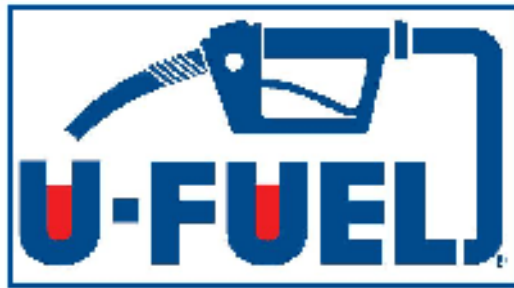


Aviation Fuel Update October 2011



Kent P. Misegades

Aviation Sales, U-Fuel, Cary, NC

Director, Aviation Fuel Club

President, EAA Chapter 1114, Apex, NC



Author

- Son of Douglas / N.A. Aviation engineer
- Pilot since 1973, FBO *Line Boy*, Louisville, KY
- Degrees in ME (Auburn) & Aerodynamics (VKI)
- 30-year career in aircraft & defense industry
- President, EAA 1114, Apex, NC
- Aviation Sales, U-Fuel / Writer for GAN and EAA



Introducing U-Fuel

- Founded by pilot/banker **Mike Webb**
- Pioneered self-service 100LL and autogas fuel stations at **Oshkosh Aero**
- Oshkosh Aero acquired by **Basler** '87
- **U-Fuel** founded in '87 in Eau Claire, WI
- Set modern international **standards** for above-ground fuel storage tanks (ASTs)
- Leading supplier of **fuel stations** to aviation, truck/bus fleets, marine, mining





1st self-service station
Greenbay, WI 1987





Topics

- Aviation fuel - present status
- Alternatives to leaded avgas
- Recent news related to aviation fuels

Present Status



- Approved Aviation Fuels - 2011
- Jet-A - vs - avgas consumption trends
- FBO statistics
- Why is avgas in decline?

Approved Aviation Fuels - 2011

ASTM D1655:

- Jet A (clear) Primary fuel for turbine aircraft in the U.S.; biofuel effort in its infancy

ASTM D910:

- 100 LL (blue) 2 grams Tetra-ethyl Lead (TEL)/g Max., aka AVGAS

ASTM D4814: aka "Autogas", or "Mogas" w/out ethanol or lead, numerous STCs & TCs

87+ AKI (no dye) EAA / Petersen STC (see www.autofuelstc.com)

91+ AKI (no dye) Petersen STC (see www.autofuelstc.com)

91+ AKI (no dye) various TCs, ASTM, e.g. Rotax 912ULS, Jabiru 3300

93+ AKI (no dye) Lycoming e.g. IO-233 LSA, IO-360-M1a, TEO-540-A1A (see SI1070Q)

ASTM D6227:

- 82 UL (purple) Not produced in US, but an 87 UL spec is being added.

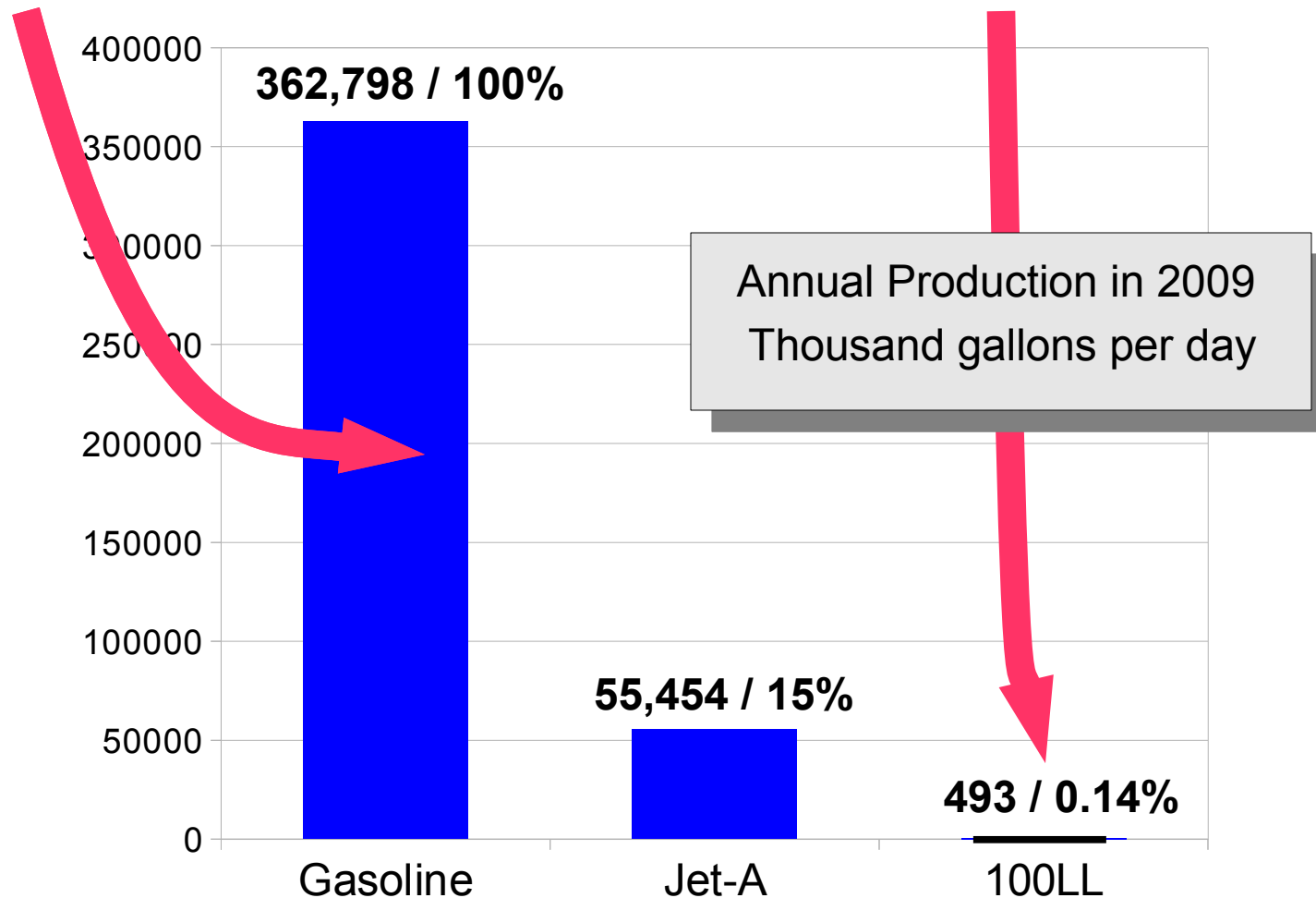
ASTM D7547-09:

