CHARACTERISTICS AND TECHNOLOGICAL ASPECTS OF THE PHENOM FAMILY

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Sr. Manager, Product Strategy
Embraer Executive Jets
Embryr Product Portfolio

Ultra-large

Ultra-Long Range

Large

Super Mid-Size

Mid-size

Mid-light

Light

Entry
DESIGN DRIVERS

- Premium comfort
- Docile flying characteristics
- Low operating costs
- Optimized performance
- Next generation technology
CABIN PREMIUM COMFORT

- Unique design by BMW
- Oval Lite® cross section
- Largest cabin
- Largest baggage compartment
- Rear private lavatory
- Largest window
- Cabin Layout flexibility
INTERNAL DIMENSIONS

Cross section – Oval Lite® (Phenom 100 & Phenom 300)

- Highest and widest cross section in the category
- More legroom and more headroom
- A result of Embraer and BMW Designworks USA commitment to ergonomics aspects

4 ft 11 in (1.50 m)
3 ft 7 in (1.09 m)
5 ft 1 in (1.55 m)
7 pre defined interior collections

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INTERIOR AND PERFORMANCE

7 ft³ (198 ℓ)  7 ft³ (198 ℓ)  53 ft³ (1,501 ℓ)
Cabin Length – 11 ft (3.35m)

Phenom 100

Mustang

CJ1+

Source: Conklin & de Decker Aircraft Comparator 2007 – Manufacturers’ web sites and promotional material
Source: Business & Commercial Aviation 2009
ENTRANCE DOOR (Phenom 100 & Phenom 300)

- Largest entrance door
- Unique “air stair”
- A handrail to allow easier access
- Optional step lights and telescopic tubes

Eclipse  Mustang  CJ 1+
CJ 2+  CJ 3  Hwk400XP

Image for illustration purposes only. Some items are optional.
DOCILE FLYING CHARACTERISTICS

- Straight wing design
- Low approach speeds
- Single-pilot workload philosophy
- Integrated Avionics
- Reduced workload than traditional jets
**Design Drivers**

- Single Pilot Operation
- Human Factors
- Enhanced Situational Awareness

- Glass Cockpit with large displays
- State-of-the-art avionics
Human Factors

- Displacement of pilot interfaces throughout the cockpit:
  - How often will it be used?
  - How critical is the phase of flight when it happens?
  - Ex: Keypad – located in the front panel instead of central pedestal.
- Three 12.4” displays, fully interchangeable.
Human Factors

- Symbols, information displacement and colors used on displays;
- CAS Messages for all systems: wording, colors, priorities, inhibition, link to pilot procedures in the QRH (quick reference handbook);
- Aural Warnings: voices, reduced use of tones, priorities, one at a time, continuous x single time, cancelable or not, etc. Ex: "Fire, Fire" for engine fire.

EMERGENCY AND ABNORMAL PROCEDURES

LG LEVER DISAG

CAS Indication: One or more landing gear indications disagree with the landing gear lever.

Airspeed........................................MAX 180 KIAS
Hydraulic Pressure................................CHECK
If hydraulic pressure is below 2300 psi:

- HYD LO PRES
  Procedure (EAP10.4).......................ACOMPLISH
- LDG GEAR Lever..........................CYCLE

LG LEVER DISAG MESSAGE PERSISTS? No

- Yes
- No

AFTER LDG GEAR EXTENSION? No

- Yes

- LDG GEAR Lever .......................DN
  Free Fall Handle.........................PULL AND ROTATE

If gear does not lock down:

- Airspeed.................................MIN 140 KIAS

LG INDICATIONS DOWN? No

- Yes

END

PARTIAL OR GEAR UP LANDING
  Procedure (NAP1-15) ..................ACOMPLISH

END

- LDG GEAR Lever ...............DN
  Airspeed.................................MAX 180 KIAS
  Icing Conditions......................EXIT/AVOID
  Consider to LAND AS SOON AS PRACTICAL.

