EXTRA EA-400

SPECIFICATION AND DESCRIPTION

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1 Introduction

The EXTRA EA-400 is the world's most advanced, fully equipped single engine piston aircraft suitable for private and corporate operation. This document is intended to provide general information for the evaluation of this aircraft, its powerplant and equipment. Should more detailed data be required, it can be obtained by contacting

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2 General description

The EXTRA EA-400 is a pressurized, high wing, modern single-engine monoplane made of composite materials, that is certified for up to 6 persons including a minimum crew of one pilot.

It is powered by a six-cylinder, turbocharged, intercooled Continental TSIOL-550-C 350 hp powerplant.

The EA-400 aircraft is certified to the requirements of FAA and LBA.

2.1 DIMENSIONS

Overall Height..*3,09 m (10,14 ft.)*
Overall Length..*9,57 m (31,15 ft.)*

Wingspan..*11,50 m (37,73 ft.)*
Wing Area..*14,26 m² (153.55 sq.ft.*
Wing Loading..*140,2 kg/m² (28,7 lbs./sq.ft.)*

Flaps..*Fowler*

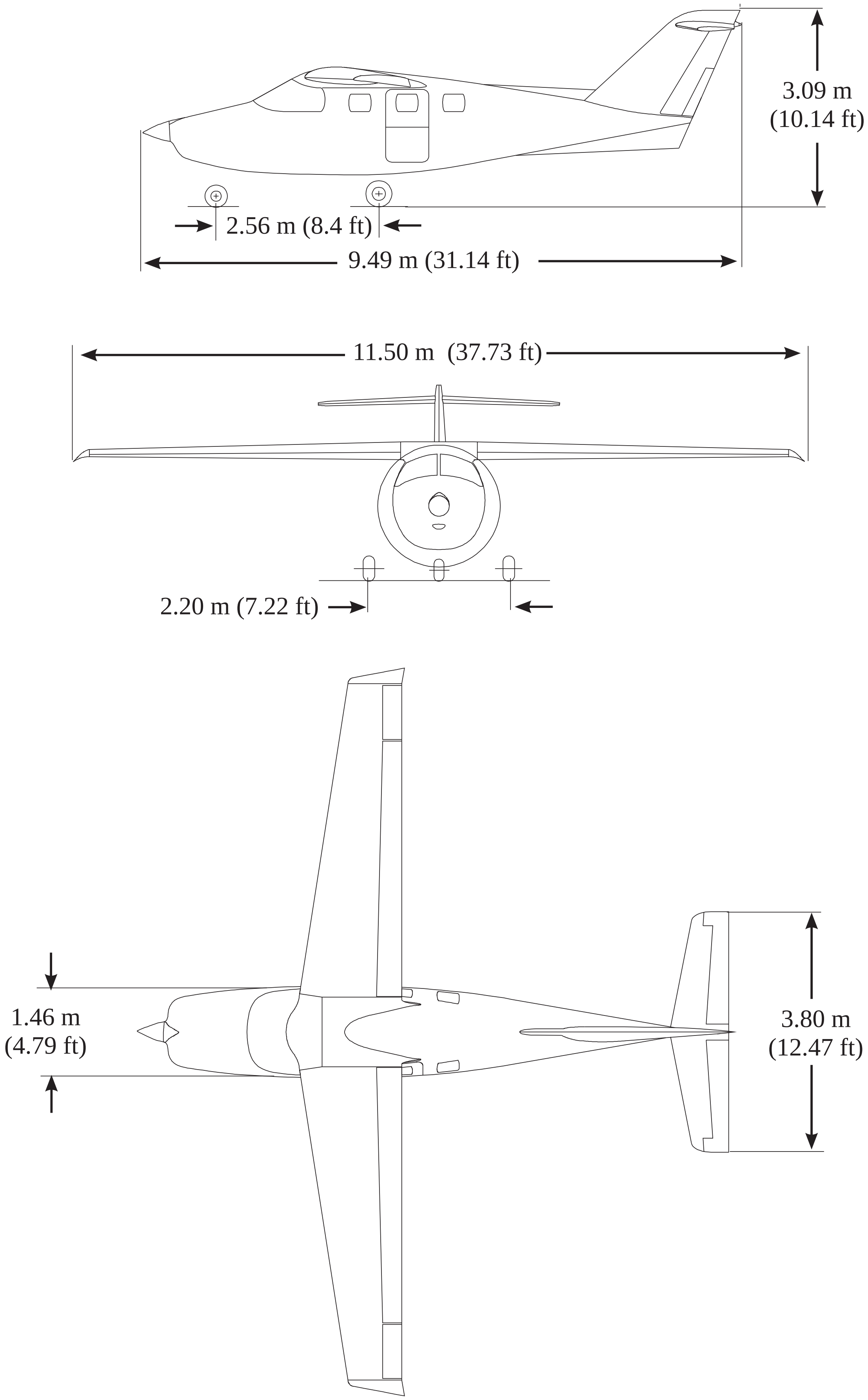
Horizontal Tail Span..*3,80 m (12,47 ft.)*