- 91 UL DOD for UAVs. Prod. possible, not imminent. DOD focus is diesel/JP8. Now "NLA".

ASTM D7594-2010:

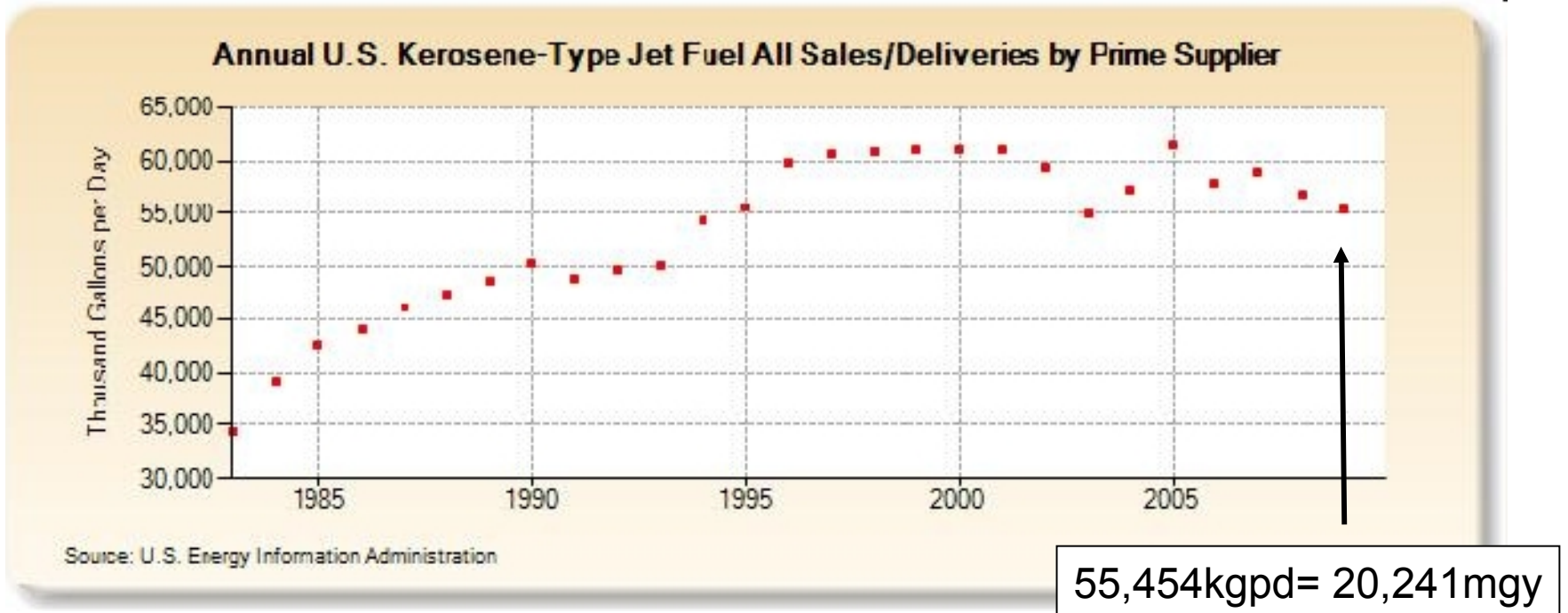
- 94 UL 100LL w/out lead w/further refinement. ASTM approved 11/2010. Used in Europe.

