

A STRATEGIC VIEW OF PERSONAL AIRCRAFT DESIGN TECHNOLOGY

On-Demand Mobility and Emerging Aviation Technology
Roadmap Workshop

Emmett Kraus

October 21, 2015

ANSWERS A DESIGNER NEEDS

OLD NEWS

- **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.

ANSWERS A DESIGNER NEEDS

TODAY'S NEWS

- 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 INSTRUMENT 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)**

OF COURSE, ALL THAT “WEIGHS TOO MUCH”

- **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

!!!!

PRECEDENT FOR MORE WEIGHT

ALLOWS ESSENTIAL FEATURES

- **IN THE LATE 1940s THE MAKEOVER OF GENERAL AVIATION HAD TWO KEY INGREDIENTS:**
 - ALUMINUM AIRFRAMES
 - 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

