

FAA CENTER OF EXCELLENCE FOR ALTERNATIVE JET FUELS & ENVIRONMENT

AFRL Update; NJFCP Reference Fuels

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AFRL Update

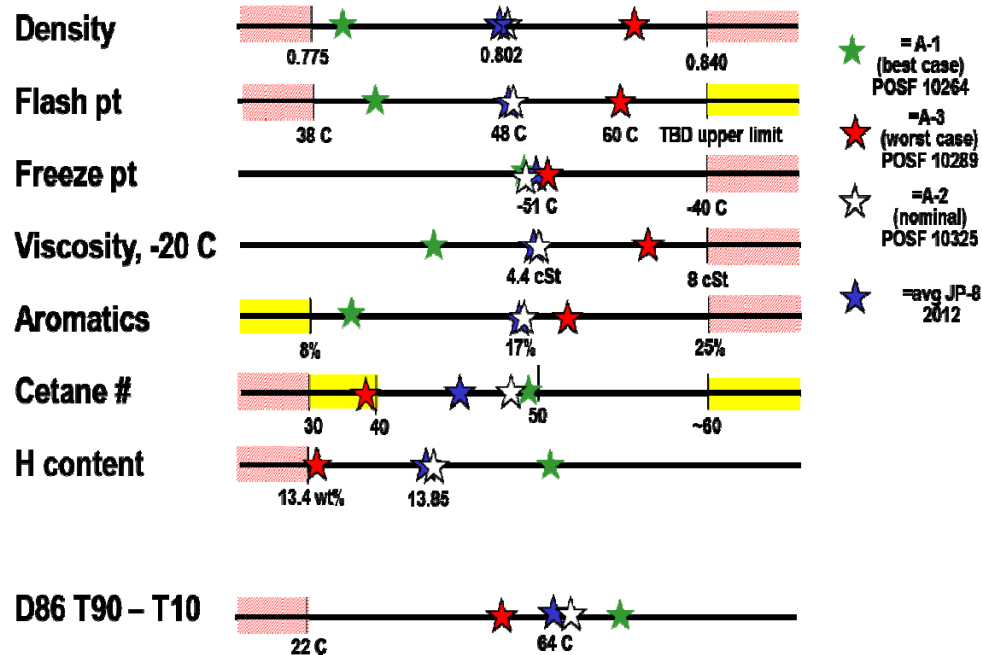


- AF conversion to Jet A fuel in U.S. (completed 2014) brings renewed interest in Jet A specification changes
 - Addition of alternative fuels
 - Approval of new additives
 - Changes to contamination limits (e.g., FAME)
- DoD reviewing changes to assess impact given differences in use (versus commercial aviation)
 - Longer storage
 - Use in diesel engines, generators, etc
 - Use in afterburning engines
- Major AFRL interest is supporting National Jet Fuel Combustion Program (NJFCP)
 - Supplying reference fuels
 - Supporting/hosting referee combustor rig at WPAFB

Reference Fuels for NJFCP

- Earlier “Combustion Rules and Tools” program with OEMs called for test device results to be bounded by range of conventional fuels available (“Category A”)
 - A-2 = average density, viscosity, flash point, H/C ratio
 - A-1 = “best case” – low flash, low viscosity, high H/C
 - A-3 = “worst case” – high flash, high viscosity, low H/C

Fuels obtained via DLA!



Category C Fuels

- “Combustion Rules and Tools” also called for test “fuels” with specific properties that were outside typical experience:

“C-2”

- Unique SPK fuel – Neat Gevo ATJ-SPK – low Cetane (~16), highly bimodal, very flat boiling (T90-T10~21 C)

“C-1”

- Bimodal carbon distribution fuel – Aromatic front end – trimethyl benzene & C14 iso-paraffins (C14: T10=217, T90=234 C)

“C-5”

“C-4”

- Flat distillation curve fuel – C10 n-paraffins/iso-paraffins (T10=163, T90=167) – trimethyl benzene can be added to make fully-synthetic fuel (TMB 165 C)

- Low cetane number fuel – 50/50 or 60/40 blend of Gevo ATJ-SPK/Sasol IPK – low Cetane (~20-25), otherwise jet like carbon dist & distillation curve

