicator

2. BRAKE ACCU indicator

6.13 Ice And Rain Protection

The ice and rain protection system permits aircraft operation in extreme environmental conditions and, in particular, in icing conditions.

An ice detector is located on the left wing leading edge and connected to the CCAS, monitors ice accretion.

Aircraft ice protection is provided by:

-a pneumatic system operating on areas of the airframe:

- outer, center and inner wing leading edges
- horizont-al tail plane leading edges
- engine air intakes and gas paths

-electrical heating of:

- propeller blades
- windshields
- probes

6.13.1 Engine/Wing De-Icing Panel

Figure 56: Engine / wing de-icing panel

1. Airframe Air Bleed pushbutton

2. Engine pushbuttons

3. Airframe pushbutton

6.13.2 Propeller Anti Icing Panel

Figure 57: Propeller anti-icing panel

1. Prop pushbutton

6.13.3 Window Heat Panel

Figure 58: Window heat panel

1. Windshield heat pushbutton

6.13.4 Probe Heat Panel

Figure 59: Probe heat panel

1. Probe heat pushbuttons

6. 14 Landing Gear And Break

6.14.1 Landing Gear Control Panel

Figure 60: Landing gear control panel

1. Landing gear control lever.
2. Landing gear position indicator.

6.14.2 Nose Wheel Steering

Figure 61: Nose Wheel steering

6.15.4 Parking Break Handle

Figure 62: Parking brake handle

6.15 Navigation System

The aircraft is equipped with:

- 2 VOR receivers
- 2 ILS receivers
- 1 MKR receiver
- 1 DME receiver

Note: VOR 1, ILS 1 and MKR are integrated in a common box, as are VOR 2 and ILS 2

6.15.1 VOR

The 2 VOR receivers are independent, but use a common VOR antenna located on top of the vertical stabilizer. Each receiver is individually controlled by the associated NAV control box on the glare shield panel: VOR 1 on the LH side, VOR 2 on the RH side. The receivers are designed for reception of one of the 160 channels with 0.05 MHZ spacing in the 108.00 to 117.95 MHZ frequency range.

6.15.2 ILS

The 2 ILS receivers are independent but use a common LOC antenna used for the VOR systems and a common G/S antenna. Each receiver is individually controlled by the associated NAV control box on the glare shield panel: ILS 1 on the LH side, ILS 2 on the RH side. The receivers operate for localizer reception in the 108 MHZ to 112 MHZ VHF range and for glide slope reception in the 329 to 335 MHZ VHF range.

6.15.3 Marker

The MARKER beacon receivers are connected to the marker antenna and are controlled by the NAV 1 and NAV 2 control boxes. Outer, middle and inner markers signals are received and processed for visual display and audio annunciation.

6.15.4 DME

The DME system operates in the 1025 to 1150 MHZ frequency range with 1 MHZ spacing. DME channeling is accomplished through the NAV 1 control box and DME 2 channeling through the NAV 2 control box. The frequency selection is automatically associated with the relative NAV frequency, as selected on the glare shield panel.

6.15.5 NAV Control Box

63: NAV control box

1. Power

2. Frequency select knobs

3. Frequencies display

6.15.6 CRS 1/HDG And ALT/CRS 2 Panels
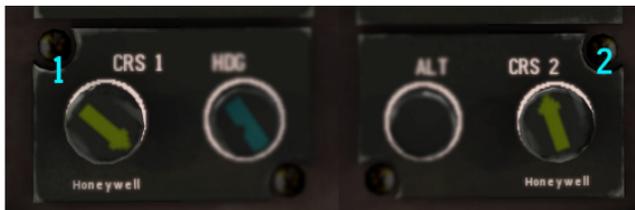
(The pictures have been partially blurred on purpose)
Figure 64: CRS 1 / HDG and ALT / CRS 2 panels

1. CRS 1 knob

2. CRS 2 knob

6.16.7 ADF System

The aircraft is equipped with an ADF system. It provides relative bearing indication to NDB'S stations.

Bearing can be displayed on EHSI or RMI

6.16.7.1 ADF Control Box

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Figure 65: ADF control box

1. Power, mode and volume controls

2. Frequency select knobs. To select the frequency put the cursor over each frequency number, an up or down arrow will appear, then click to increase or decrease the frequency number.

3. Frequency display

4. XFR/MEM switch

6.15.8 Radio Alimeter

The radio altimeter gives accurate height information when flying below 2500 ft and is particularly useful during the approach phase. The range of display is from 0 to +2500 ft. Radio altitude information is displayed on the bottom right of the EADI.

6.15.9 FMC

This model uses a slightly modified version of the X-Plane generic FMC:

Figure 66: Modified FMC installed in the ATR 72-500

To operate the FMC, see the corresponding chapter in the manual of X-Plane 9 / X-Plane 10.