Cabin Height..*1,24 m (4,07 ft.)*
Cabin Length..*4,13 m (13,55 ft.)*
Cabin Width..*1,39 m (4,56 ft.)*
Cabin Door Height..*1,15 m (3,77 ft.)*
Cabin Door Width..*0,68 m (2,23 ft.)*

Power Loading..*5,7 kg/BHP (12,6 lbs./BHP)*

2.2 WEIGHTS

Maximum Ramp Weight..*2000 kg (4409 lbs.)*
Maximum Takeoff Weight..*2000 kg (4409 lbs.)*
Maximum Landing Weight..*2000 kg (4409 lbs.)*
Standard Empty Weight..*1432 kg*


3.09 m
(10.14 ft)
2.56 m (8.4 ft)
9.49 m (31.14 ft)
11.50 m (37.73 ft)
2.20 m (7.22 ft)
1.46 m
(4.79 ft)
3.80 m
(12.47 ft)

3 Performance

Maximum Range...*1160 NM*
Stall Speed (landing configuration)...*59 KIAS*
Maximum Operating Altitude...*25000 ft*
Max Climb...*1400 ft/min*
T/O Ground
Roll...*450 m*
Landing Ground
Roll...*275 m*
Maximum Cruise Speed at MCP 25000 ft...*235 KTAS*

4 Airframe structural design

The EA-400 is a 6-place, high-wing, full composite airplane. The airframe consists of a skin with integrated longerons and frames. The wing uses a double front spar and a rear spar interconnected by ribs. The stabilizers use a front and a rear spar. In general the skins of fuselage, wing, stabilizers and control surfaces consist of carbon fiber facings and honeycomb. The supporting structures such as longerons, frames, spars and ribs consist of carbon fiber with foam core. The nose region of the wing consists of glass fiber with honey comb and glass fiber ribs.

The entry door at the left side of the fuselage is a two-section, outward opening door. The upper part folds up and is held in upper position by a telescopic lift cylinder. The lower part folds down, limited by two cables and provides a step for boarding and deplaning.

The EA-400 aircraft has a two piece windshield and three windows on each side. The middle window of the left side is incorporated in the upper part of the cabin door. The opposite window is built as an emergency exit window

The structural flight load factor limits are +5,8 g to –1,6 g with flaps 0° and +2 g to 0 g in landing configuration.

At the maximum operating altitude of 25000 ft, a maximum cabin pressure differential of 5.5 psi provides a cabin altitude of approx. 8000 ft.

4.1 Structural Speed Limits

Maneuvering Speed V_O at 1450 kg (3192 lbs.)......*128 KIAS*
Maneuvering Speed V_O at 2000 kg (4409 lbs.)......*156 KIAS*
Maximum Flaps Extended Speed V_{FE} at 15°......*120 KIAS*
Maximum Flaps Extended Speed V_{FE} at 30°......*109 KIAS*
Maximum Landing Gear Operation Speed V_{LO}......*140 KIAS*
Never Exceed Speed V_{NE}......*219 KIAS*
Maximum Structural Cruising Speed......*188 KIAS*

