Future fuels of aviation

ECAS Sept. 07-08 2011

HJELMCO OIL AB

Lars Hjelmberg

C.E.O.

Aviation Gasoline

A speciality product.

estimated w/w production

~ 1.600.000 ton/year

In volume

< 0.5 % of automotive gasoline

or

< 1/4 of automotive gasoline system

<u>evaporation</u>

AVGAS PRODUCERS ENDANGERED SPECIES

FROM THE ATLANTIC TO THE PACIFIC

4 PRODUCERS

TOTAL FRANCE

SHELL HOLLAND

HJELMCO SWEDEN

OBR POLAND

Unleaded AVGAS available today

- Hjelmco 91/96 UL for all 91/96, 80/87 octane, Rotax and Kalisz (radial) engines
- UL 91 for Rotax Engines and 80/87 octane engines
- 82 UL for certain 80/87 octane engines (Mogas without ethanol)
- **Nothing for 100/130 octane engines**

Unleaded Avgas under development

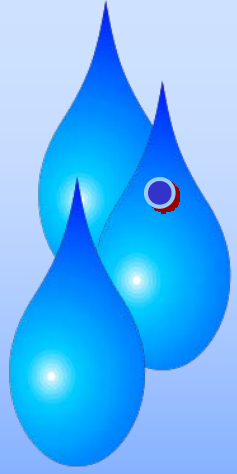
Not meeting current AVGAS standards

SWIFT ~85 % aromatics,~ 15% isopentane

GAMI ~ > 50+ % aromatics.

Active component for both: 1,3,5-trimethylbenzene

86-87 MON super car gasoline (no ethanol)



Unleaded Avgas under development

Not meeting current AVGAS standard

SWIFT ~ 85 % aromatics
GAMI ~ >50 + % aromatics

Entire AVGAS distribution system relies on max 30 % aromatics in tank coating for hoses etc.. How to handle that?
Density around 830 gram/liter at + 15 degr. C. i.e. more than JET-A1 kerosine.

How to handle in a carburettor, the floatation gear?

From where will the heat come to vaporize the fuel in the carburettor?

Unleaded Avgas under development not meeting current AVGAS standard

SWIFT ~ 85 % aromatics
GAMI ~ 50 + % aromatics

Highly aromatic and heavy fuels may require a separate distribution system (drums?) and may only be for fuel-injected aircraft.

US Oil companies have requested a single AVGAS stream.

Dual AVGAS streams said not profitable.

Avgas under development

not meeting current AVGAS standard

Uphill battle to prove suitability

Parameters in current standard are there for known reasons (trial and error)

If going outside D910 standard concessions in:

performance

safety

reliability

Avgas under development

meeting current AVGAS standard

100 VLL: concession to the US EPA to reduce overall lead in the air (~50 % reduction is researched)

Problem: octane numbers don´t tell the whole story

Unleaded AVGAS 98 lean of peak

performed better detonationwise than a 100 LL AVGAS at peak

Contradicts earlier data of the need to add about 3 MON in a 100 unleaded AVGAS.

Avgas under development meeting current AVGAS standard

UL 94 : TCM project, final parameters not set
However – first aircraft already certified – Cirrus 22 T
315 HP turbocharged TIO520 TCM engine.
engine initially rated for AVGAS 100 LL

Hjelmco AVGAS 91/96 UL
in production since 1991 (20 years)
meets or exceeds performance of UL 94

AVGAS APPROVAL PROTOCOL

Under development by the ASTM to assist fuel researchers in the difficult tasks to test new aviation gasolines and additives.

It is an uphill battle to prove fit for purpose for the entire world piston powered fleet.

UNLEADED AVIATION

GASOLINE TRANSITION AVIATION RULEMAKING COMMITTEE SPONSORED BY THE FAA

WITH STAKEHOLDERS FROM THE USA

faa, gama, aopa, eaa
lycoming, continental
gami, swift
us oil-companies etc.

Developments 2010-2011 in Europe.

Air TOTAL launches UL 91 AVGAS

ROTAX approves UL 91 AVGAS

both meeting US standard D7547

EASA issues SIB 2010-31 for ”orphaned” aircraft.

Swedish MOF to propose lower fuel taxes in Sweden on unleaded AVGAS ?.

Avgas UL 91


ALL ABOUT
THE NEW AVGAS UL 91
Total will launch a new, high-quality aviation fuel during the second half of 2010, specially designed to meet the needs of microlight pilots: AVGAS UL 91. We take a closer look at the reasons behind the development.
91

Rotax-SI -912-016-R3
Rotax-SI-914-019-R3
July 13 2010

	Usage / Description	
	912 UL / A / F	912 ULS / S - 914 UL /F
AVGAS		
leaded	AVGAS 100 LL (ASTM D910)	AVGAS 100 LL (ASTM D910)
unleaded	UL91 ASTM D7547	UL91 ASTM D7547
released brand-name		
	HJELMCO AVGAS 91/96 UL [5)]	HJELMCO AVGAS 91/96 UL [5)]
	HJELMCO AVGAS 91/98 UL [5)]	HJELMCO AVGAS 91/98 UL [5)]

What will be the future AVGAS?

A dual AVGAS situation ?

Keeping AVGAS 100 LL for a/c that really need 100 LL and UL 94 (Hjelmco AVGAS 91/96 UL) for the rest of the fleet.

Requires an agreement with EPA and industry.