Commodity -vs- Boutique Fuels



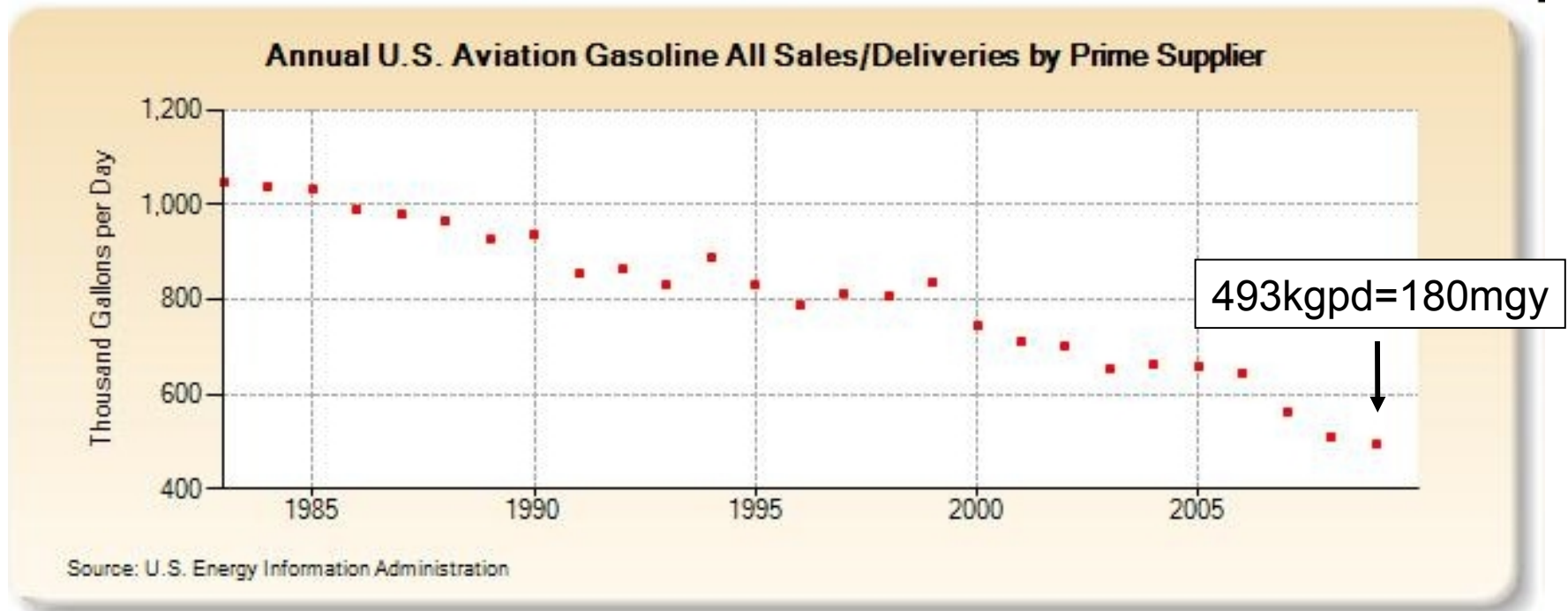
Jet-A Consumption Trends

- Decrease in flight hours offset by transition from pistons
- New-generation turbines more efficient (GEnx, 15% reduction)



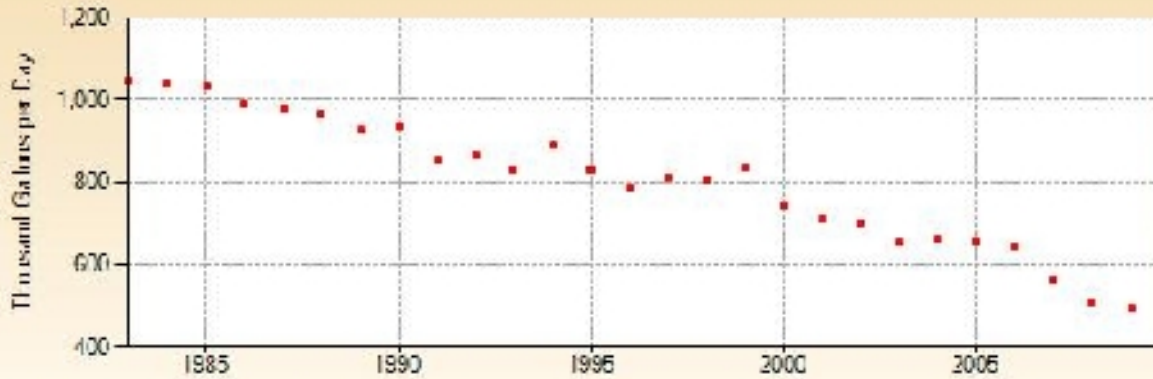
Avgas Consumption Trends

- caused by G.A. stagnation, LSAs & transition to turbines
- 100LL represents < 0.2% of all U.S. fuel; < **1% of Jet-A**
- 2009: 180mgy consumed, dropping by 7.5 mgy, ~4% annually