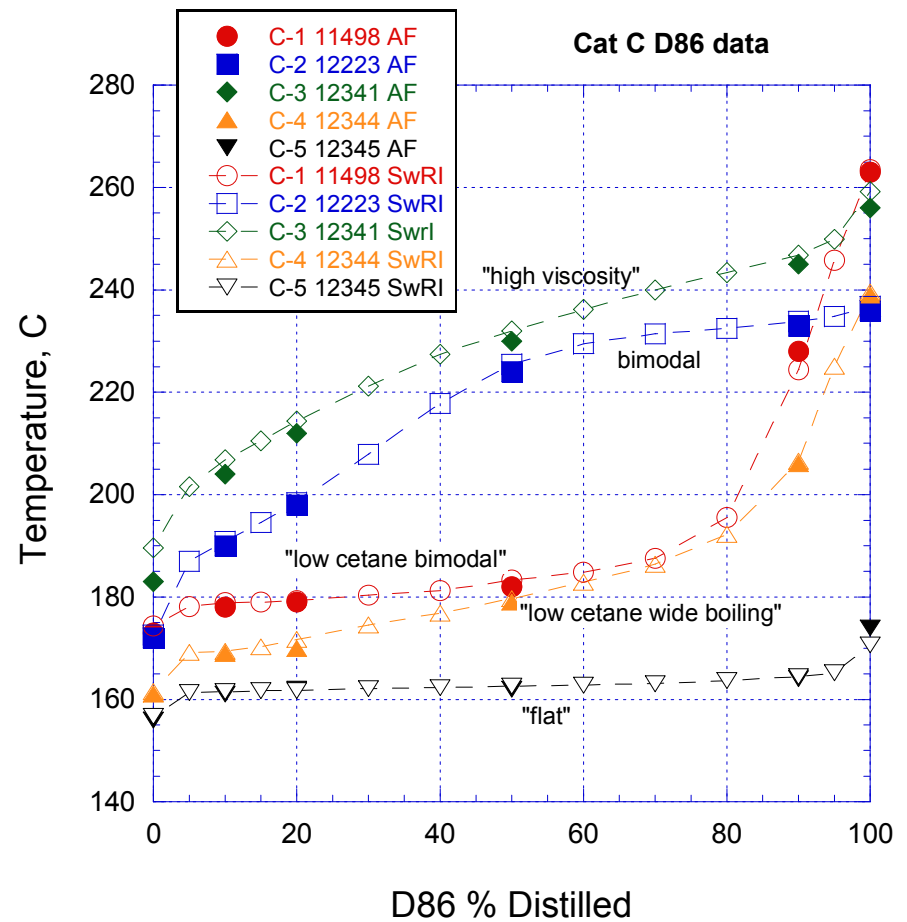
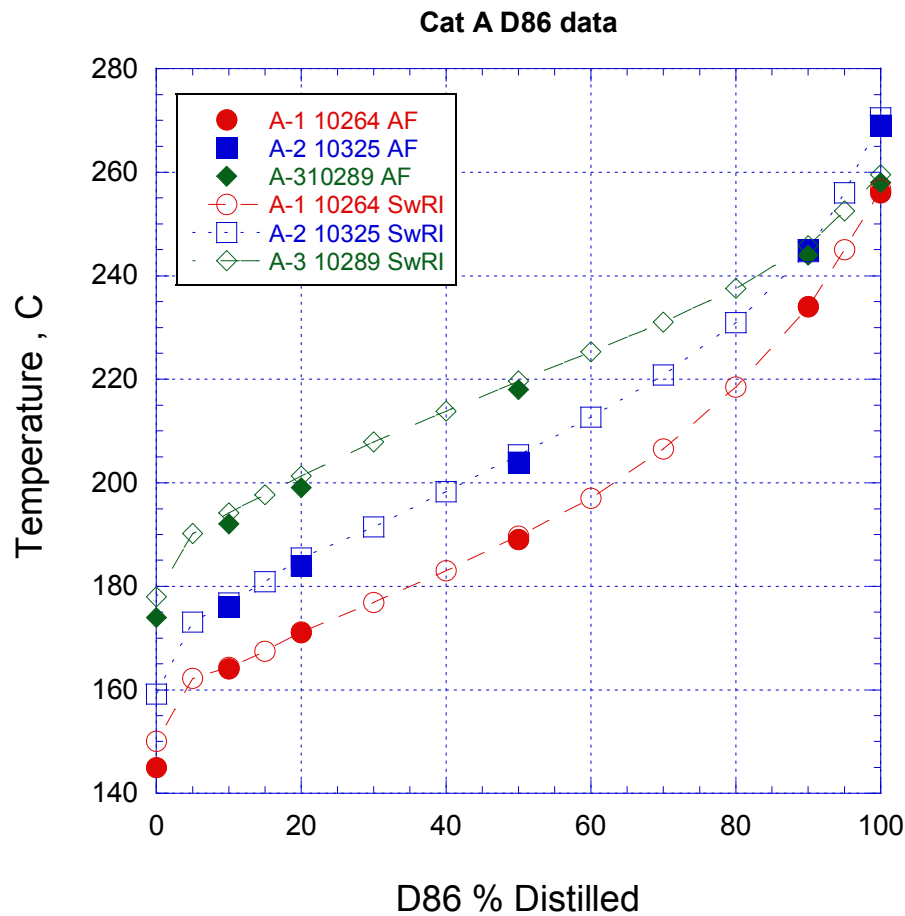
“C-3”

- High viscosity fuel – A blend including Amyris DSHC/SIP
- High cyclo-paraffin content fuel (>80%)

“C-6”