Air-quality will rule

(amount of lead in the air next to major GA-airports)

Dual AVGAS

Benefits:

- Drop in replacements fuels for 100 LL
- Cheap to produce
- Known products
- Allows for slow elimination of leaded AVGAS during xx-years.
- Allows for new a/c to be certified on UL94.

Dual AVGAS

- one stream of AVGAS 100 LL

or

- one stream of Swift AVGAS

or

- one stream of AVGAS 100 VLL

and

- second stream of AVGAS 94 UL ?

Dual AVGAS

Disadvantages:

- Production of 2 AVGAS
- Logistics – storage and distribution
- costs for 2 products
- cost for 2 fuel-tanks at the airport

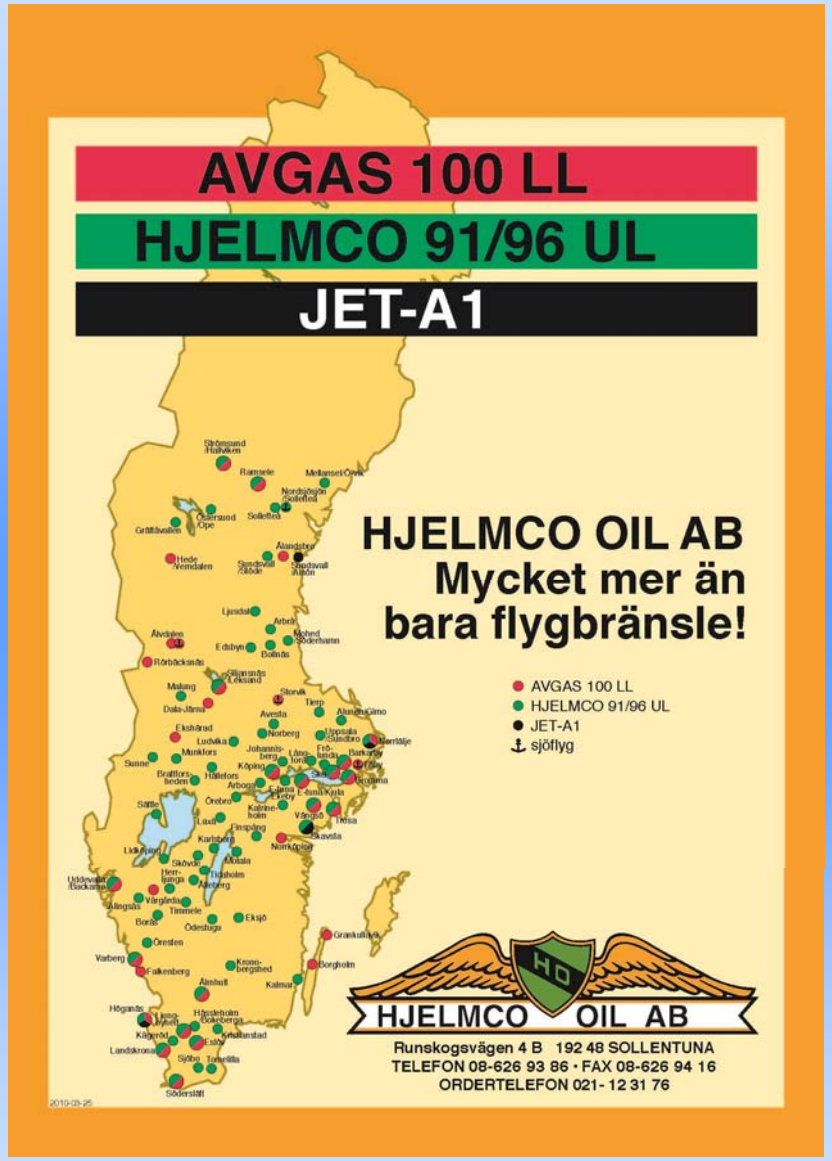
New fuel tank not necessary extra investment for unleaded AVGAS – old 100 LL tank might only be good for xx years allowing for a transition to UL fuel

30 years of Unleaded Avgas in Sweden

Hjelmco 91/96 UL (UL94)

today 2011

- **Available at > 70 airports**
- **used by ~ 1000 aircraft**
- **excellent technical history**
- **approved by piston engine manufacturers covering > 90 % of the entire world piston aircraft fleet.**
- **produced by Hjelmco Oil in Sweden**


AVGAS 100 LL
HJELMCO 91/96 UL
JET-A1
HJELMCO OIL AB
Mycket mer än
bara flygbränsle!
AVGAS 100 LL
HJELMCO 91/96 UL
JET-A1
sjöflyg
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ORDERTELEFON 021- 12 31 76

JET FUEL

First step.

SYNTETIC JET FUELS WILL BE INTRODUCED AS A MIX WITH REGULAR JET FUEL.

Second step.

100 % SYNTETIC

SYNTETIC JET FUEL

EXITING

can be tailored to fit

environment

engines

performance

Environment

Exhaust profile can be tailored

Engines

changed

density

viscosity

droplet size

= more efficient engines.

Performance

higher energy density

=

longer range

Jet fuel

can be produced
by virtually
anything that burns
i.e. contains
carbon.

Syntetic Jet fuel

Technical considerations

cetane numbers for diesel eng.

lubricity

freezing point

Problems for all new fuels

Must be standardized fuels to meet requirements of new and old engines/aircraft during a lifespan of 50 years. Aviation is international

Thank you

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