A Perspective on Joint Agency Collaboration in F-T Aviation Fuels (2006-2008)

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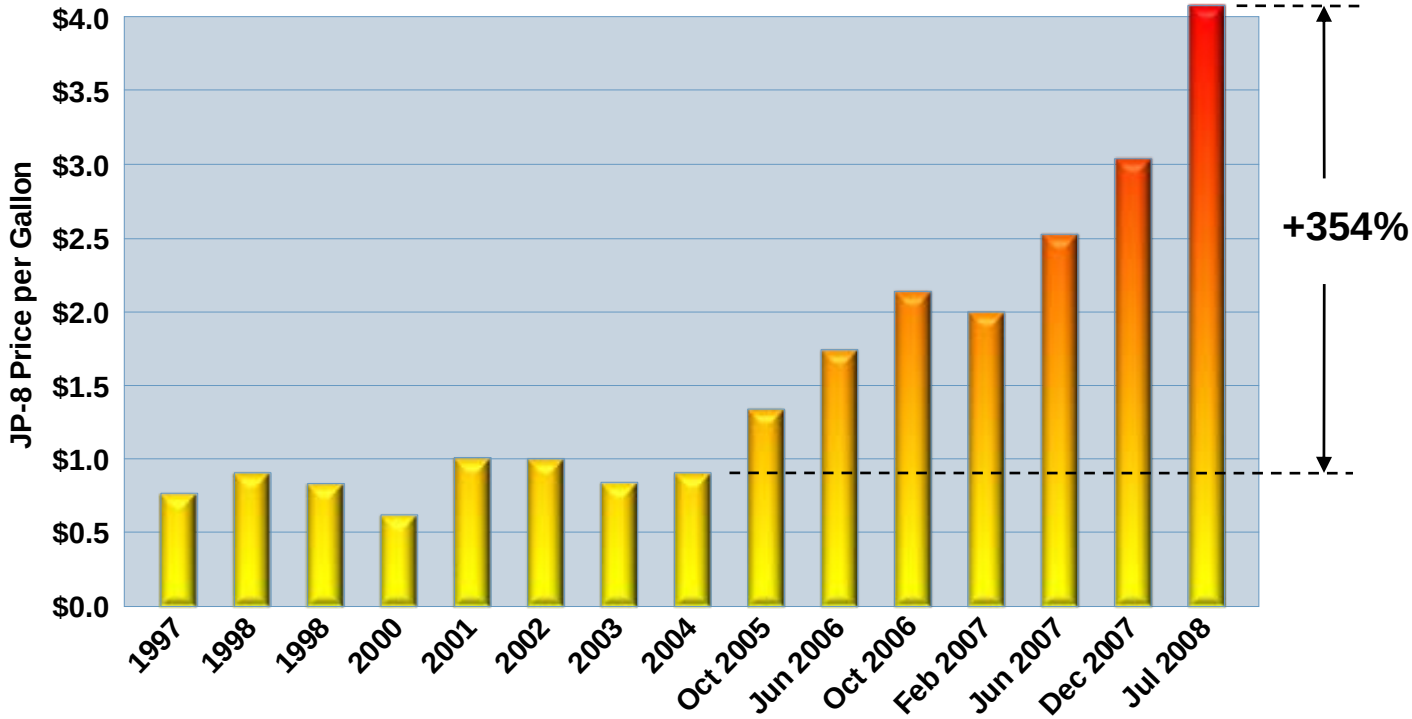
WPAFB 08-2850

DOD Assured Fuels Initiative



AF Vision

"The Air Force is committed to completing its testing and certification of our aircraft fleet for alternative fuels by 2011. Working with industry, we can accomplish this goal. Once accomplished, we look forward to buying domestically produced synfuel at competitive market prices from manufacturing facilities that engage in effective carbon dioxide capture and reuse."

Secretary of the Air Force Michael W. Wynne, July 9, 2007, Keynote Address at AIAA/SAE/ASME Joint Propulsion Conf., Cincinnati, OH

AF Leadership Strategic Message

- **The Air Force has a three-step Energy Strategy:**
- **<u>Reduce Demand</u>**
  - **Increase energy efficiency and reduce our energy consumption**
- **<u>Increase Supply</u>**
  - **Research, test and certify new domestic fuels**
- **<u>Cultural Change</u>**
  - **We are creating a culture where all Airmen make energy a consideration in everything we do**

- ***The Air Force is working our energy strategy in partnership with other government agencies and the private sector.***