100LL Sales - vs - Price

Annual U.S. Aviation Gasoline All Sales/Deliveries by Prime Supplier



Source: U.S. Energy Information Administration

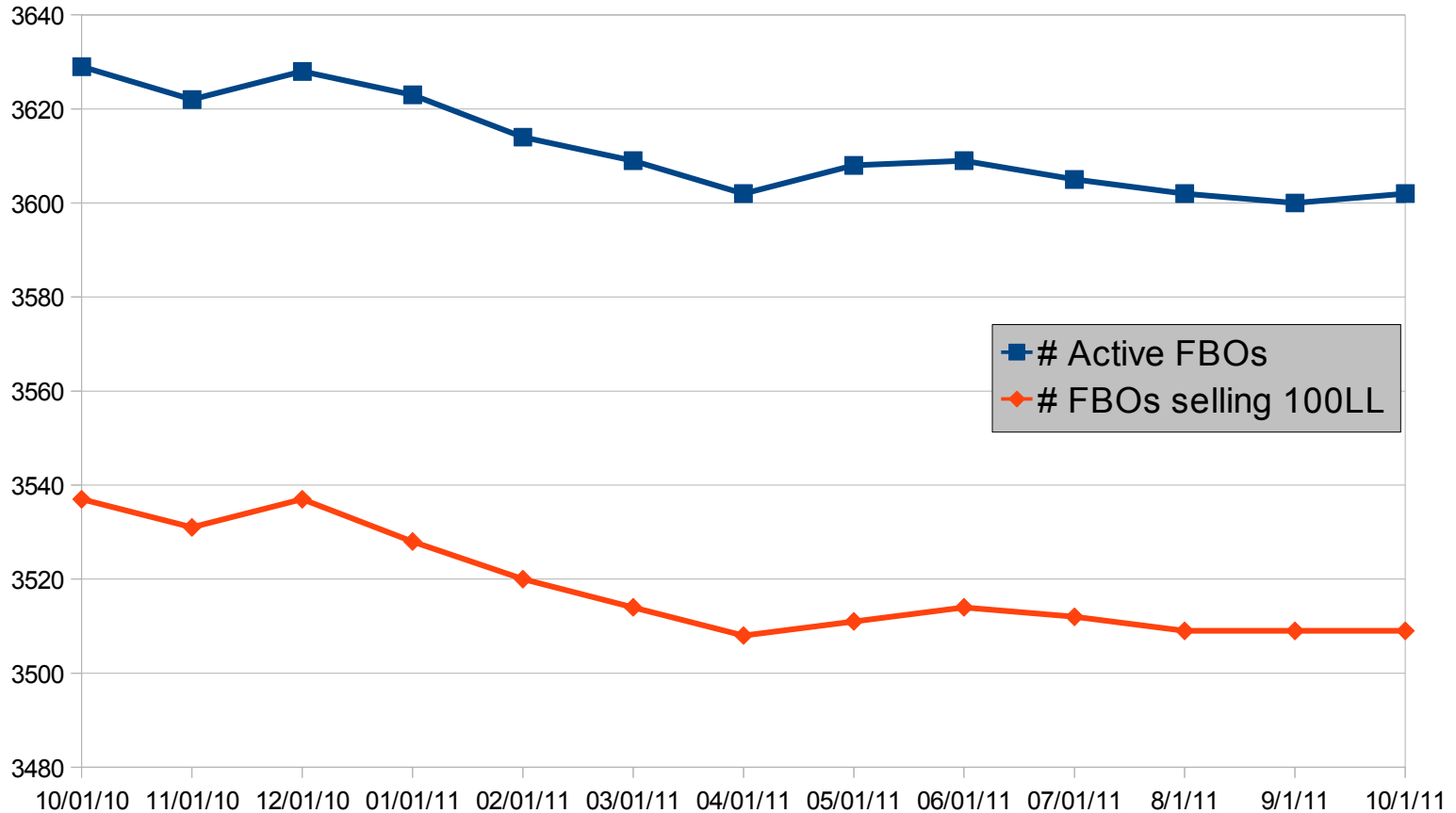
- Prices rising
- Sales dropping
- Fewer refiners
- Price volatility