4.2 Center of Gravity Limits

Aft Limit...... *38%*
Forward Limit at 2000 kg (4409 lbs.)......*21%*
Forward Limit at 1600 kg (3527 lbs.)......*12%*
Forward Limit at 1450 kg (3197 lbs.)......*12%*

4.3 Further Ranges

Maximum operating Altitude......*25000 ft*
Maximum passenger seating limit......*5+1*
Outside Air Temperature......*-54°C to +55°C*
Structure Temperature Limits......*-54°C to +72°C*
Approved T/O Flap Position......*15°*
Approved Landing Flap Position......*30°*

5 Powerplant

5.1 Engine

Engine Manufacturer..*Teledyne Continental Motors*
Engine Model...*TSIOL-550-C*
Engine Type…………………………………………...*Six cylinder, horizontally opposed, liquid cooled, turbocharged, fuel injected, straight drive*
Displacement...*9014 ccm (550 cubic inches)*
Take Off Power..*350 BHP at 2600 RPM and 39,5 in. Hg Man Press.*
Maximum Continues Power................................*325 BHP at 2500 RPM and 37,5 in. Hg Man Press.*

The engine is mounted to a steel tube engine bearer by four vibration isolated engine mounts.

Engine controls are centrally located between the pilot's and copilot's seat on the middle console in the cockpit.
The engine is lubricated by a wet sump, high pressure oil system. The sump capacity is 11,4 l (12 quarts). A scaled conventional dip stick with quarts-indication is provided for determining the oil quantity.

The engine is equipped with a dual ignition

system, each system entirely independent from the other.

The air induction system takes cool unfiltered air from the underside of the engine cowling. From there air flows through a duct to the air filter and then to the compressor of the turbocharger. Alternate, pre-heated air is available.

Fuel is provided by a continuous flow fuel injection system. Fuel from the aircraft tanks is delivered to the auxiliary fuel pump and the engine driven pump. It is then routed through the fuel metering unit, regulating the fuel flow. This metering unit is simultaneously activated by the throttle, so fuel/air ratio remains constant.

5.2 Fuel System

The fuel system of the EA-400 is gravity based and activated by an engine driven continuous flow injection system. It consists of two integral wing tanks of 234 l each, a fuel selector valve, and an electrical auxiliary fuel pump. The fuel system has three drains.

The wing tanks are located in the area between the front and rear spar beginning at the root ribs and having a length of 2 m each. Each wing tank is equipped with a 5 cm diameter filler cap for gravity fuelling positioned at a distance of about 1 m from the fuselage.

Fuel flows from the wing tanks through fuel lines meeting in the fuel selector valve, which is located under the cockpit floor. It is directly linked to the fuel selector handle under the left side of the copilots seat.

The auxiliary fuel pump is located at the engine side of the firewall providing pressure for priming, vapour clearing and for handling the complete fuel supply in case the engine driven fuel pump fails.

A fuel quantity sensor located at the inner ribs of each fuel tank is connected to the respective fuel gauge. Low fuel warning annunciator lights are illuminated if the system senses a fuel quantity of 36 l or below in both tanks.

5.3 Propeller

Propeller Manufacturer..*MT-Propeller*
Propeller Model *MTV-14-D/195-30a*
Propeller Type..*Hydraulic actuated, pitch range: 26°*

Number of blades..*4*
Propeller Diameter..*1,95 m (76,77 in.)*
TBO..*800 h*

The installed propeller is a wooden composite 4-blade, governor regulated propeller. Springs are holding the propeller blades in low pitch position. The propeller governor is connected to the engine oil circuit using oil pressure to work against the springs for increasing propeller blade pitch and thus decreasing propeller and engine RPM. In case of oil pressure loss the propeller goes to minimum pitch (high RPM). The propeller pitch is adjusted by the propeller control lever located on the middle console in the cockpit.

6 Aircraft Systems

6.1 Flight controls

The flight controls consist of the ailerons, rudder and elevators. The right elevator is equipped with a trim system. All these control surfaces are made of composite material. The primary control is based on a conventional cable-system consisting of a double control wheel (pitch and roll) with respective coupled systems, hanging control pedals (yaw), tubes, levers, pulleys and push-pull rods.
Rudder and aileron controls are interconnected via springs. However, this coupling can easily be overpowered (e.g. for side slipping).