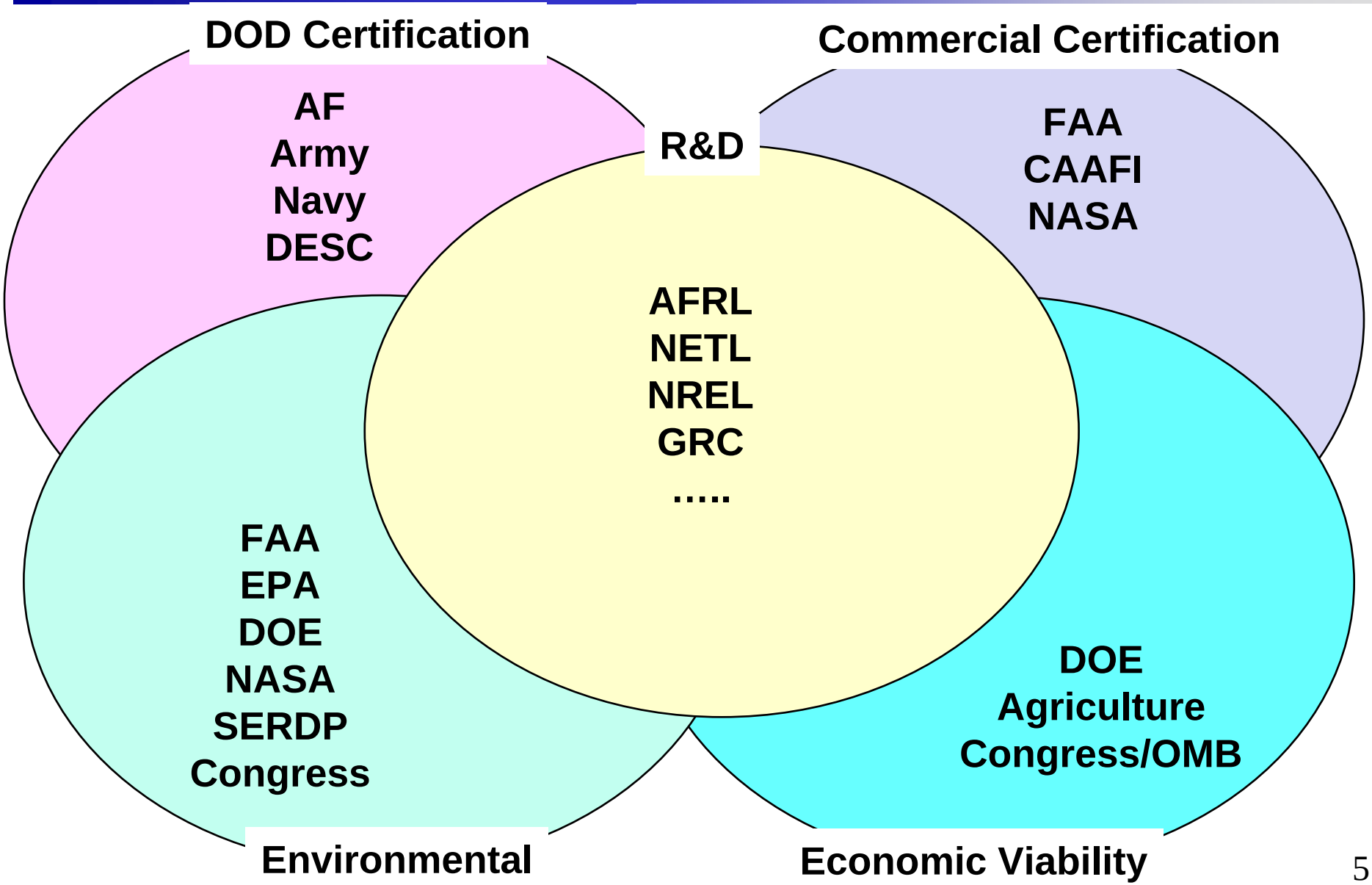
AIR FORCE ENERGY VISION:

MAKE ENERGY A CONSIDERATION IN ALL WE DO

AF Alternative Fuel Program Highlights

- Near-term goal: 50/50 F-T/JP-8 blend certified in all AF vehicles by 2011 (ASC Alternative Fuel Certification Office(AFCO))
  - B-52 certified Aug 2007 (Syntroleum F-T “S-8” purchased by AFRL)
  - C-17 flight test Oct 19/22, 2007; B-1 March 19, 2008 (Shell F-T purchased by Defense Energy Support Center (DESC))
- Coordinating with Commercial Alternative Aviation Fuel Initiative (CAAFI)
  - Developing fuel certification process through AFCO, MIL-Handbook-510
  - Generating reams of physical property data on F-T and blends
- Coal expected to be first resource utilized domestically in U.S. …. however:
  - Biomass has significant CO_2 footprint reduction potential
  - AF supporting DARPA “biojet” program
- Desire is for 50% of AF consumption to come from alternative fuel blend by 2016 (~400M gal/yr)
  - Defense Energy Support Center Request for Information for 200M gal buy