Monthly U.S. Aviation Gasoline Retail Sales by Refiners



Source: U.S. Energy Information Administration

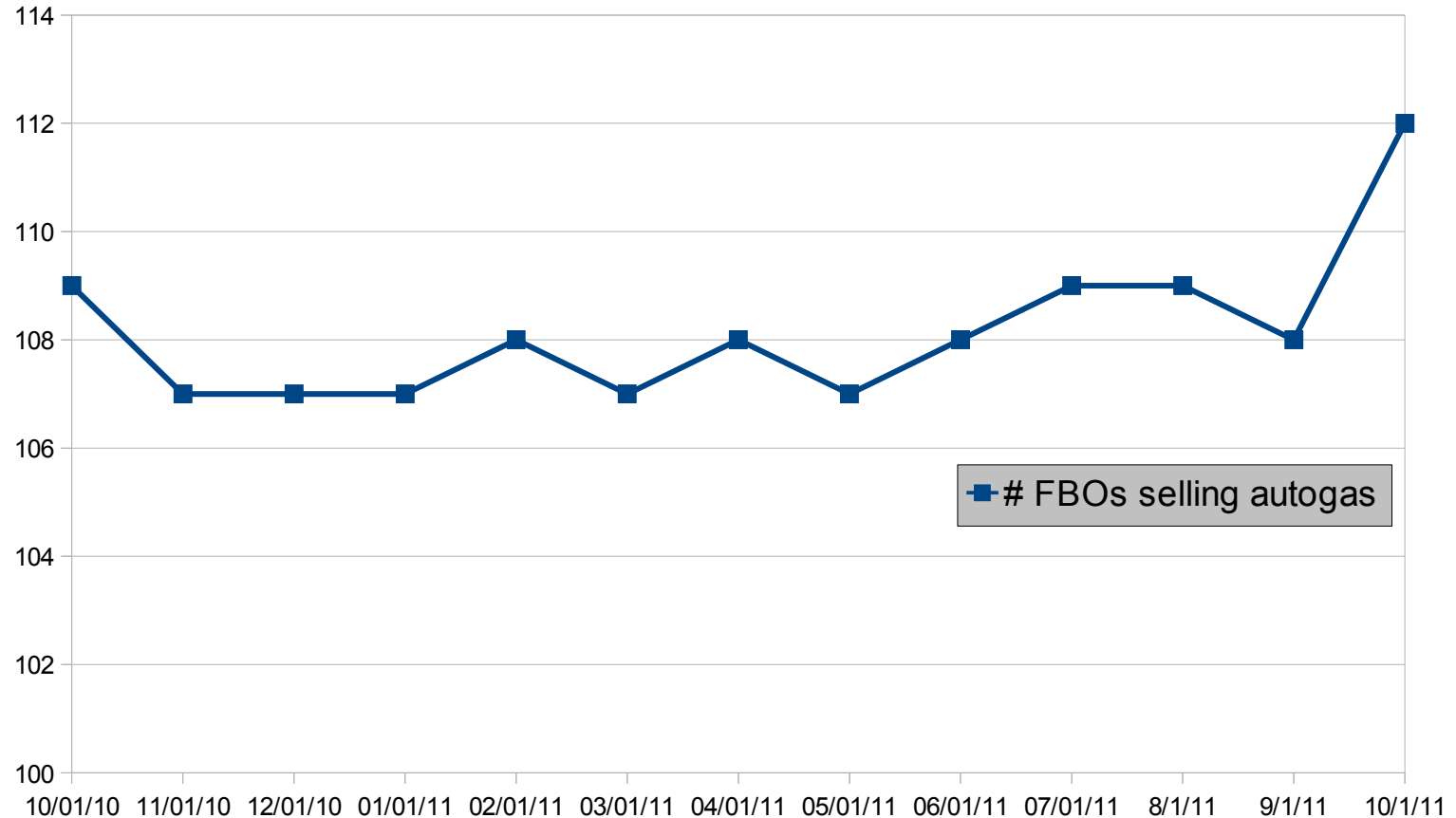
100LL disappearing at airports



Number of U.S. Airports with 100LL

Data from Airnav Fuel Price Report

Autogas making comeback



Number of U.S. Airports with Autogas

Data from Airnav Fuel Price Report

Why is Avgas in decline?



Then (BAC / Howard 250, 1963) ...



... and now (Pilatus PC-12)

- Major Avgas users now fly turbines
- Sport aviators fly less, only 25-50 hours/year
- New sport/training A/C burn 4-5 gph, mogas
- Pilot “bubble” from 50s/60s/70s is aging

Liberty
AEROSPACE



“We are offering the autogas-burning Rotax 912 ULS in our Liberty XL2 due to our sales efforts in emerging markets where affordable avgas is not available.”

Keith Markley, CEO, Liberty Aerospace, Sun 'n Fun 2011

JAARS



“We are converting our fleet of aircraft to Jet-A turbines and diesels since avgas has essentially disappeared where we operate.”

Terry Heffield, Chief Engineer, JAARS, September 2010, Waxhaw, NC

Alternatives to 100LL

- **Why bother looking for one?**

- One supplier of TEL remains, Innospec (UK), future?
- GA is main user of leaded fuels, target of FOE, CEH, etc.
- **CA FBO injunction just dismissed, CEH lawsuit proceeding**
- Higher octane fuels (\$\$) not needed in modern engines
- 20%-30% needing 100 octane burn 50%-70% all avgas ?

