

November 6, 2024

PtX-Hub Webinar

- Synthetic Aviation Turbine Fuel Qualification Status

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Notes

Tech community uses the term Synthetic Aviation Turbine Fuel (SATF) in US and Semi-Synthetic Jet Fuel in UK for the final finished fuel, and synthetic blending component (sbc) for the synthetically derived component. For the purposes of this presentation, we will mostly use the term SAF.

Fuel standard specifications are for synthetic fuels, sustainable or not. Not all synthetic fuels are sustainable (or SAF!).

Be aware of “Kerosene vs SAF” depictions in charts/reports/articles! SAF is also kerosene; just partially (or fully in the future) synthetically derived.

When the tech community uses the term synthetic fuel, they refer to all qualified SAF pathways, not just to Power-to-Liquid (PTL, efuel, electrofuel) fuel as EU uses the term synthetic for.

PtL is not an ASTM pathway. It is an upstream approach to get to the feedstock (e.g., syngas, alcohol) for multiple SAF pathways (e.g., Fischer-Tropsch, Alcohol-to-Jet).

What is (and is not) SAF?

Most only refer to the synthetically and sustainably derived component as SAF (e.g., US SAF Grand Challenge, ReFuelEU, UK Jet Zero Strategy, etc.). Misunderstanding, however, is that many think this synthetic-only component itself is Jet A/A-1.

Prevailing (incorrect) thought:

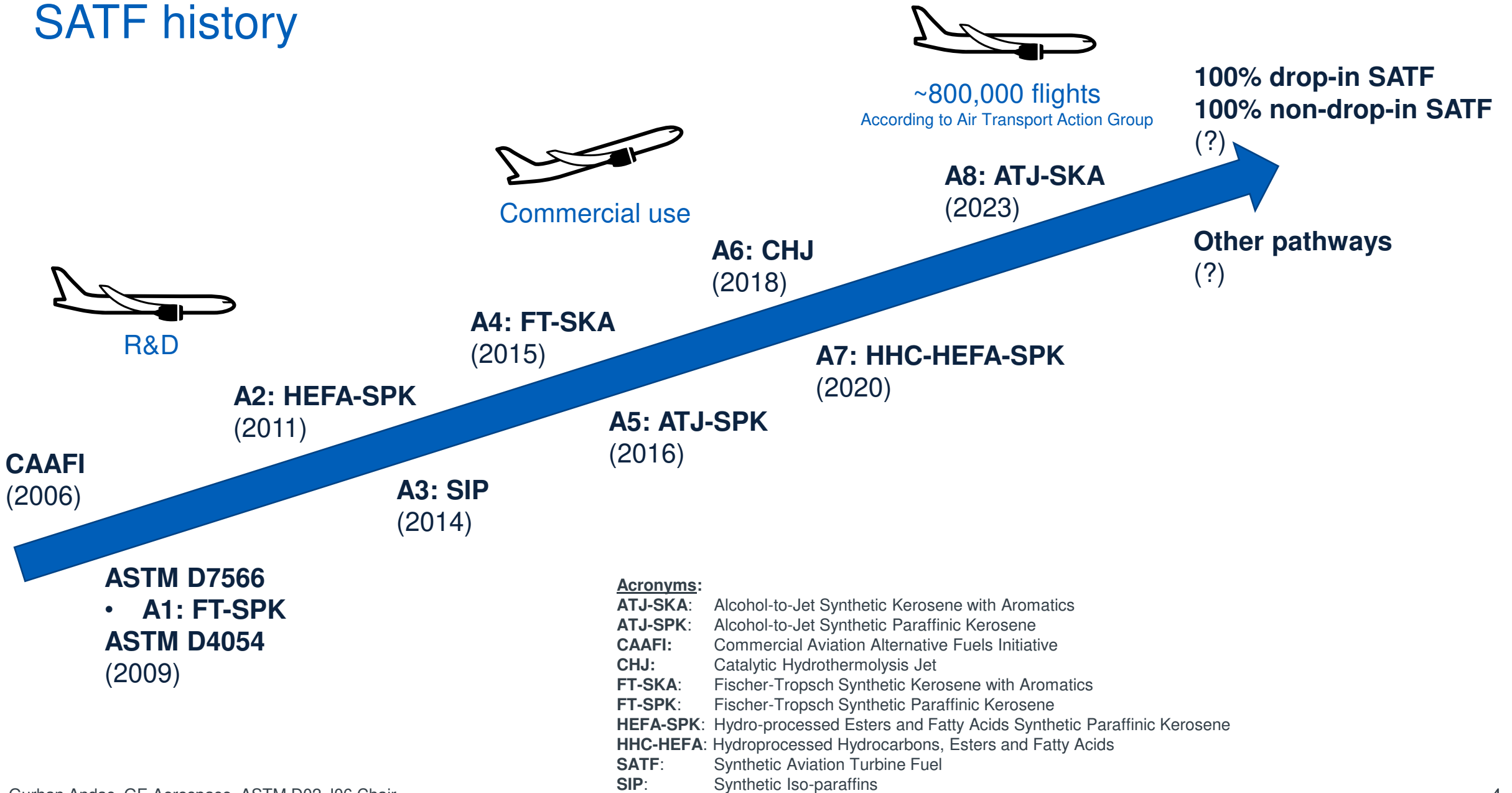
“Today, we allow synthetic/sustainable Jet A/A-1 (SAF) to be used only when blended with conventional Jet A/A-1. One day, we will remove this limitation and will use this synthetic/sustainable Jet A/A-1 (SAF) by itself, unblended, at 100%.”