Ailerons. The coupling between the two control wheels is implemented by a direct cable-chain system. The cables are connected to the control wheels by means of a longitudinal toothed wheel and run through the windshield center strut to the wing nose where they are split and moved outboard. Outside the tank area they cross the front spar. Then they are connected to a cable segment which actuates the aileron over a lever and push-rod. Each aileron is attached to the rear spar of the wing by two hinges.

Rudder. The pedals are mounted hanging on two tubes which have a lever arm at the right side of the cabin. From there the cables run along the cabin's right side armrest panel to the empennage over in group positioned pulleys. There a direct connection to the lever arms of the rudder is implemented. The connection points lay inside the tail cone adjacent to the lower rudder bearing. The rudder is connected to the rear fin spar at three points.

Elevator and Tab. Elevator control movement is connected via a sliding coupling using a lever system and a cable segment. From this cable segment the elevator cables run horizontally to the right cabin side to a 90° pulley and parallel with the rudder cables to the empennage. They are lead to the elevator in front of the front fin spar and are attached to a lever in front of the horizontal stabilizer front spar. This lever actuates the two elevator sides separately by means of push rods. Each elevator is attached to the respective horizontal stabilizer by three bearings. Electrical pitch trim is operated by trim buttons on the control wheels. Mechanical pitch trim is actuated through a trim wheel in the pedestral. The pitch trim tab is located in the right elevator and is linked over a 'redundant' cable-lever system to the trim wheel. The trim cables run from the pedestral down crossing the cabin floor and are then directed rearwards to the empennage following the nose section of the fin to the right side elevator.

6.2 Wing Flaps

Two Fowler Flaps per side are attached to the rear wing spar. They are guided by three wing tracks while moving. There are no Fowler-typical hinges for flap movement disturbing the aerodynamic. Actuation is by means of two spindles, which are connected to the central electrical flap motor by flexible shafts. The flap motor is located in front of the rear spar in the fuselage area of the wing and is controlled by the wing flap position switch in the cockpit. The actual flap position will be indicated by green lights at the left side of the wing flap position switch. As the flaps move, an electrical circuit compares the movement of the left and right wing flaps. If the wing flap positions differ by more than 3°, the flap motor will be automatically switched off to prevent asymmetric conditions. This will be indicated by the 'wing flaps unbalanced warning light' located on the annunciator panel.

6.3 Landing gear and hydraulic system

Landing Gear Tread..2,20 m (7,22 ft.)
Wheelbase..2,56 m (8,40 ft.)
Minimum Turning Radius..20,4 m (66,94ft.)

The EA-400 aircraft has a hydraulically operated, retractable landing gear. The main gear is equipped with an oil shock absorber in a parallel guide rod retracting against flight direction after moving the wheel 90° forward. The nose gear is equipped with an internal shock absorber retracting aft in the nose gear compartment. During ground operation, accidental gear retraction, regardless of landing gear switch position, is prevented by a safety switch located at the nose gear shock absorber.

At touch down, additional sensors located at the nose and main wheel will dump the cabin pressure, turn off the weather radar and stop the ADF clock.

The airplane is provided with an independent hydraulical brake system for each main wheel. A toe actuated hydraulic master cylinder is attached to each rudder pedal. The brakes can be actuated from either the pilot's or copilot's seat. The parking valve system consists of a manually operated control assembly located on the middle console. It is connected to the parking brake valve. The nosewheel steering system consists of tappets on the nose gear leg linked to the rudder pedals by a cable system and springs. Landing gear retraction automatically disengages the steering mechanism from the nosewheel and centers the nose wheel. The nose gear turning angle when extended is 30° to each side.

The hydraulic pump and sump are located in front of the main landing gear attachment frame. The hydraulic valves needed for the sequence operation are located in the same compartment in front of the hydraulic pump. Hydraulic fluid level can be checked any time by means of an inspection glass with access from the R/H main wheel bay. The directional valves are spring loaded and will automatically switch in the gear down position once electric power is lost within the control box. No emergency pumps are required for emergency gear operation.