- **Autogas** - FAA approved in 1982, affordable, can power 70%-80% of piston fleet with no or small mods. Lycoming approved 93 AKI for many engines, SI 1070Q, 7/2010.

100 Octane Alternatives to 100LL

- **Swift Enterprises**

- UL102 in flight test, 7 lbs/gallon, cost ?
- ASTM D7719 approved in May, allows testing only

- **GAMI** – 100GF unleaded fuel in flight test, cost ?

- **100VLL** - a “transition” fuel, 20% lower lead than 100LL

- ASTM D910-11 now covers 100VLL
- **most 100LL has been 100VLL for years, so big whoop!**



What about Europe?

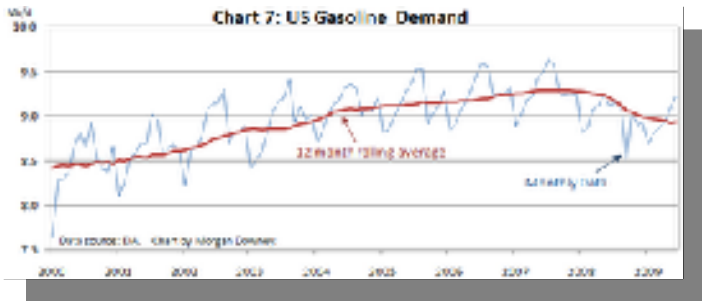
- Europe – 4-fuel solution: mogas/avgas/94UL/Jet-A
- Heavy pistons replaced by Jet-A turbines
- LSA class popular, run on 91+ E0 avgas
- LSA makers adding 4+ seat A/C, use avgas
- 94UL available across Europe by late 2011
- Jet-A diesels gradually entering market

What's up with biofuels?

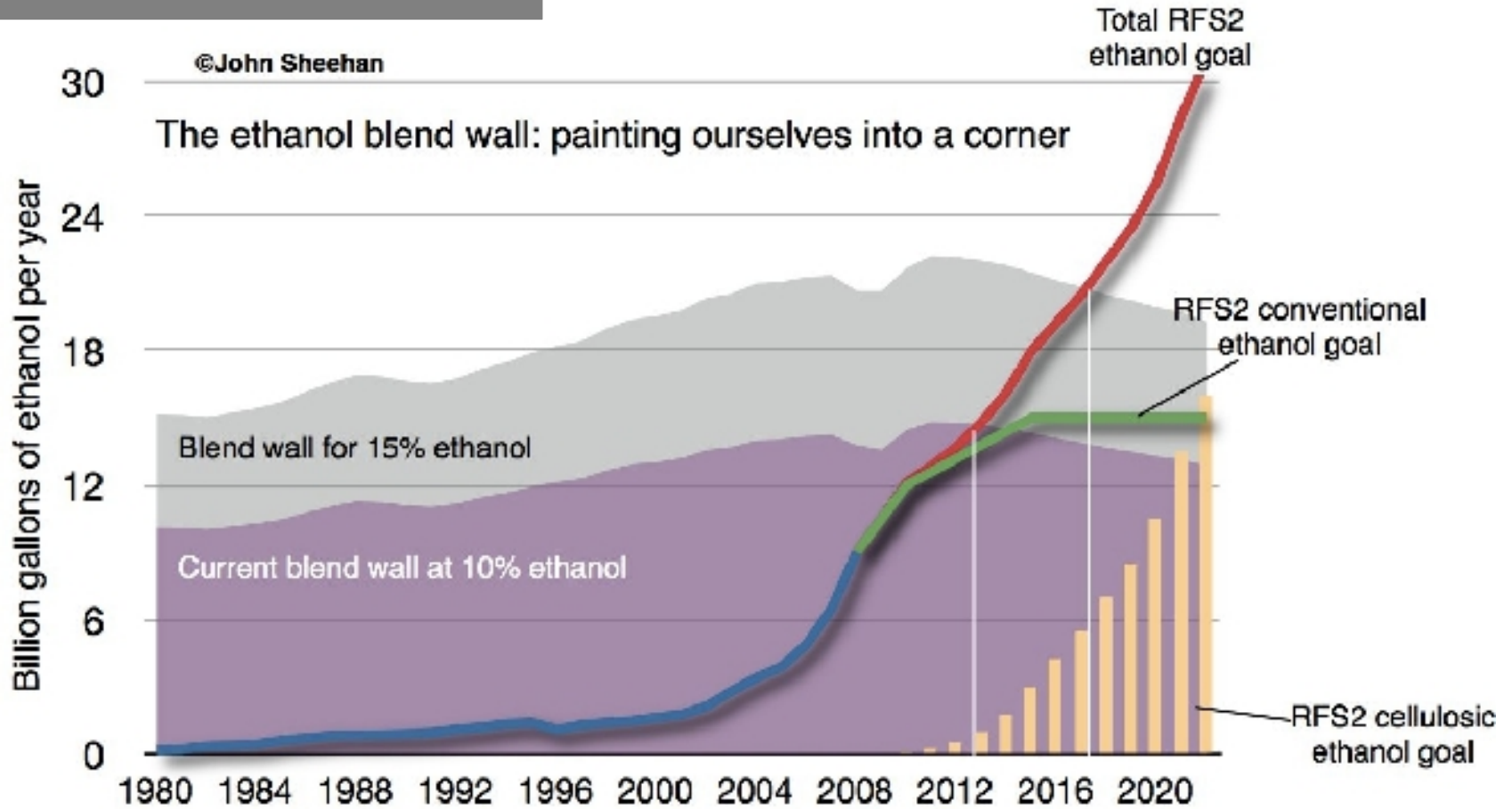


“America’s biofuels policy is a train wreck in progress.”