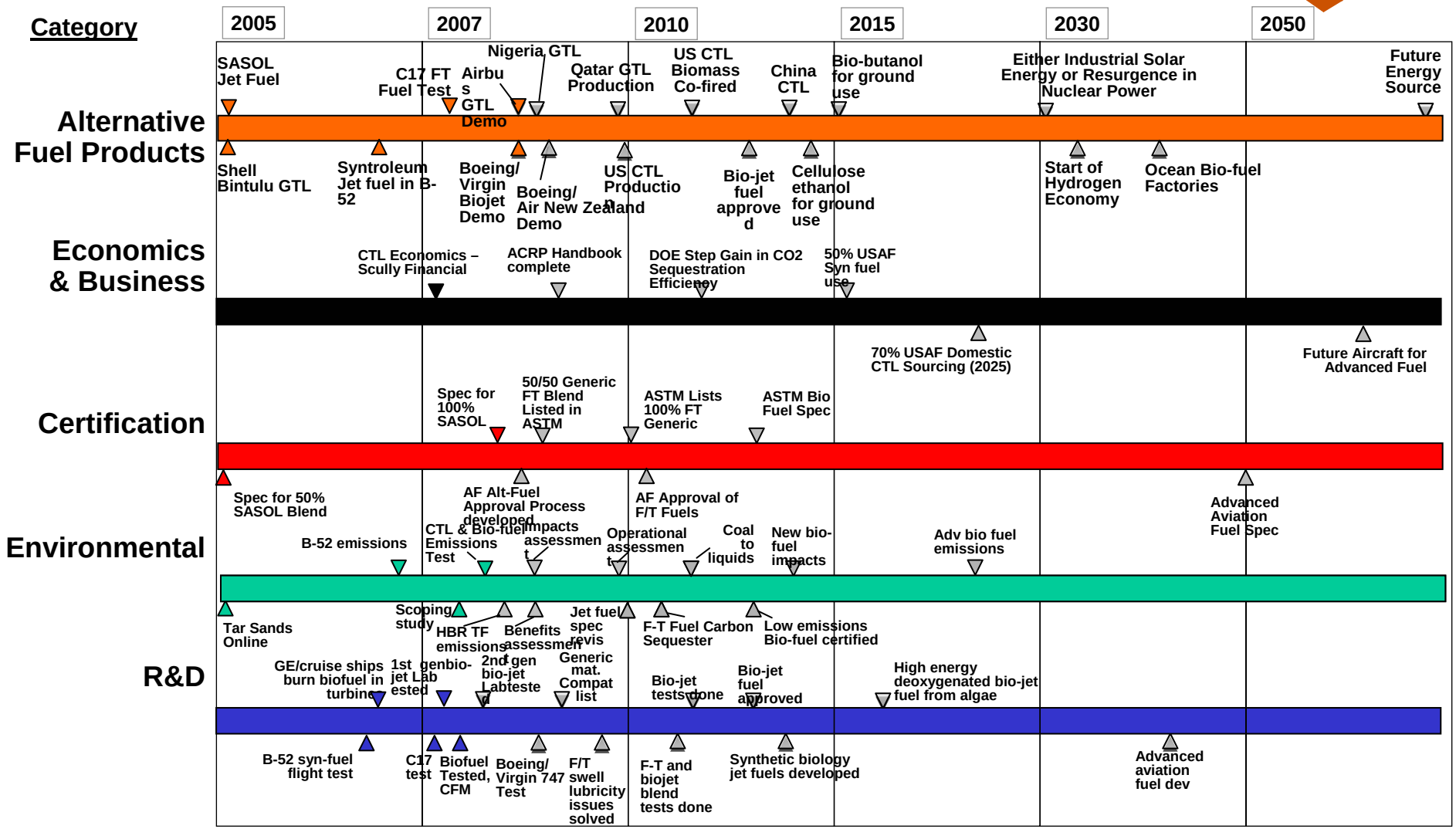
Federal Interactions in Alternative Aviation Fuels



CAAFI Aviation Alternate Fuels Roadmap

(Level 2 / Scenario 1 - Long Term)

