Alternative Jet Fuel Approval

November 14, 2012

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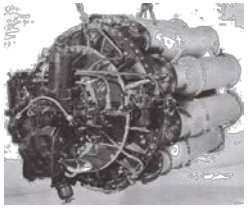
COMMERCIAL AVIATION
ALTERNATIVE FUELS INITIATIVE

Mark Rumizen
Senior Technical Specialist
Federal Aviation Administration

New Engines Have Historically Been Certified To Existing Fuel

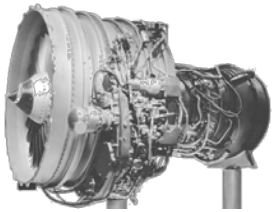
New Engines

Existing Fuel

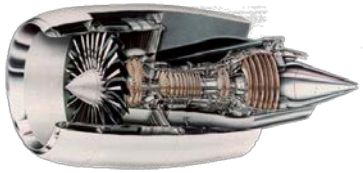


1950's

1970's



1990's



2000's

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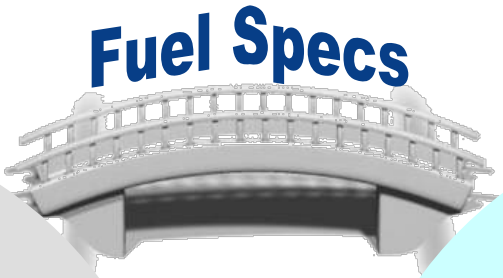
Fuel Specifications Evolved to Support Both Aviation and The Petroleum Industry

Petroleum Industry



Civil Aviation

Ease of Movement — **Demanding Performance**

Airworthiness Regulations Reflect This Historical Evolution

Regulatory Authorities Do Not Certify Fuel, They Certify Airplanes and Engines to Operate on Specified Fuel

ASTM Fuel Specification

* **Engine Operating Limitations**
  * Fuel Specification

* **Aircraft Operating Limitations**
  * Engine limitations Used for Aircraft

* **Aircraft Operator (Airlines) Operating Rules**
  * Must Adhere to Aircraft and Engine Limitations