Dr. Phillip Verleger, oil economist & professor at the University of Calgary, 9/2010



The Blending Wall Cometh



Recent News

100LL production decline continues

- 30% drop since 2005; 4%-5% annual decline continues
- ~219 mgy forecast for 2011, far below FAA claim of 350 mgy
- ExxonMobil departed GA 6/11, closing Avitat FBO network
- Eight 100LL producers left, all west of Mississippi
- CA FBO injunction just dismissed, **CEH lawsuit proceeding**

Jet-A production stable

- airline travel stagnant, modest recovery in business A/C use

Recent News

Drop-In unleaded replacement for 100LL unlikely

- Reported on 10/18/2011 in **General Aviation News**
- Avgas Transition **Aviation Rulemaking Committee** (ARC), with members from EPA, FAA, EAA, NBAA, GAMA, NATA, others.
- Announced at **2011 AOPA Summit** in Hartford, CT
- “One of the key conclusions the committee came to recently is that there is not going to be a drop-in replacement,” said **Michael Kraft**, senior vice president and general manager at **Lycoming**.
- After 20 year effort, **failure** is finally admitted
- **Lycoming & Continental** announced new **autogas**-burning engines in 2011, by coincidence?

Recent News

Autogas making comeback

- **Raleigh East & Gilliam-McConnell** (Carthage) added in NC
- **Mountain Empire** added in VA
- **Dearbury Oil** in Spartanburg will deliver to **airports** in NC/VA/SC/GA
- Increasing calls for ends to **ethanol subsidies & mandates**
- Soon available in **California**, unthinkable last year
- **Primary fuel** for pistons outside North America and Europe
- **Lycoming & Continental** recently debuted autogas engines
- Italy's Tecnam, world's #1 light A/C maker, has **100% autogas fleet**

Recent News at U-Fuel

Financial partner announced

- American Equipment Finance (**AEF**), Warren, NJ
- **Paul Hagner**, 20+ years experience financing fuel equip.
- See flyer from AEF, www.aefllc.com

Insurance partner announced

- Aviation Unlimited Agency (**AUA**), Greensboro, NC,
www.auaonline.com
- **Highly regarded** in sport aviation & General Aviation
- Provides insurance coverage for all fueling, **including autogas**