END
Synthetic Vision System (SVS) and Synoptic Views

- Enhances situational awareness, specially in low visibility conditions
- Creates and displays real-time 3-D images based on on board geographical database (SD Card)
- Synoptic views for the main aircraft systems – enhances the status monitoring, fault isolation capacity and situational awareness.
State-of-the-art avionics additional features:

- FMS with graphical flight planning capabilities
- Charts and Maps (SID, STARs)
- Coupled VNAV
- Central Maintenance Computer (CMC): quick fault location and isolation
- Electronic checklist
- Integrated Electronic Standby Instruments (IESI):
  - More info than conventional standby instruments: attitude, speed, altitude plus Vmo/Mmo, vertical speed, ILS, heading, mach and others. Similar PFD symbology.
Reduced workload: smart automation and system integration

<table>
<thead>
<tr>
<th>Usual tasks</th>
<th>Phenom 100 Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Button………Press</td>
<td>Start Switch………Switch</td>
</tr>
<tr>
<td>Fuel……………………Open</td>
<td></td>
</tr>
<tr>
<td>Engine Paramet.....Monitor</td>
<td></td>
</tr>
<tr>
<td>Gen…………………… On</td>
<td></td>
</tr>
<tr>
<td>Gen Load.......... Check</td>
<td></td>
</tr>
<tr>
<td>Av Master…………… On</td>
<td></td>
</tr>
<tr>
<td>STB horizon………Unlock</td>
<td></td>
</tr>
<tr>
<td>Brakes……………Check</td>
<td>Brakes……………Check</td>
</tr>
<tr>
<td>Flaps………………Set</td>
<td>Flaps………………Set</td>
</tr>
<tr>
<td>Speed brake……Check</td>
<td></td>
</tr>
<tr>
<td>Pitot / static………On</td>
<td></td>
</tr>
<tr>
<td>Ignition……………………On</td>
<td></td>
</tr>
<tr>
<td>Thrust rev…………Check</td>
<td></td>
</tr>
</tbody>
</table>
LOW OPERATING COSTS

- Scheduled Maintenance: 600FH or 12 months
- Based on MSG-3 methodology
- Airframe design and engines: low fuel consumption.
- Lower per mile cost than a turboprop

<table>
<thead>
<tr>
<th>Phenom 100</th>
<th>King Air C90GT</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flight time (min)</td>
<td>114</td>
<td>145</td>
<td>- 21%</td>
</tr>
<tr>
<td>600 nm mission cost (US$)</td>
<td>1,565</td>
<td>1,997</td>
<td>- 22%</td>
</tr>
</tbody>
</table>

• Source: C&dD Aircraft Cost Evaluator 2009 vol 1. Includes Engine Restoration Cost. This analysis is for a 10 years period.
## OPTIMIZED PERFORMANCE

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>1,178 nm (2,182 km)</td>
</tr>
<tr>
<td>Max. ceiling</td>
<td>41,000 ft (12,497 m)</td>
</tr>
<tr>
<td>MMO</td>
<td>Mach 0.70</td>
</tr>
<tr>
<td>TOFL**</td>
<td>3,125 ft (953 m)</td>
</tr>
<tr>
<td>High Speed Cruise</td>
<td>390 knots (722 km/h)</td>
</tr>
<tr>
<td>Landing distance***</td>
<td>2,699 ft (823 m)</td>
</tr>
</tbody>
</table>

*The fastest in its class. Superior range*

---

* 4 occupants @ 200 lb, LRC, NBAA IFR reserves (100 nm alternative, 35 min of holding @ 5,000 ft)  
** MTOW, ISA, Sea Level  
*** MLW, ISA, Sea Level, FAR 91
Range from New York and Los Angeles

Mission Details: 4 Occupants @ 91 Kg (200 lb) each | LRC | 85% Boeing Annual Winds and ISA en-route | Great Circle Distance + 3% | 85% Boeing Airport Temperature.

NBAA IFR Reserves: 100 nm Alternate Airport + 35 min. of Holding @ 5,000 ft.

Average flight time of 3 h 40 min.
PERFORMANCE COMPARISON

**Phenom 100 vs. Mustang**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Phenom 100 (At High Speed)</th>
<th>Mustang (At High Speed)</th>
<th>Phenom 100 (at Mustang´s High Speed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cruise speed (kt)</td>
<td>373</td>
<td>338</td>
<td>338</td>
</tr>
<tr>
<td>Associated fuel flow (lb/h)</td>
<td>680</td>
<td>569</td>
<td>570</td>
</tr>
<tr>
<td>Specific fuel consumption (nm/lb)</td>
<td>0.549</td>
<td>0.594</td>
<td>0.593</td>
</tr>
</tbody>
</table>

*Mid-cruise weight (8,500 lb for Phenom 100 and 7,500 lb for Mustang), ISA, based on FL370*