Draft

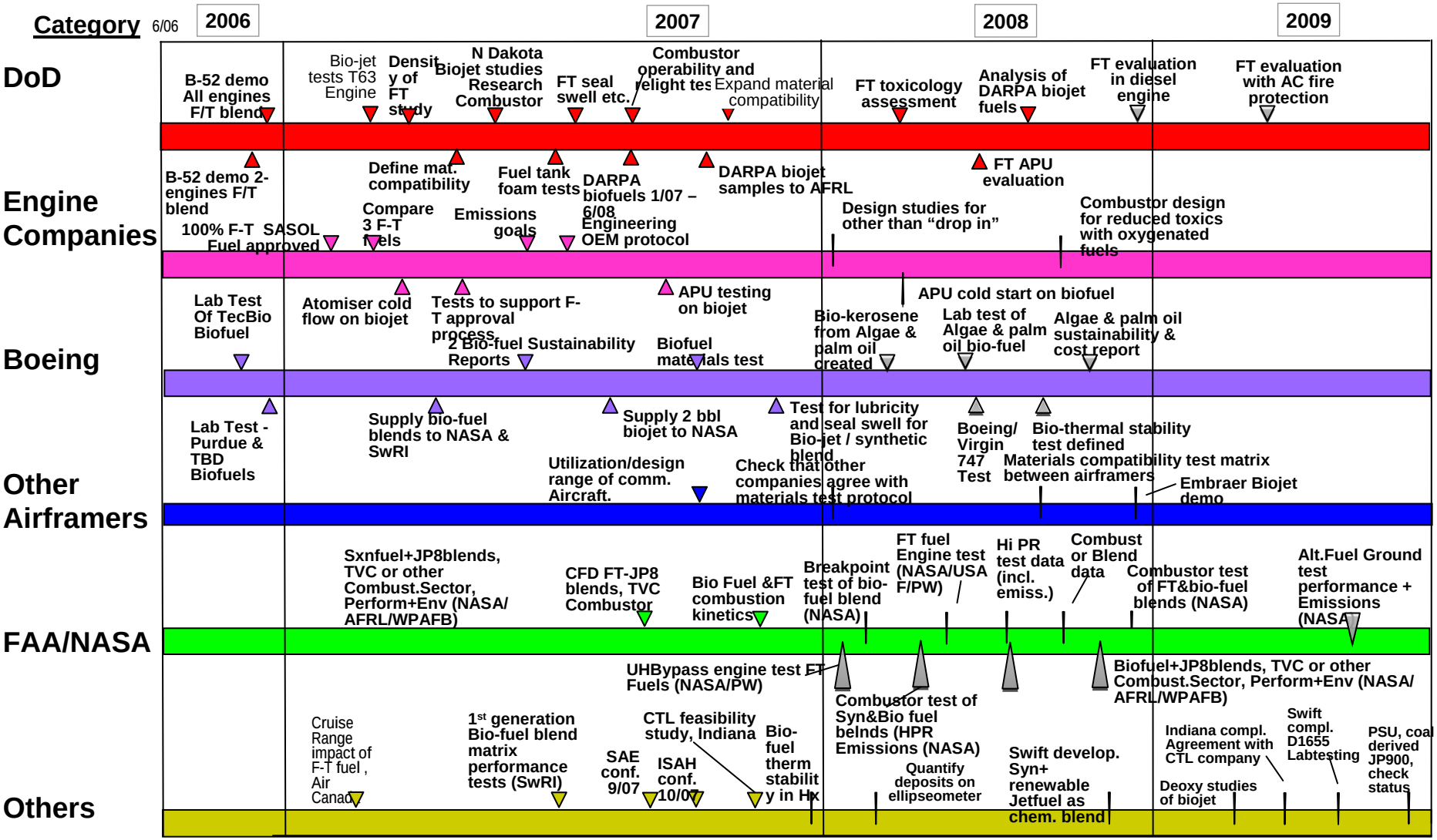


Status as of April, 2008

Aviation Alternate Fuels Roadmap

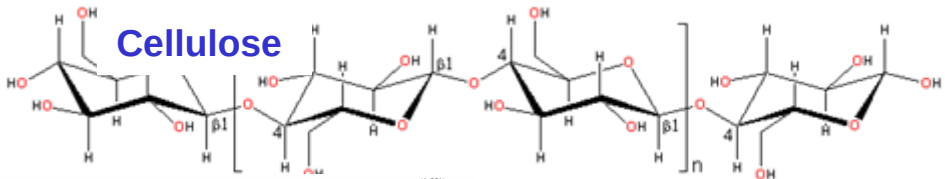
(Level 3 / Scenario 1, R&D Near Term Only)