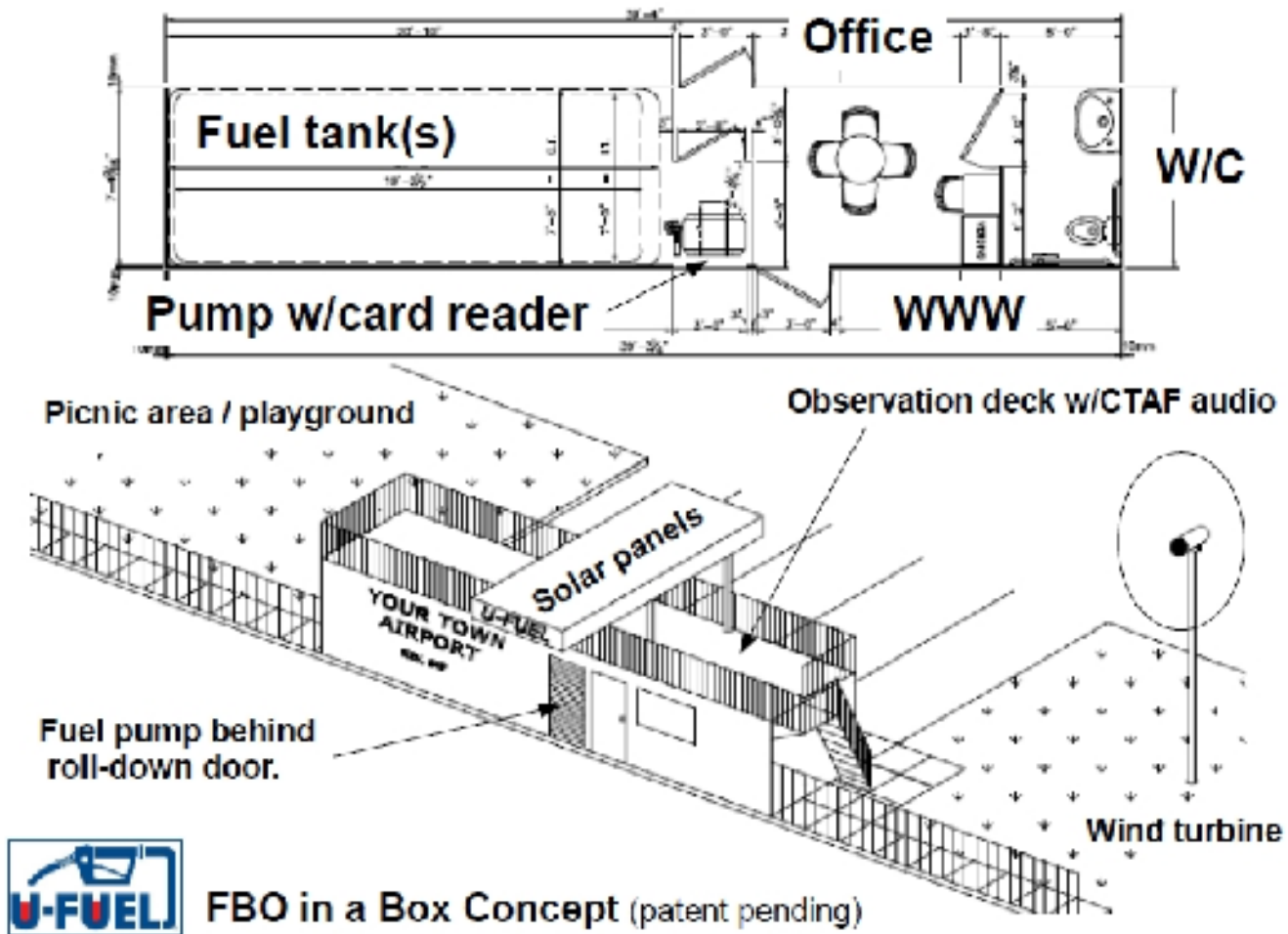
Recent News at U-Fuel

- **Aviation Fuel Club ~ 400 members, busy year**
- **Self-Service White Paper, aerosouth.net > U-Fuel**
- **Debut of first Sport Fuel Station**
 - Described at **NCAA 2011** annual meeting
 - 3,450g self-service station for **autogas/avgas/Jet-A**
 - Highly-portable, very affordable at **\$55,000**
 - **First shown** at Chinese CIGAC show, Xi'an, October 2011
 - Will be installed at **China's** first ten GA airports
 - First US station will go to **South Carolina** GA airport

First U-Fuel Sport Fuel Station



U-Fuel FBO in a Box Concept



Autogas Resources

Retail sellers - www.Pure-Gas.org

Terminals - www.OPISNet.com

Airports with autogas - www.flyunleaded.com/airports.php

Aviation Fuel Club & Sport Fuel - www.aviationfuelclub.org

AirNav - Aviation Fuel, www.airnav.com/fuel/

GAfuels - www.generalaviationnews.com/category/opinion/gafuels/

Autogas Primer - see GAfuels 3-part series “Autogas for Everyone”

Autogas STCs - Petersen Aviation, www.autofuelstc.com

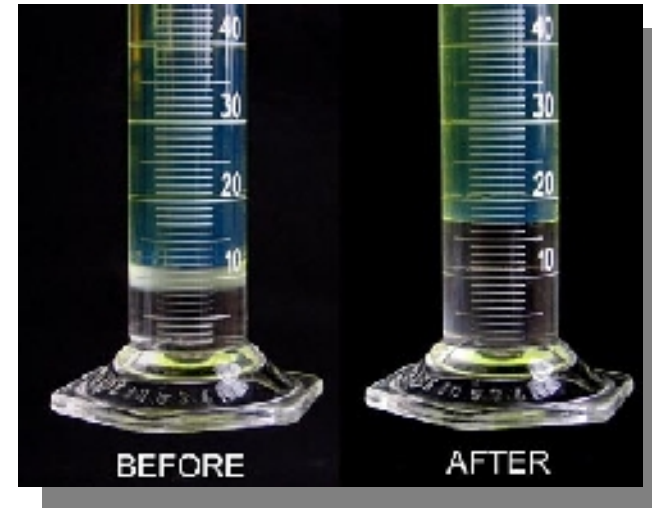
Ethanol test tube - <http://autofuelstc.com/autofuelstc/pa/ethanoltest.html>

Surplus fuel equipment - Government Liquidators, www.govliquidation.com

Aviation Fuel Stations - U-Fuel, Elk Mound, WI, www.ufuel.com

Congressional General Aviation Caucus - www.nbaa.org/advocacy/ga-caucus/

Kent Misegades, Cary, North Carolina, kent@ufuel.com, 919-303-8230 (home office), 919-946-7096 (cell)



**Always test gas
station fuel for ethanol!**





Thank You!

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www.aerosouth.net



Questions?

E0 Autogas fueled, four-seat
Rotax 912 powered Tecnam P2006T
Tecnam N.A., Richmond, VA