- Phenom 100 high speed is 35 kt faster than Mustang´s;
- When Phenom 100 slows down to Mustang´s high speed (338kt), specific fuel consumption for both aircraft are equal, even Phenom 100 being 1,000lb heavier;
- Flying at Mustang´s high speed (338kt) or faster is just a matter of choice. Mustang can't do the same. It stays with the 338kt.
State of the art Avionics:

- SVS, Integrated EICAS, IESI, CMC (airline heritage), System Synoptics, Graphical Flight Planning, etc;

- Specially developed engine by P&WC - lower emissions and noise

- Dual FADEC

- Brake-by-wire
# CERTIFIED PERFORMANCE DATA SUMMARY

<table>
<thead>
<tr>
<th></th>
<th>Initial estimates</th>
<th>ANAC/FAA Certified Phenom 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range with IFR(^{(1)}) reserves</td>
<td>1,160 nm</td>
<td>1,178 nm (2182\text{km}))</td>
</tr>
<tr>
<td>MMO</td>
<td>0.70</td>
<td>0.70</td>
</tr>
<tr>
<td>Maximum Ceiling</td>
<td>41,000 ft</td>
<td>41,000 ft</td>
</tr>
<tr>
<td>High Speed Cruise</td>
<td>380 kt</td>
<td>390 kt (722\text{km/h}))</td>
</tr>
<tr>
<td>Landing Distance(^{(2)})</td>
<td>3,000 ft</td>
<td>2,699 ft (823\text{m}))</td>
</tr>
<tr>
<td>Enhanced Takeoff Distance (^{(3)})</td>
<td>N/A</td>
<td>3,125 ft (953\text{m}))</td>
</tr>
<tr>
<td>Standard Takeoff Distance (^{(3)})</td>
<td>3,400 ft</td>
<td>3,400 ft (1036\text{m}))</td>
</tr>
<tr>
<td>Engine Thrust</td>
<td>1,615 lb</td>
<td>1,695 lb</td>
</tr>
<tr>
<td>Block Fuel for 1,000 nm</td>
<td>1,960 lb</td>
<td>1,889 lb</td>
</tr>
<tr>
<td>External noise</td>
<td>Stage IV</td>
<td>33 EPNdB below Stage IV</td>
</tr>
<tr>
<td>Main baggage compartment</td>
<td>45 ft(^{3})</td>
<td>53 ft(^{3}) (1.70\text{m}^{3})</td>
</tr>
</tbody>
</table>

\(^{(1)}\) NBAA IFR reserves (35 min) with 100 nm alternate; 4 occupants @ 200 lb each  
\(^{(2)}\) MLW, SL, ISA  
\(^{(3)}\) MTOW, SL, ISA

All targets achieved or exceeded!
Improved comfort and space
  - Armrest and fold-over

In production line - 4Q/09

Retrofit to customers with original seats starts in 1Q/2010 at special conditions

Replacements at Embraer Service Centers
Increased aisle width - Armrest Deployed

<table>
<thead>
<tr>
<th>Current</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>345mm</td>
<td>513.5mm</td>
</tr>
<tr>
<td>13.38in</td>
<td>20.21in</td>
</tr>
<tr>
<td>257mm</td>
<td>407.4mm</td>
</tr>
<tr>
<td>10.11in</td>
<td>16.03in</td>
</tr>
<tr>
<td>241.6mm</td>
<td>222mm</td>
</tr>
<tr>
<td>9.51in</td>
<td>8.74in</td>
</tr>
<tr>
<td>207mm</td>
<td>345mm</td>
</tr>
<tr>
<td>8.15in</td>
<td>13.58in</td>
</tr>
</tbody>
</table>
“Our overall impression was that the Phenom 100 is very easy to fly, having one of the most intuitive cockpits of any business aircraft yet produced, docile handling manners and simple, reliable systems”

Fred George (B&CA, Oct 2008)
PRODUCT OVERVIEW

- Is it a stretched Phenom 100?
- No, a lot more than that!
Multiple finishing choices:

- wood veneer, laminates, leather, carpets, fabric

Full “Mix & Match” option.

The largest cabin, baggage compartment and windows in its class.
The largest cabin, baggage compartment and windows in its class.

