A STRATEGIC VIEW OF PERSONAL AIRCRAFT DESIGN TECHNOLOGY

On-Demand Mobility and Emerging Aviation Technology Roadmap Workshop

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Why did US light plane sales drop from 14,400 in 1978 to 550 last year?

- **End of the WWII Infrastructure**
  - Closing of hundreds of Mom & Pop FBOs
  - Older pilots retiring (600,000 were trained during WWII)

- **Shocks to the GA cost structure**
  - Sudden, dramatic growth of liability costs
  - End of the GI Bill(s)
  - Changes in tax rules that increased costs to the end customer
  - Large growth in regulatory overhead costs
  - All resulted in huge price increases

- **Available technologies**
  - can take market share
  - have no clear impact on overall market growth.
• 350,000 individual USA taxpayers earn more than $1 Million annually.
• Last year, some 550 new, single-engine personal airplanes were delivered in the USA.
• We infer that only about 0.16% of those who arguably could afford a new personal airplane actually buy one.
• Instead, some HNWIs buy a larger, faster airplane; but most use
  – Airline first class or business class
  – Air taxi
  – Charter flights
  – Private jet memberships
  – Fractional ownership
DIFFERENT POINTS OF VIEW
WHAT WILL PEOPLE BUY?

• The Engineer
  – High efficiency propulsion
  – Low drag
  – Light weight

• The Pilot / Enthusiast
  – Affordable
  – Reliable
  – More Payload & Range
  – Faster
  – Fun to fly
  – Appealing Style

• The Passengers
  – Spacious, Modern Cabin
  – Effective HVAC
  – Quiet
  – Smooth
  – Sturdy feel
  – High perceived safety
  – Faster (or a real toilet)

• The Affluent Buyer / Pilot
  – All of the above, plus
  – Few demands on time
DEMANDS ON TIME
Piloting Requirements Are Absolute Barriers

TRAINING
-- BASIC PRIVATE LICENSE
  - 100 Hours Of Coursework And Study
  - 50 Hours Of Flying Instruction Practice
  - $7500

-- “Travel” IFR RATING
  - 200 Hours Of Coursework And Study
  - 100 Hours Of Cross Country, Advanced Instruction, And Practice
  - $10,000 Additional

CONTINUED INSTUMENT PROFICIENCY
-- REGULATIONS – the minimum
  -- 6 APPROACHES IN 6 MONTHS
  -- INSTRUMENT PROFICIENCY CHECK
  -- BIENNIAL FLIGHT REVIEW

-- REAL
  -- Unceasing Time Commitment to Practice and Drill
WHAT IS THE DESIGN ISSUE FOR PERSONAL AIRPLANES?

- People Want Affordable Value.
  - In precise economic terms, today’s prices are just plain nuts.

- The Marketplace Will No Longer Tolerate Discomfort, Inconvenience, & Current (Perceived) Risk Levels.

- Those who can afford a new airplane rarely have the time to become pilots and stay safe.
  - Professionals
  - Business Owners
  - Corporate Executives

- The broader market requires less reliance on near-professional levels of pilot skills.
WHAT DESIGNS WILL PEOPLE BUY?

PEOPLE WILL BUY AIRPLANES WITH THESE ATTRIBUTES:

- Reliable
- Spacious, Modern Cabin
- Effective Heating and Air Conditioning
- Quiet
- Smooth
- Sturdy
- High Perceived Safety
- Cockpit and Airspace Automation (ODM)
The Longstanding Injunction Against Weight Has Made The Industry Hostage to Its Current Customers. (Christensen, The Innovators Dilemma)

When The Customers Have All But Disappeared, Why Cater To Them?

The Third Wave Of Aeronautics Is Overdue

SOME WEIGHT IS GOOD
In the late 1940s, the makeover of general aviation had two key ingredients: aluminum airframes and tricycle landing gear. These features added ~150 lb to the typical 4-place airplane, much more if a larger engine was needed. Another 400 lb would allow revolutionary features and reduce prices.

The design challenge is to make this happen.
AN EARLY PRECEDENT

FULLY CERTIFIED ODM C208B IN 2008

- AUTONOMOUS MODE
- PILOTED MODE
- GROUND CONTROLLED MODE
- SEAMLESS SWITCHING BETWEEN MODES