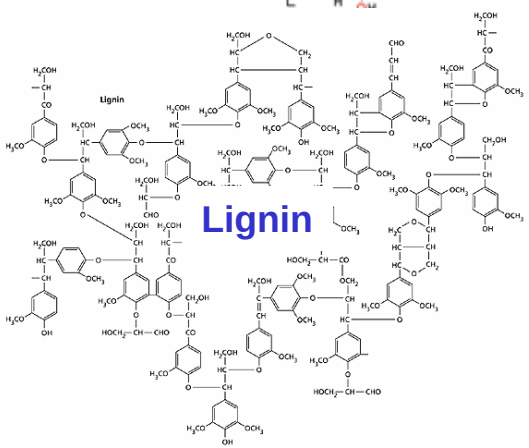
Draft



Production of “Bio” Jet Fuel

“second generation”

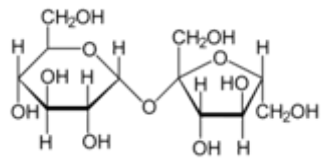




gasification
(or co-gasification
with coal)

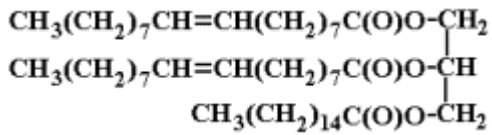
$CO + H_2$

“BTL”



“direct fermentation”

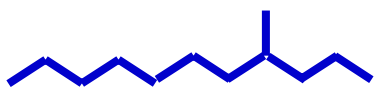
“first generation”



Triglycerides (fats, oils)

pyrolysis/
hydroprocessing

“HXO”
“HFO”
“HAL”