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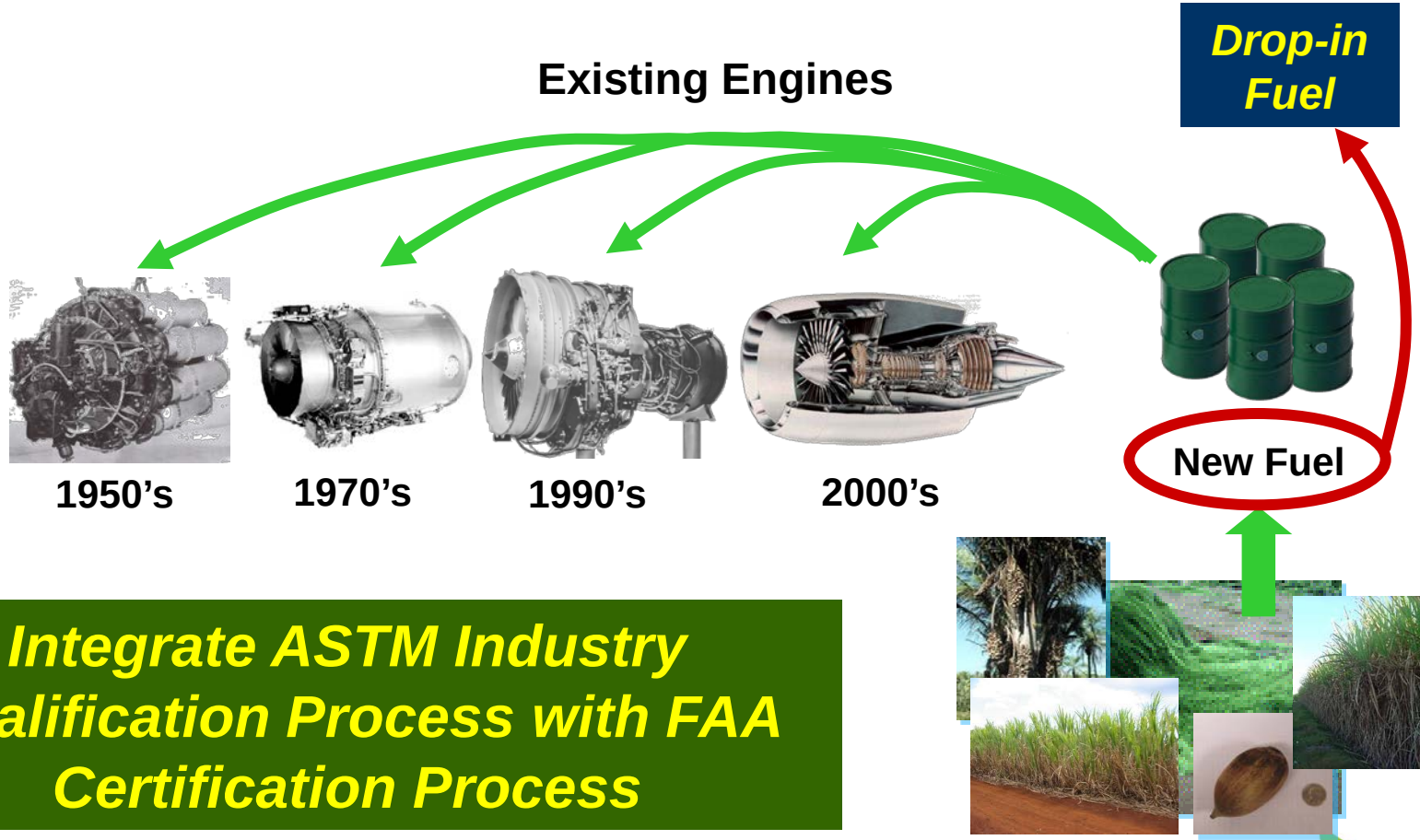
How to Work Backwards to Prove New Fuel Is Acceptable for Existing Fleet of Engines?



Integrate ASTM Industry Qualification Process with FAA Certification Process

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Certification of Drop-In Alternative Fuels

Industry Qualification (ASTM D4054)