6.16 Power Plant

The engine is a Pratt & Whitney of Canada PW 127 F certified for a 2750 SHP max takeoff rating. However, in normal operation, take-off rating will be 2475 SHP.

The engine comprises two spool gas generators driving a six blade propeller via a free turbine/concentric shaft/reduction gear box assembly.

The propeller is a Hamilton Standard 568 F.

6.16.1 Power Controls

6.16.1.1 Power Levers (PL)

For takeoff acceleration, the pilot will push the PL's from GI to TO position, which is 90% torque.

At landing, the pilot will reduce PL's to FI, then he will reduce down to GI and eventually to reverse.

6.16.1.2 Condition Levers (CL)

The control levers operate feathering control and HP fuel shut off valves (and also propellers speed, in the real aircraft, but not in this model: propeller speed is controlled by the PWR MGT selector, see chapter 6. 17.4. In real aircraft, propeller speed is controlled also by PWR MGT selector, when CL are in the Auto position, this is the case also in this model.

The CL has 3 positions in this model (instead of the four that it has in the real aircraft):

1. Fuel shut off (FUEL SO)

2. Feather (FTR)

3. AUTO and OVRD (almost the same)

6.16.2 Power Indicators

6.17.2.1 Torque Indicator
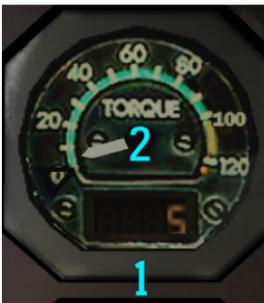
Figure 67: Torque indicator

1. Digital counter

2. Pointer

Green sector: 0-100%

Red mark: 100%

Amber sector: 100-106%

Red dashed radial: 106.3 %-Red dot: 120%

4. Manual target

6.17.2.2 NP Indicator

Figure 68: NP indicator

1. Digital counter

2. Pointer

Amber sector: 41.6%-65%

Green sector: 70.8-100%

Red mark: 100%

Red dot: 120%

6.17.2.3 ITT Indicator

Figure 69: ITT indicator

1. Digital counter

2. Pointer

Green sector: 300-765°C

Red point + H: 715°C (Hotel mode in the real aircraft)

Amber sector: 765.800 C

Red mark: 765°C (Temperature limit during normal take-off, to be checked)

White/red mark: 800°C (Temperature limit in up trim conditions)

Red point: 840°C (Temperature limit for 20 sec)

Red point + S: 950°C (Temperature limit for 5 sec for start)

6.16.2.4 NH/NL Indicator

Figure 70: ITT indicator

1. Digital counter

Actual NH is displayed

2. Pointer

Green sector: 62-102.7%

Red mark: 102.7%

6.16.2.5 OIL Indicator

Figure 71: Oil indicator

1. OIL PRESS indication

Green sector: 55-65 PSI

Amber sector: 40-55 PSI

Red mark: 40 PSI

2. OIL TEMP indication Green sector: 45-125 °C Amber sector:
125-140 C and below 0 °C ` Red mark: 140 °C

6. 16. 2. 6. Fuel Flow indicator

See chapter 6. 12. 3

6.16.3 ENG Start Panel

Figure 72: Engine start panel

1. ENG START rotary selector

2. START pushbutton

6.16.4 PWR MGT Panel

Figure 75: Power management panel

1. PWR MGT rotary selector has 4 positions:

1. Maximum Continuous Thrust (MCT)

2. Take Off (TO)

3. Climb (CLB)

4. Cruise (CRZ)

7 Performance

7.1 Limitations

The airplane is certified for:

-VFR and IFR

-Flight in icing conditions

-Reverse thrust taxi (single or twin engine)

7.1.1 Maximum Operating Altitude

25000 FT

7.1.2 Maneuvering Limi Load Factors

FLAPS RETRACTED= -2.5 to -1 G

FLAPS EXTENDED= -2 to 0 G

GEAR DOWN= -2 to 0 G

7.1.3 Design Weight Limitations

MAXIMUN WEIGHT	KG	LB
TAXI	22180	48898
TAKE OFF	22 000	48501
LANDING	21850	48170
ZERO FUEL	20000	44092

7.1.4 Airspeeds

MAXIMUM OPERATING SPEED

This limit must not be intentionally exceeded in any flight regime

V M O = 250 kts

MM==0.55

MAXIMUM DESIGN MANEUVERING SPEED VA

Full application of roll and yaw controls as well as maneuvers involving angles of attack near the stall should be confined to speeds below VA

VA = 175 kts

MAXIMUM FLAPS EXTENDED OPERATING SPEEDS VFE

FLAPS 15 185 kts

FLAPS 30 150 kts

MAXIMUM LANDING GEAR EXTENDED OPERATING SPEED

VL = 170 kts

MAXIMUM TIRE SPEED

165 kts (Ground speed)

STALL SPEEDS VSR

TAKE-OFF AND LANDING

TAIL WIND LIMIT: 10 kts

The maximum demonstrated cross wind on dry runway is 35 kts.