What really is the case:

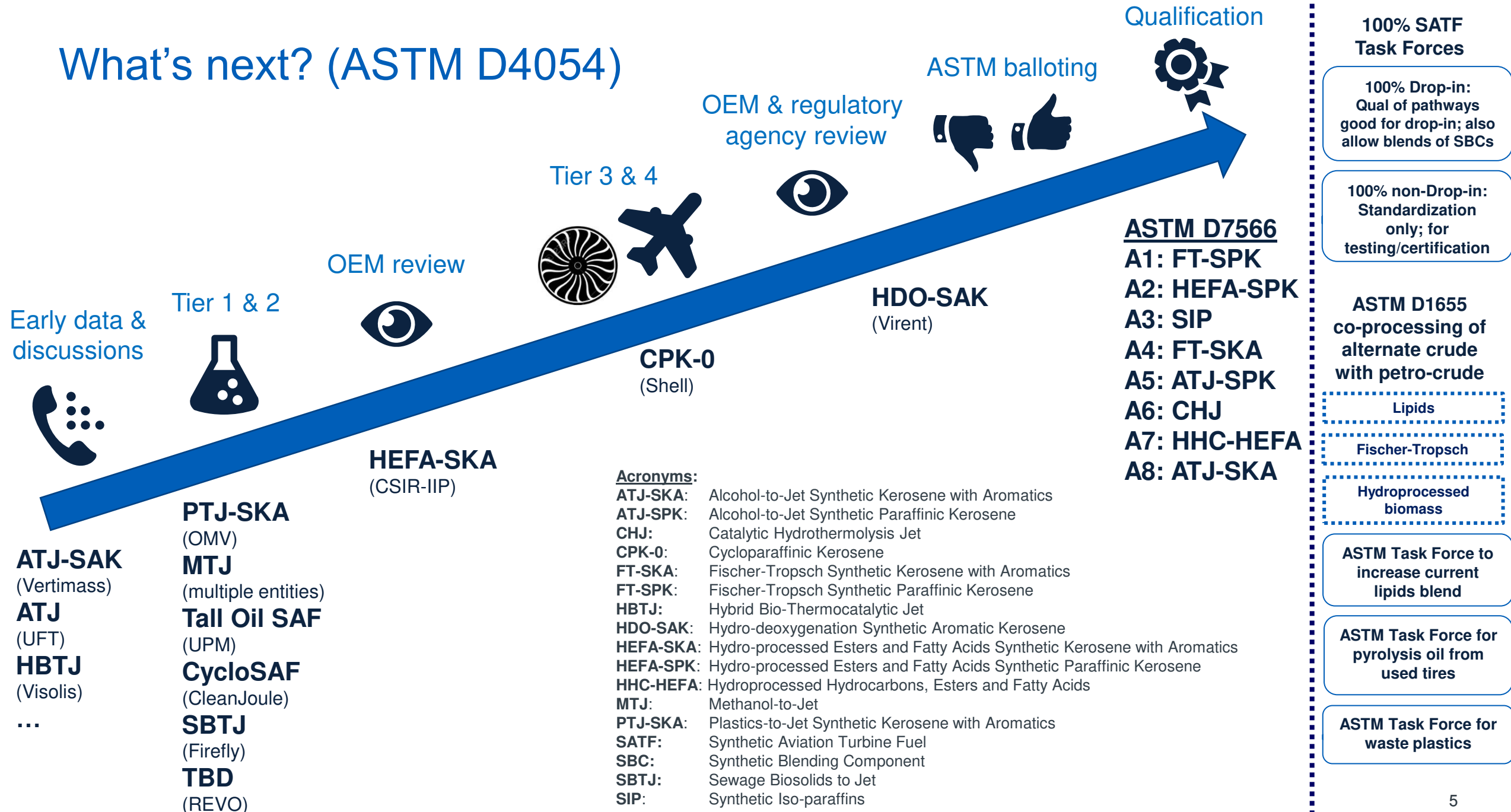
Synthetic Blending Component (SBC) + Conventional Blending Component = SAF Blend
(SAF) (typically petro Jet A/A-1) (Jet A/A-1)

What is determined to be equivalent to Jet A/A-1 is the SAF blend, not the SBC; SBC (which is what people refer to when they say SAF) is not necessarily Jet A/A-1 equivalent.