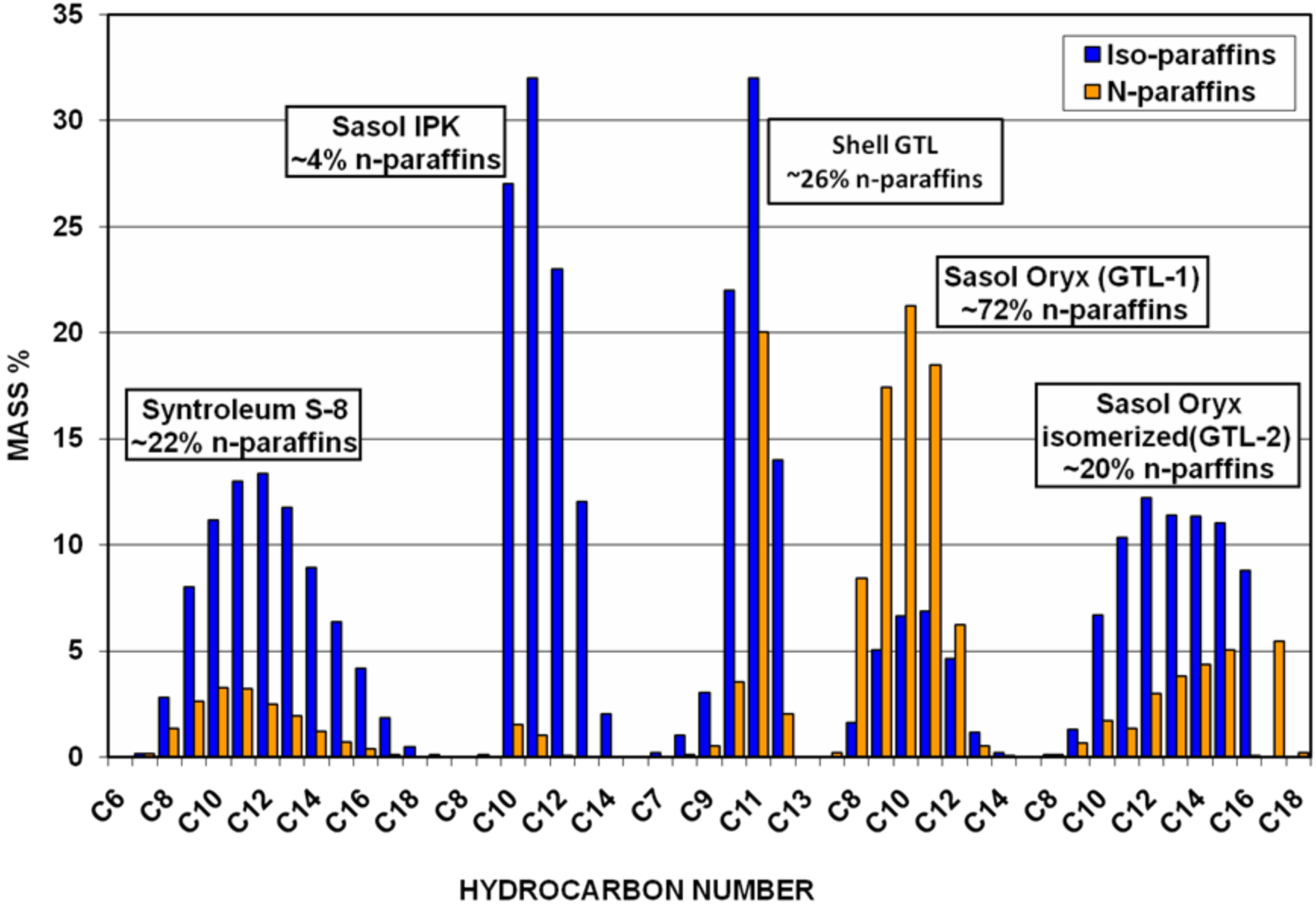


Typical jet fuel molecule

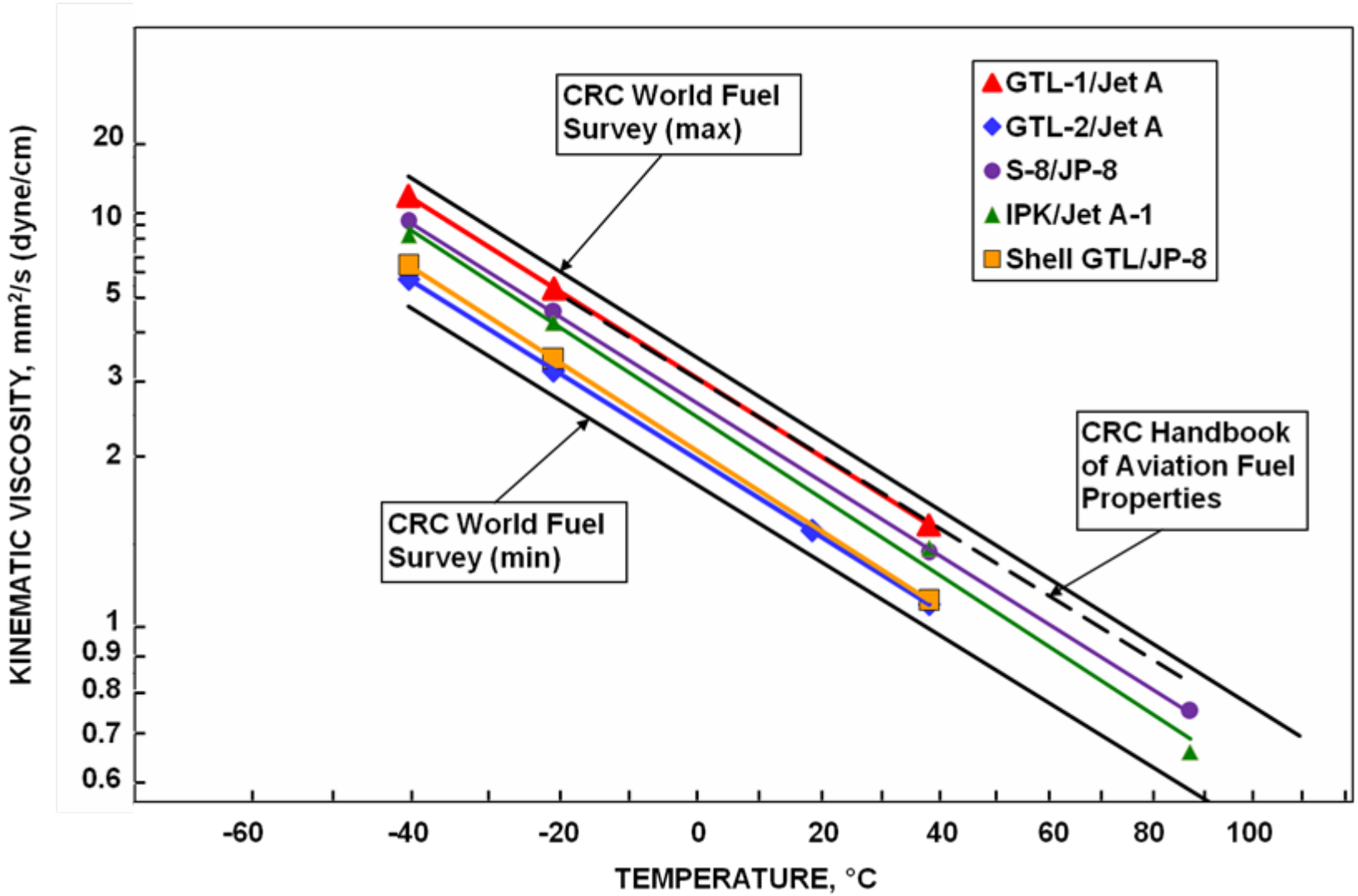
Product Variability

- What does certifying “F-T” mean?
- Have substantial data on Sasol and Syntroleum fuels
  - Large delivery of Shell fuel in Sep 07
    - Extensive property measurements underway
  - Test quantities of F-T fuels, biofuels available
    - How consistent?
    - How to specify?
- How should F-T be obtained? DESC is the procurement agency for all federal agencies & DOD.
  - Incorporate in MIL-DTL-83133? Current proposal is Appendix with specification for “synthetic” (non-petroleum) component, with blend to meet Table I in main spec
  - Specialty procurement? (either blend or pure F-T)