- 5 ft³ (141 ℓ)
- 5 ft³ (141 ℓ)
- 66 ft³ (1,869 ℓ)
CROSS SECTIONS COMPARISON

Phenom 300

CJ3

Preliminary data
CROSS SECTIONS COMPARISON

Preliminary data

4ft 11in (1.50m) 4ft 9in (1.45m)

4ft 10in (1.47m)

5ft 1in (1.55m)

CJ4

4ft 11in (1.50m)

4ft 11in (1.50m)

5ft 1 in (1.55m)

5ft 1in (1.55m)

Lear 40XR

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Pressurization

Flight Altitude 45,000 ft (13,716 m)

Cabin altitude

Aspen 7,820 ft (2,383 m)

6,600 ft (2,011 m)
CABIN ALTITUDE

Cabin altitude at flight level FL450*

- CJ2+, CJ3, Premier IA* - 8,000 ft
- Aspen - 7,820 ft
- Hawker 400 XP - 7,240 ft
- Phenom 300 (6,600 ft)

*Premier IA at FL 410

Lower cabin altitude
**PRODIGY FLIGHT DECK 300**

**Design Drivers**
- Single Pilot Operation
- Human Factors
- Enhanced Situational Awareness
- Glass Cockpit with large displays
- State-of-the-art avionics
**PERFORMANCE SUMMARY**

**Range**
- 1,800 nm (3,334 km)

**Max. ceiling**
- 45,000 ft (13,716 m)

**MMO**
- Mach 0.78

**TOFL**
- 3,700 ft (1,128 m)

**High Speed Cruise**
- 450 knots (833 km/h)

**Landing distance**
- 2,950 ft (900 m)

* The longest range in its class. Superior high speed.

---

* 6 occupants @ 200 lb, LRC, NBAA IFR reserves (100 nm alternative, 35 min of holding @ 5,000 ft)
** MTO, ISA, Sea Level
*** MLW, ISA, Sea Level, FAR 91
From New York and Los Angeles

Mission Details: 6 occupants @ 200 lb (91kg) each | LRC speed | 85% Boeing Annual Winds and ISA en-route | Great Circle Distance + 3% |
Takeoff analysis @ SL, ISA, MTOW

NBAA IFR Reserves: 100 nm Alternate Airport, 35 min. of Holding @ 5,000 ft

Average flight time of 4h 50min.
System Highlights

Anti-Ice System:
- Engine bleed for wing leading edge, horizontal stabilizer and engine lip.
- Probes, static ports, drains and windshield are electrically heated.

Brake System:
- Brake by Wire
- Carbon brakes

Ground Service:
- Single point refueling
- Externally serviced lavatory

PW535-E:
- Not only a software change but a different hardware (compared to PW617F-E)

High reliability, less maintenance actions
# Direct Operating Costs (DOC)

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Phenom 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Burn (1) (@ US$4.49 / Gal)</td>
<td>745.34</td>
</tr>
<tr>
<td>Maintenance Labor (2)</td>
<td>55.18</td>
</tr>
<tr>
<td>Maintenance Parts (3)</td>
<td>61.04</td>
</tr>
<tr>
<td>Engine Restoration (4)</td>
<td>245.52</td>
</tr>
<tr>
<td>Miscellaneous (5)</td>
<td>52.00</td>
</tr>
<tr>
<td><strong>Total DOC (US$ per FH)</strong></td>
<td><strong>1,159.08</strong></td>
</tr>
</tbody>
</table>

*According to Conklin & de Decker 2009 Vol I assumptions

Phenom 300 DOC: US$ 1,159 / FH*

- CJ3 DOC is 10% higher: US$ 1277.13
- Hawker 400XP DOC is 26% higher: US$ 1569.68
- Lear 40XR DOC is 25% higher: US$ 1,559.39
PHENOM 100 & PHENOM 300: DESIGNED FOR HIGH UTILIZATION

Economic life - 10 years typical utilization

Extended Economic Life

Air Taxi (20,000)
Fractional (12,000)
Charter & Branded Charter (8,000)
Private Owner (2,000)

Favors Residual Value
**Main design drivers**
- Premium comfort
- Docile flying characteristics
- Optimized performance
- Next generation technologies

**Commercial aviation experience**
- Designed for high utilization
- High availability
- Low operating cost

---

Flexible to suit all business models
4 prototypes flying

- Aerodynamic configuration finalization
- Maximum operational speed and maximum altitude envelope opening
- Water spray tests
- Engine controllability, in-flight start, thrust determination, fire detection and extinguishing
- Fuel systems tests
- Lightning Tests
Structural tests:

- Bird strike tests concluded successfully
- On going fatigue and static tests
PHENOM 300® - PROGRAM UPDATE

- Natural ice
- Crosswind takeoff and landing
- Cold soak
- External noise tests
- Autopilot and avionics tests – on going
- Flutter and high speed tests – on going
- Landing and take-off performance – on going

Over 750h of flight tests completed
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