SATF history



What's next? (ASTM D4054)



- ATJ-SAK**
(Vertimass)
- ATJ**
(UFT)
- HBTJ**
(Visolis)
- ...
- PTJ-SKA**
(OMV)
- MTJ**
(multiple entities)
- Tall Oil SAF**
(UPM)
- CycloSAF**
(CleanJoule)
- SBTJ**
(Firefly)
- TBD**
(REVO)

- Acronyms:**
- ATJ-SKA:** Alcohol-to-Jet Synthetic Kerosene with Aromatics
 - ATJ-SPK:** Alcohol-to-Jet Synthetic Paraffinic Kerosene
 - CHJ:** Catalytic Hydrothermolysis Jet
 - CPK-0:** Cycloparaffinic Kerosene
 - FT-SKA:** Fischer-Tropsch Synthetic Kerosene with Aromatics
 - FT-SPK:** Fischer-Tropsch Synthetic Paraffinic Kerosene
 - HBTJ:** Hybrid Bio-Thermocatalytic Jet
 - HDO-SAK:** Hydro-deoxygenation Synthetic Aromatic Kerosene
 - HEFA-SKA:** Hydro-processed Esters and Fatty Acids Synthetic Kerosene with Aromatics
 - HEFA-SPK:** Hydro-processed Esters and Fatty Acids Synthetic Paraffinic Kerosene
 - HHC-HEFA:** Hydroprocessed Hydrocarbons, Esters and Fatty Acids
 - MTJ:** Methanol-to-Jet
 - PTJ-SKA:** Plastics-to-Jet Synthetic Kerosene with Aromatics
 - SATF:** Synthetic Aviation Turbine Fuel
 - SBC:** Synthetic Blending Component
 - SBTJ:** Sewage Biosolids to Jet
 - SIP:** Synthetic Iso-paraffins

- ASTM D7566**
- A1: FT-SPK**
 - A2: HEFA-SPK**
 - A3: SIP**
 - A4: FT-SKA**
 - A5: ATJ-SPK**
 - A6: CHJ**
 - A7: HHC-HEFA**
 - A8: ATJ-SKA**

- 100% SATF Task Forces**
- 100% Drop-in:** Qual of pathways good for drop-in; also allow blends of SBCs
- 100% non-Drop-in:** Standardization only; for testing/certification
- ASTM D1655 co-processing of alternate crude with petro-crude**
- Lipids**
- Fischer-Tropsch**
- Hydroprocessed biomass**
- ASTM Task Force to increase current lipids blend**
- ASTM Task Force for pyrolysis oil from used tires**
- ASTM Task Force for waste plastics**

Qualification into D7566 via D4054 process



Clearinghouse

- US – UDRI
- EU – Trinity College
- UK – Univ. of Sheffield
- process, data, plans
- 50-100 gal fuel early
- 1000's gal later if req'd



ASTM Task Force

- D02.J06 Chair



Incorporation into ASTM D7566

- new or modified Annex



Prescreening

- US – WSU
- EU – DLR
- 1L fuel

ASTM balloting & deliberations

- comments
- negatives



Wider tech community engagement

- overview at ASTM/CRC



OEM introduction




- ready for clearinghouse?
- fast track?



Prescreening: Josh Heyne (WSU), Georg Echel (DLR)
OEM intro: George Wilson (SwRI)
Clearinghouse: Zach West (UDRI), Stephen Dooley (Trinity College), Chris Lewis (Univ. of Sheffield)
ASTM J06: Gurhan Andac (GE)

Drop-in vs non-drop-in fully-SATF

Drop-in: not just compatible with a particular engine and/or aircraft, but fleet-wide and infrastructure-wide compatible

	Drop-in (Jet A/A-1 equivalent; main focus)  or  +  + ...	non-Drop-in (paraffinic, longer-term)
Composition:	Fully formulated Jet A/A-1	Subset of Jet A/A-1
Fleet applicability:	Fleet wide drop-in	Designated aircraft/engines only
Example pathways:	FT-SKA (D7566 Annex A4), CHJ (D7566 Annex A6), ATJ-SKA (D7566 A8), future: HEFA-SKA, multi-blend, others	FT-SPK (D7566 Annex A1) HEFA-SPK (D7566 Annex A2) ATJ-SPK (D7566 Annex A5) <i>certain types</i>
Specification:	ASTM D7566	New standard needed
Regulatory cert/substantiation:	No change	Required for each intended aircraft/engine model
Infrastructure:	No impact	Separate supply chain/handling/storage required

ASTM Task Force est. Apr '21

Chair: G. Andac (GE), Vice-Chair: M. Rumizen (Air Company)

Approval of use of conforming fully-SATF as Jet A/A-1

(No change to the semi-synthetic fuel requirements)

ASTM Task Force est. Apr '22

Chair D. Parmenter (Airbus), Vice-Chair: A. Hobday (Rolls-Royce)

NOT approval of use; to be used for testing

OEMs are active via ASTM, IAEG, and internally

Thank you!