Composition

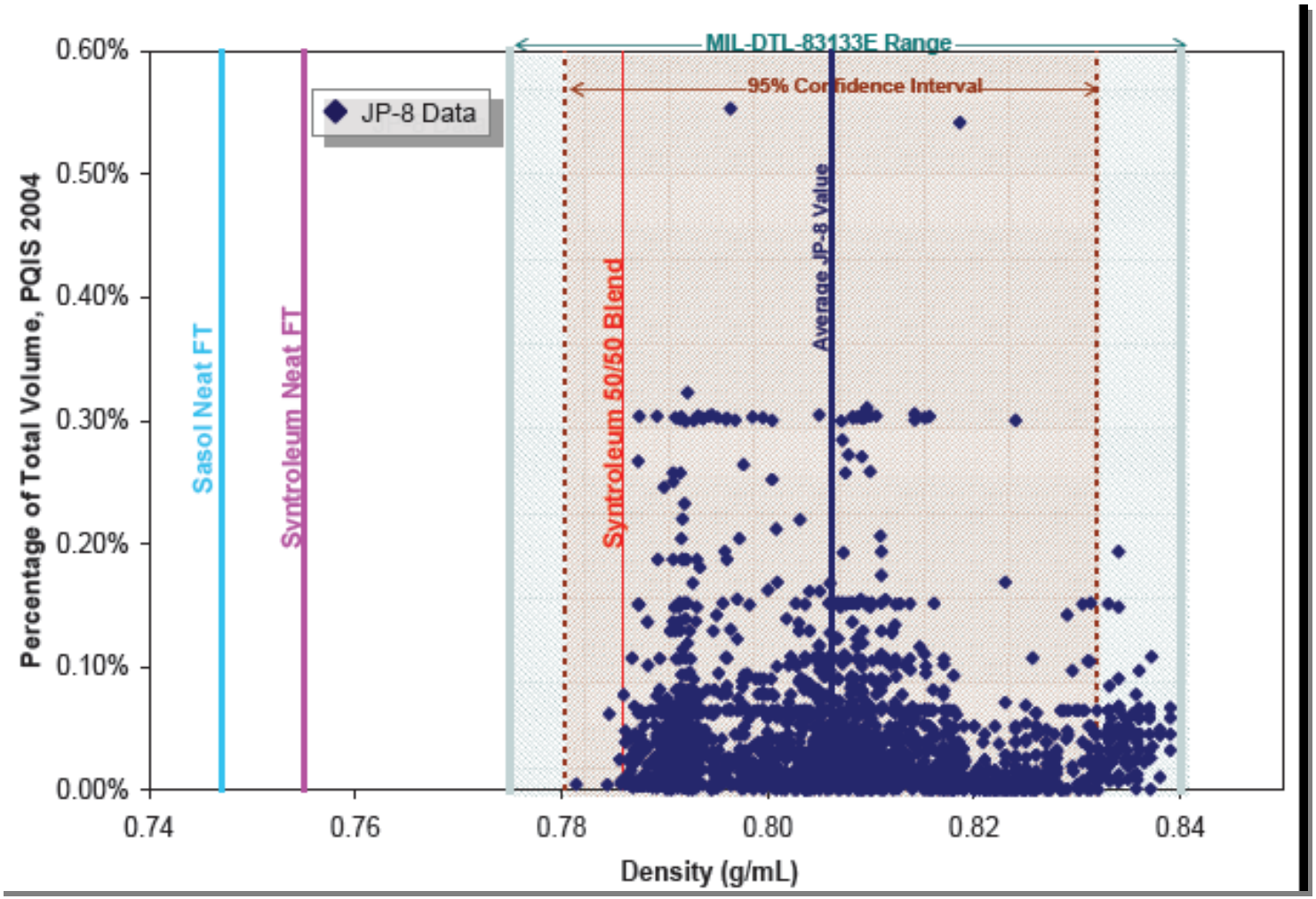


Viscosity (50/50 blends)



- **Viscosity of SSJF has typical temperature characteristics**

Property “Experience Base”