7.2 Quick Reference Tables Fot Take Off And Landing Speeds

29.000 lb	PW127F /PW127M		
	Speeds	**Normal**	**Icing**
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	104 110	104 110
FINAL TAKE OFF		110 (Flaps 0)	110 (Flaps 15)
DRIFT DOWN	VmLB	106 (Flaps 0)	100 (Flaps 15)
MINIEN ROUTE			127 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	95	95

31.000 lb	PW127F /PW127M		
	Speeds	**Normal**	**Icing**
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	104 110	104 110
FINAL TAKE OFF		110 (Flaps 0)	110 (Flaps 15)
DRIFT DOWN	VmLB	110 (Flaps 0)	103 (Flaps 15)
MINIEN ROUTE			131 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	95	95

33.000 lb	PW127F /PW127M		
	Speeds	**Normal**	**Icing**
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	104 110	104 110
FINAL TAKE OFF		113 (Flaps 0)	110 (Flaps 15)
DRIFT DOWN	VmLB	113 (Flaps 0)	107 (Flaps 15)
MINIEN ROUTE			136 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	95	97

35.000 lb	PW127F /PW127M		
	Speeds	**Normal**	**Icing**
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	104 110	104 110
FINAL TAKE OFF		117 (Flaps 0)	110 (Flaps 15)
DRIFT DOWN	VmLB	1107 (Flaps 0)	110 (Flaps 15)
MINIEN ROUTE			140 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	95	100

37.000 lb	PW127F /PW127M		
	Speeds	**Normal**	**Icing**
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	104 110	104 110
FINAL TAKE OFF		121 (Flaps 0)	111 (Flaps 15)
DRIFT DOWN	VmLB	121 (Flaps 0)	114 (Flaps 15)
MINIEN ROUTE			144 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	95	104

39.000 lb	PW127F /PW127M		
	Speeds	Normal	Icing
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	104 110	106 110
FINAL TAKE OFF		124 (Flaps 0)	115 (Flaps 15)
DRIFT DOWN	VmLB	124 (Flaps 0)	117 (Flaps 15)
MINIEN ROUTE			148 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	98	106

41.000 lb	PW127F /PW127M		
	Speeds	Normal	Icing
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	104 110	104 113
FINAL TAKE OFF		127 (Flaps 0)	117 (Flaps 15)
DRIFT DOWN	VmLB	127 (Flaps 0)	120 (Flaps 15)
MINIEN ROUTE			151 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	101	109

43.000 lb	PW127F /PW127M		
	Speeds	**Normal**	**Icing**
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	104 110	113 116
FINAL TAKE OFF		131 (Flaps 0)	120 (Flaps 15)
DRIFT DOWN	VmLB	131 (Flaps 0)	123 (Flaps 15)
MINIEN ROUTE			155 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	103	112

45.000 lb	PW127F /PW127M		
	Speeds	**Normal**	**Icing**
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	107 110	116 119
FINAL TAKE OFF		134 (Flaps 0)	123 (Flaps 15)
DRIFT DOWN	VmLB	134 (Flaps 0)	126 (Flaps 15)
MINIEN ROUTE			159 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	106	115

47.000 lb	PW127F /PW127M		
	Speeds	Normal	Icing
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	110 112	118 122
FINAL TAKE OFF		137 (Flaps 0)	126 (Flaps 15)
DRIFT DOWN	VmLB	137 (Flaps 0)	129 (Flaps 15)
MINIEN ROUTE			162 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	109	118

48.500 lb	PW127F /PW127M		
	Speeds	Normal	Icing
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	112 114	121 124
FINAL TAKE OFF		139 (Flaps 0)	128 (Flaps 15)
DRIFT DOWN	VmLB	139 (Flaps 0)	131 (Flaps 15)
MINIEN ROUTE			165 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	111	120

49.600 lb	PW127F /PW127M		
	Speeds	Normal	Icing
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	112 115	122 125
FINAL TAKE OFF		140 (Flaps 0)	130 (Flaps 15)
DRIFT DOWN	VmLB	140 (Flaps 0)	133 (Flaps 15)
MINIEN ROUTE			167 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	113	122

50.700 lb	PW127F /PW127M		
	Speeds	Normal	Icing
NON LIMITING RWY TAKE-OFF FLAPS 15	V1=VR V2	114 117	123 126
FINAL TAKE OFF		141 (Flaps 0)	132 (Flaps 15)
DRIFT DOWN	VmLB	141 (Flaps 0)	135 (Flaps 15)
MINIEN ROUTE			169 (Flaps 0)
FINAL APPROACH	VmLB (Flaps 30)	115	124

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