The landing gear switch is located on the left hand instrument panel well in reach of both pilot seats. The in-transition and the downlock information for each wheel separately, is given by a yellow and three green lights located near the selector switch.

6.4 Electrical system

A 24-volt battery located in the tail cone, a direct driven 100 A alternator and a belt driven 85 A alternator supply power for the electrical system. The battery directly feeds the hot bus supplying power for equipment which has to be independent from the master switch position (clock, door light, flap door warning). Turning the master switch to the ON-position will activate a relay connecting the battery to the battery bus and to the main bus to start the engine and to feed the other equipment and, if engine is running, to recharge the battery by alternator action. Push-pull circuit breakers automatically break the current if the system or unit receives an overload to prevent damage to the electrical wiring.

As an starting aid external power can be used. For that purpose an external power plug is installed in the tail cone. It is accessible by the tail cone access panel.

6.5 Cabin Pressurization

The cabin pressurization system consists of the engine turbocharger, a sonic venturi (flow limiter), a cabin control outflow valve, an unregulated safety valve, the cabin pressurization switch, the cabin pressure controller, a dump safety switch, the landing gear squat switch, and two indicators, one for cabin altitude and differential pressure and one for cabin rate-of-climb.

Pressurization air is supplied from the engine turbocharger through the sonic venturi and is then led through a check valve into the cabin. The engine provides adequate airflow to maintain pressurization up to the maximum differential pressure of 5.5 PSI at normal power setting.

The airplane may be operated in either pressurized or unpressurized mode. The mode selection is made via the cabin pressurization switch, which either opens the safety valve for unpressurized mode, or closes the safety valve for pressurized mode. The latter will activate the cabin control outflow valve, if pressurized air is selected on the cabin air knob and the dump safety switch is in OFF-position.

When changing from unpressurized to pressurized mode, the cabin altitude rate of change will be limited by the pressurization controller. The valves are also opened by the landing gear squat switch assuring depressurized mode when aircraft is on ground to avoid cabin door damage due to cabin pressure when opening.

In pressurized mode cabin pressure is regulated by the cabin control outflow valve allowing air to exhaust either to the pressure level preselected by the cabin pressure controller or to maximum differential pressure level. Setting the center dial (identified as "Flight Level") of the cabin pressure controller will suggest the system being at a certain flight altitude. So the system will maintain the corresponding cabin altitude (about 5.5 PSI above static pressure of flight level) or reach it with the rate set by the rate control knob located on the lower left corner of the pressurization controller. Only if maximum differential pressure is reached or flight level is below the selected cabin altitude, cabin altitude would change with the same rate as the flight altitude.

In case of failure of the cabin outflow control valve the safety valve will open at an differential pressure of slightly above 5.5 psi to avoid structural damage.

Cabin altitudes of 10000 ft or above and the exceeding of the maximum differential pressure is indicated at the annunciator panel.

For ventilating warm air is guided from the engine department through the cabin inflow valve into the cabin. The air conditioning system located in the tailcone sucks cabin air and blows cool air through hoses to the front cockpit area and to the adjustable nozzles in the passenger compartment ceiling. Airflow can be adjusted by changing the operation mode of the cabin fans.

6.6 Ice protection

Flights into known icing conditions require a complete ice protection system. In the EA-400 aircraft such a system is installed, allowing efficient and save operation of the aircraft in adverse weather conditions.

The complete ice protection system consist of the following components:

- Pneumatic wing and empennage boots
- wing ice detection light
- electrothermal propeller de-ice pads
- electrothermal windshield panel
- heated lift detector
- heated pitot heads
- two independent, heated static sources
- dual alternators
- dual vacuum pumps

Alternator and ice protection controls are located on the left side panel.

7 Flight compartment, Instrumentation and avionics

Two crew stations are provided with dual control columns, rudder pedals and brakes. The pilot's and copilot's seats are made of one piece and incorporate energy absorbers which reduce g-forces in case of a crash. The seats are adjustable in four ways (forward, aft, up, and down) by pulling a handle located at the right respective left forward underside of the seat to release the fixing mechanism. The horizontal adjustment range is 135 mm (4 fixed positions provided). The vertical adjustment range is 80 mm (5 fixed positions are provided). Telescopic cylinders support the pilot during vertical adjustment.