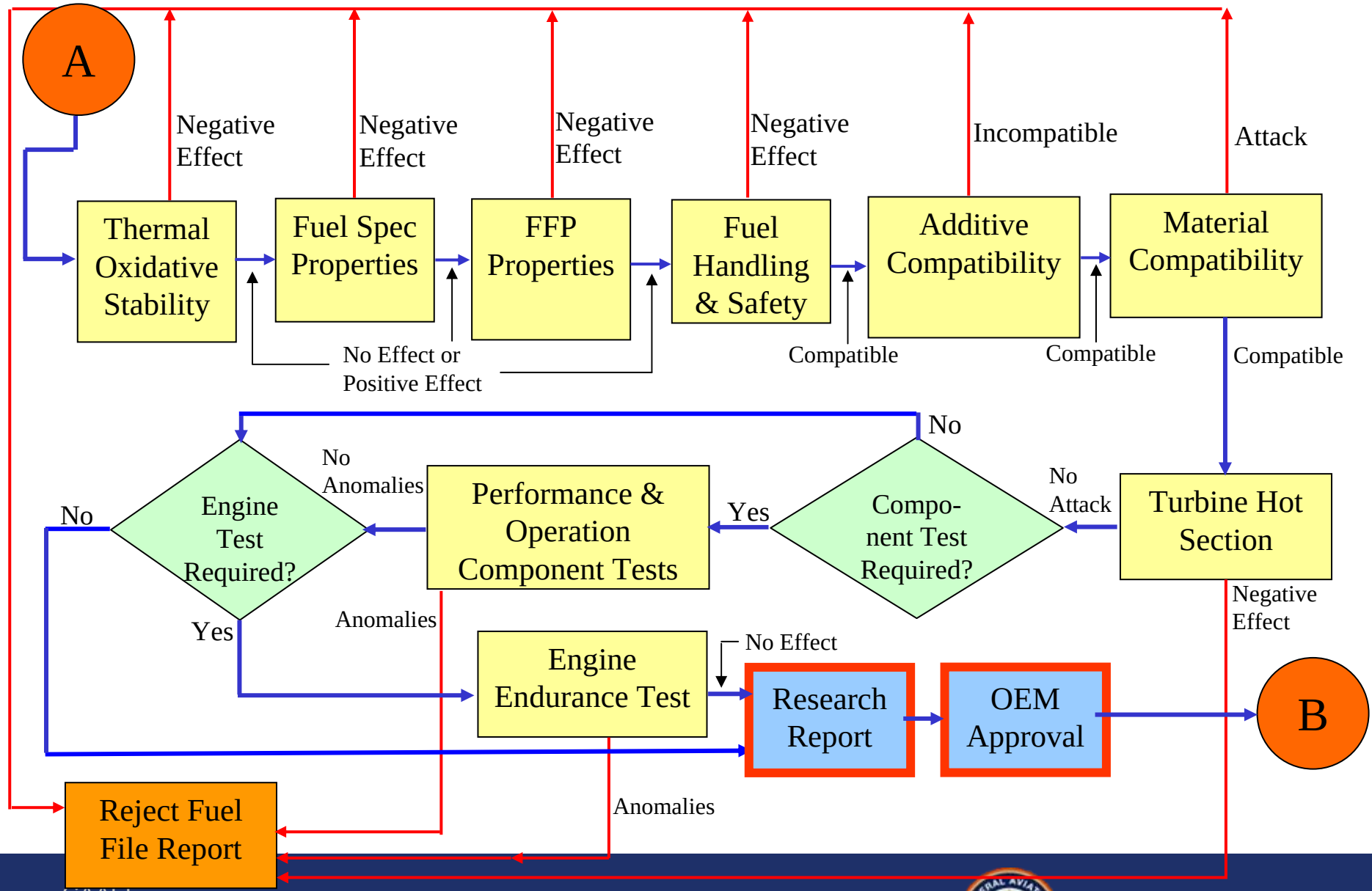


Bringing “Biojet” into the Process

- **Experience with submitted samples**
- **Bringing in as blend or 100%?**
- **Potential technical issues:**

“BTL”	Biojet / green jet/ biokerosene
• Same as other FT fuels	• Storage stability/bio growth • Trace oxygenates, non HC species

Phase 2: Technical Evaluation of Fuel/Additive



Summary

- **Evolving U.S. alternative fuels program a true multi-agency effort**
  - **R&D – DOE, DOD, NASA, FAA, Agriculture, …**
  - **Certification – FAA, DOD**
  - **Environmental – FAA, EPA, DOE, NASA, DOD**
  - **Economic Viability – DOE, Agriculture, OMB, Congress…**
- **Current close collaboration with industry also a key aspect of program**