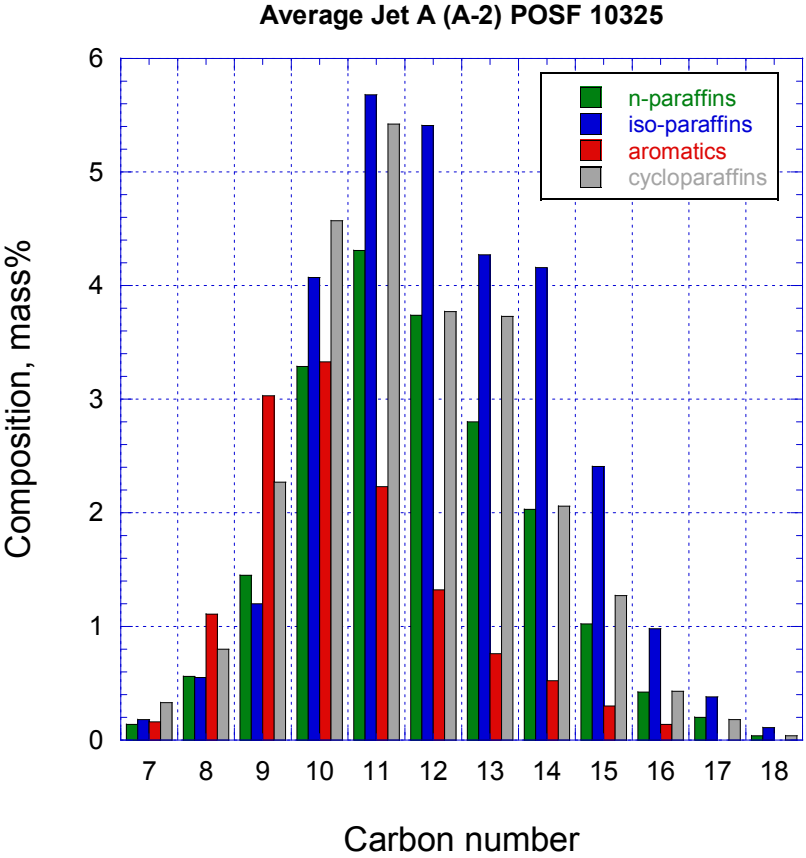
Distillation (Boiling Range)

- Category A fuels are conventional, wide-boiling; Category C "fuels" are atypical by design

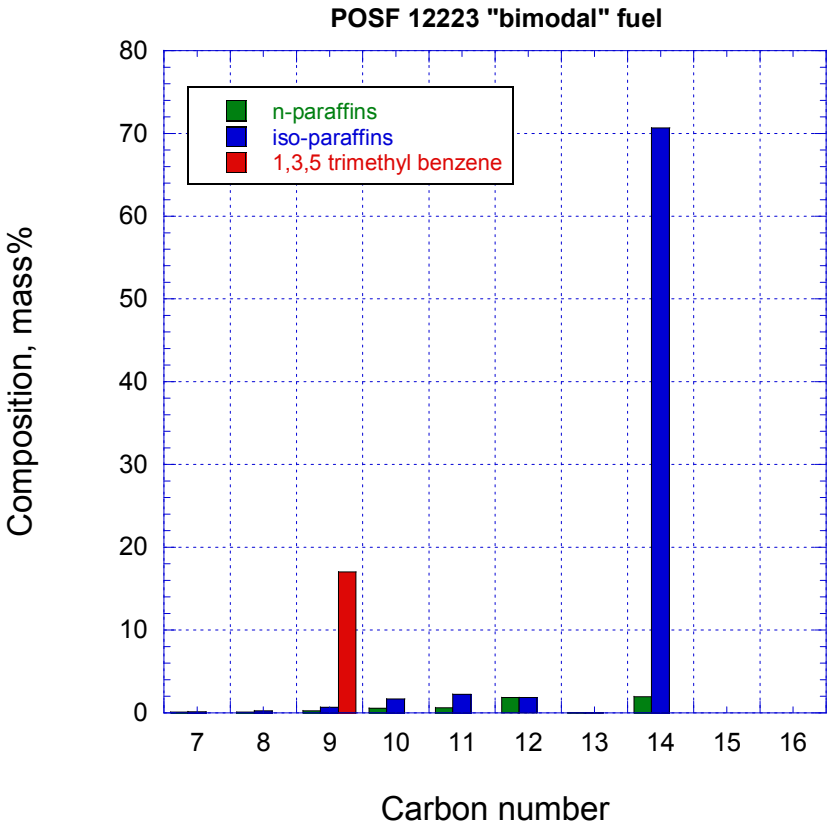


Composition by GCxGC

“A-2” “POSF 10325”



“C-2” “POSF 12223”



POSF 12223 = C14 iso + trimethyl benzene

Summary



- Conventional and reference fuels supplied to ASCENT/NJFCP; alternative fuels also available
- Also available to collaborators with ASCENT/NJFCP
- Specification and fit-for-purpose properties available for model development and testing purposes