The seat belts and the shoulder harnesses with inertia reels used for the pilot and copilot are attached to the seats. The seat belts provide a conventional adjustment. Shoulder harness adjustment is not necessary due to the inertia reels, which allow straps to extend and retract as required under normal movement. However the reels will lock in place if a sudden deceleration occurs.

Electroluminescent panels, instrument flood-lights and background lightning illuminate all cockpit instruments and switches in a very ergonomic manner. Overhead map lights and floodlights are also provided.

Independent sources are used to drive the pilot’s and copilot’s flight instruments. Pilot´s and Copilot´s stations are equipped with ANR Headsets.

7.1 Avionics

KING EFS 40

The installed Bendix King EFS 40 is a full function Electronic Flight Instrument System that is compatible with a wide range of avionics systems. It features multicolored displays of unequalled clarity and brightness and meets FAA HIRF and lightning requirements. The EADI and MFD display is the 4 in. ED 462. The EHSI display is the 4 in. ED 461.

When in 360-degree mode, the EHSI display has four formats: standard HSI compass rose, NAV map, NAV map with weather (when optional weather radar system is installed) and an DG only mode.
In ARC mode, display formats include: standard HSI, NAV map, NAV map with weather and standard HSI with weather.

S-TEC System 55

The S-TEC System 55 is a pure rate based autopilot offering smooth, precise and dependable performance. Combining the programmer, computer, annunciator and servo amplifier functions into one compact panel mount unit, the System 55 is designed specifically to be integrated into the aircraft’s radio panel with other avionics. The S-TEC System 55 also offers control wheel steering and an electric yawtrim system.

The System 55 roll axis has heading select, VOR/Localizer front and back course intercept with pilot selectable intercept angles and tracking. In the EA-400 it is interfaced with the Navigation Receivers and the GPS Navigation unit.The pitch computer receives signal input from altitude pressure transducer, accelerometer, glideslope deviation indicator and vertical speed modifier control.

Garmin GNS 430
The GNS 430 System is a fully integrated, panel mounted instrument, which contains a VHF Communications Transceiver, a VOR/ILS Receiver, and a Global Positioning System (GPS) Navigation Computer. The system consists of a GPS antenna, GPS Receiver, VHF and VOR/LOC/GS antenna, VOR/ILS receiver, VHF Communication portion of the equipment is to faciltate communication with Air Traffic Control. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Sope Signals. The primary function of the GPS portion of the system is to acquire signals from the GPS sytem satellites, recover orbital data, make range an Doppler measurements, and process this information in real-time to obtain the users position, velocity, and time.

GMA 340

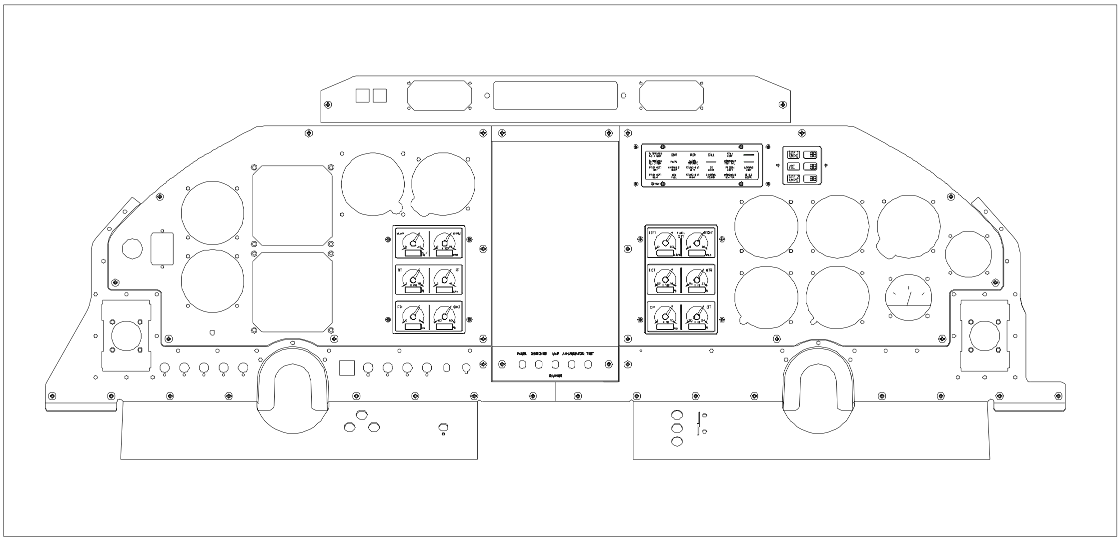
The Garmin GMA 340 Audio Panel meets the needs of aircraft owners and operators who require reliability and versatility in the essential audio switching function. LED-illuminated push-button simplicity and intuitive panel layout allow audio selection of both NAV and COM audio. Large, single-button activation of the COM microphone and audio for up to three COM transceivers simplifies cockpit workload.