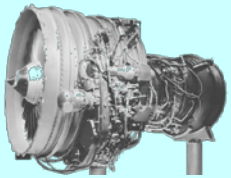
Drop-In Fuel ASTM D7566 Spec

Non-Drop-In Fuel New Spec

Unchanged Operating Limitation

New Oper Limitation

FAA Certification



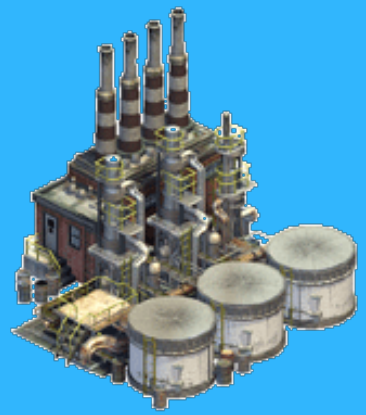
Engine Operating Limitations

Aircraft Operating Limitations

Aircraft Flight Manual

D7566 Enables Drop-In Fuel

Production



Semi-Synthetic Fuel

Tighter Control of Fuel Properties

Re-Identified

Distribution

Conventional Jet Fuel

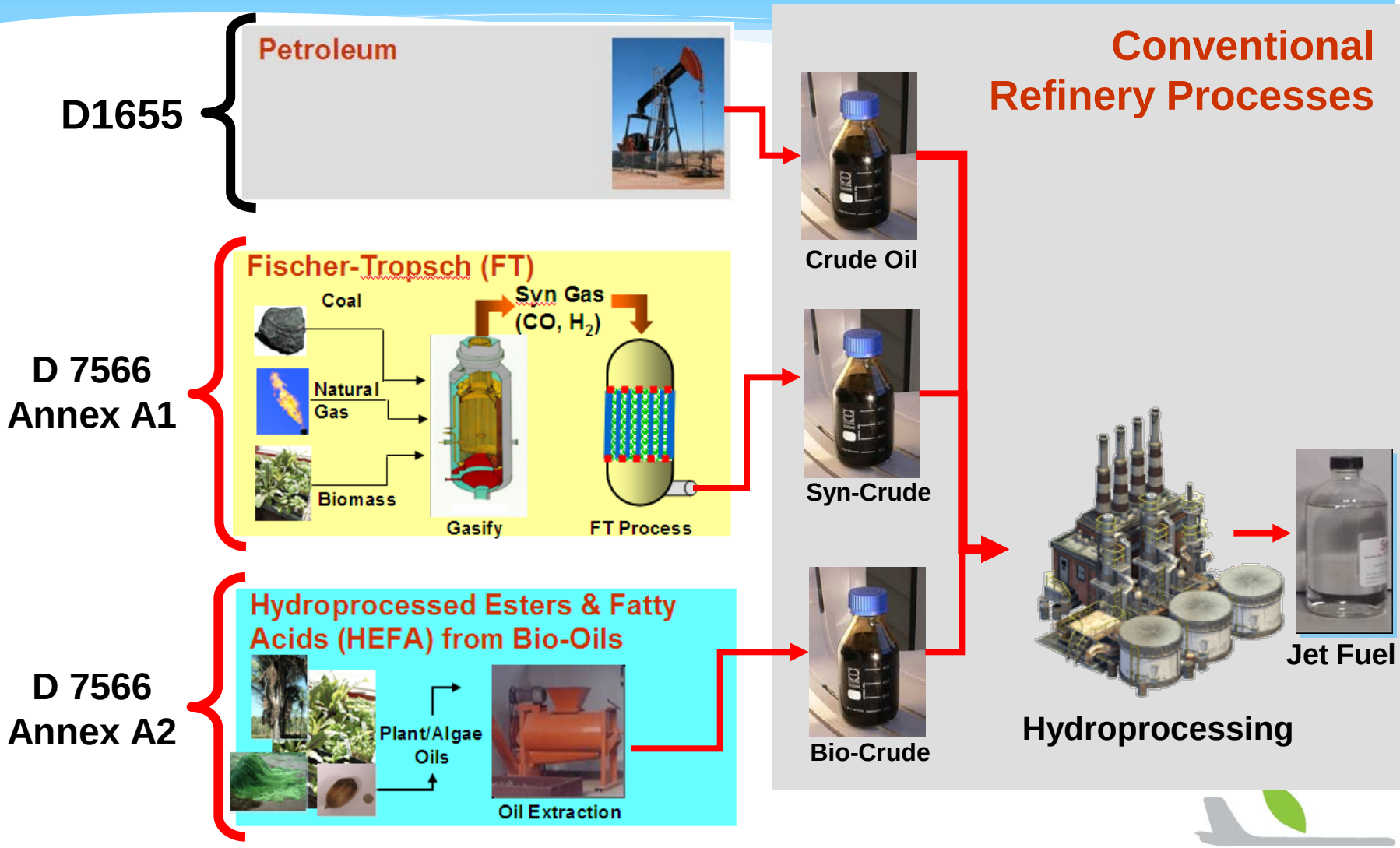
Separate Tracking NOT Required

Operations

Conventional Jet Fuel

Re-Certification NOT Required

ASTM Aviation Fuel Specifications



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Future Fuels at ASTM

Sugar

Lignocellulose

Fermented Sugar to HCs

Fermentation

Genetically Engineered Microbes

Jet Fuel Product

Alcohol to Jet (ATJ)