Photocell dimming circuitry automatically adjusts the brightness of the LED´s to a level appropriate for ambient cockpit light. A fail-safe circuit connects the pilot´s headset and microphone directly to COM1 in the event that power is interrupted or the unit is turned off.

Additionally, the GMA 340 includes a six-position intercom (ICS) with electronic cabin noise de-emphasis, two stereo music inputs, and independent pilot, copilot and passenger volume controls.

Garmin GTX 327

The Garmin GTX 327 is a panel-mounted TSO.d transponder with the addition of timing functions. The transponder is a radio transmitter and receiver that operates on radar frequencies, receiving ground radar interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz.



LEFT MAIN PANEL
Altimeter, encoding, King, KEA-130A
Airspeed indicator, United Instruments, UI 8030
Variometer, United Instruments, UI 7130
EADI, King ED 462
EHSI, King ED 461
S-TEC System 55 X
Engine Instrument Cluster I
Turn Coordinator

RIGHT MAIN PANEL
Airspeed indicator, United Instruments UI 8030
Altimeter baro, United Instruments UI 5934-AD1
Attitude Gyro
Directional Gyro
VOR/LOC/Glideslope Indicator, King KI 204
Annuniciator Panel
Engine Instrument ClusterII
Suction Indicator
Digital Volt/ Amp. Indicator
CHT

Magnet compass, Airpath, C2400-L4VT
Autopilot S-TEC System 55 X
Altitude Preselect S-TEC System 360

AVIONIK PANEL
Audio Control, GARMIN GMA 340
COM/NAV/GPS, GARMIN GNS 430
COM/NAV/GPS, GARMIN GNS 430
Transpinder, Garmin GTX 327

7.2 Engine Instrumentation

The Instrumentation Package consists of an annunciator panel, two engine instruments clusters, a digital Volt/Amp Indicator, an EXTRA-built dimmer panel, and a conventional CHT Indicator.
The annunciator panel combines all warning an annunciator lights which are not located on special places.
The engine instruments clusters display engine information in both analog and digial form.
A purely digital package is provided for electrical data (Alternator 1 + 2 Amps, Volt DC).
The dimmers allow ad justing the brightness of the divers cockpit lighting, if the night mode is selected on the NIGHT/DAY switch located on the left side panel.

8 Interior

The cabin is pressurized and air conditioned. The cabin door is located on the left hand side between seat-rows 2 and 3. The emergency exit is on the right hand side.

Finest leather and other material is used for the interior. The passenger cabin features 4 executive style seats in club arrangement with several accessiors like a table, several lighting possibilities, a NAV Chart case and a baggage compartment. Each seat has access to the aircraft's intercom system and own air condition inlets. An optional in-flight entertainment system is also available.

9 Optional equipment

The EXTRA EA-400 is a completely equipped aircraft, which will surely satisfy the requirements of even the most demanding operator. As a result, the list of optional equipment is short, resulting in a minimum of additional cost.

- In-flight Entertainment System (CD-Changer)
- Color Weatherradar Bendix King, RDR2000 coupled with EHSI display
- GARMIN GNS 530
- Second Transponder GARMIN GTX 327
- Druck altimeter, Honeywell or Thommen