Fermentation

Alcohol

Dehydration

Olefins

Catalyzed Sugar to HCs

Pretreatment

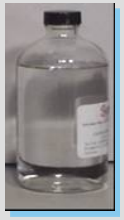
Catalysis

Olefins

Conventional Refinery Processes

Oligomerization

Hydroprocessing



Jet Fuel

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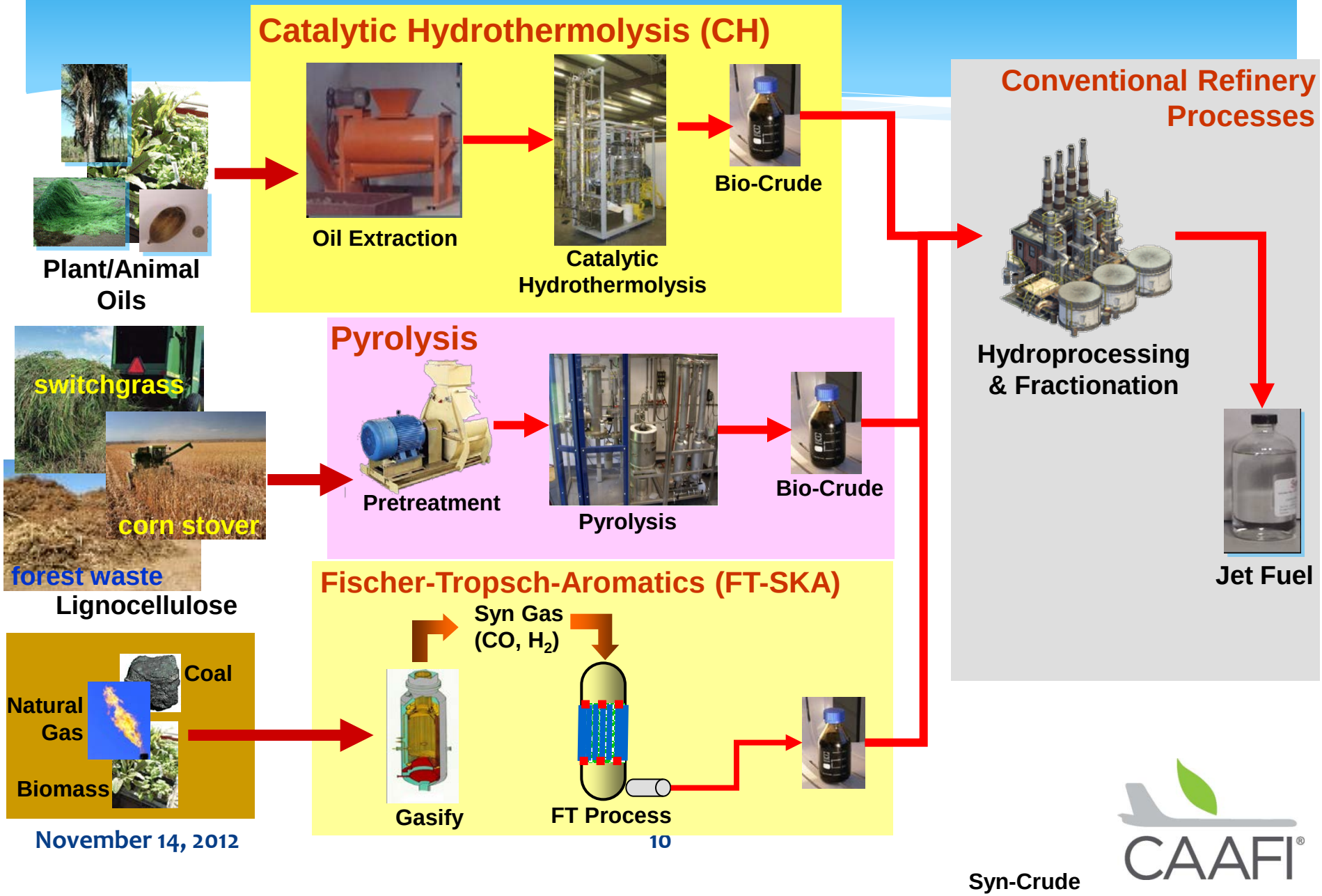
Future Fuels at ASTM (cont'd)



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FUELING SOLUTIONS FOR
SECURE & SUSTAINABLE AVIATION