DoD Fuel Specification Review

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Presenting on behalf of TRIPOL
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• TRIPOL informally began in March 2003 at the recommendation of AFPET Technical Division

• Official charter signed in 2006
• Charter was revised in 2014

• As DoD moves towards increased ‘Jointness’ in warfighting it is imperative that the Services ensure harmonization in their POL policies, processes, and procedures
What we are going to talk about?

- DoD Fuel Specifications
- Fuels used by DoD
- Specification Updates –
  - JP-8
  - JP-5
  - F-76
- Approved Alternative Fuels
- Conversion to F-24
- Biodiesel
- TRIPOL & DLA Energy
<table>
<thead>
<tr>
<th>Fuel Specification</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP-8 (F-34)</td>
<td>Revised December 2015</td>
</tr>
<tr>
<td>MIL-DTL-83133</td>
<td></td>
</tr>
<tr>
<td>F-24</td>
<td>Revised December 2016</td>
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<tr>
<td>(ASTM D1655 + SDA, CI/LI, FSII)</td>
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<tr>
<td>JP-5 (F-44)</td>
<td>Revised March 2016</td>
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<tr>
<td>MIL-DTL-5624</td>
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<tr>
<td>JP-4 (F-40)</td>
<td>Revised March 2016</td>
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<tr>
<td>MIL-DTL-5624</td>
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<tr>
<td>F-76</td>
<td>Revised March 2014</td>
</tr>
<tr>
<td>MIL-DTL-16884</td>
<td>Revision in progress</td>
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<tr>
<td>Diesel Fuel</td>
<td>Revised October 2016</td>
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<tr>
<td>ASTM D975</td>
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<tr>
<td>ISO 8217 Grade DMA</td>
<td>Revised March 2017</td>
</tr>
<tr>
<td>Aviation Gasoline (AVGAS)</td>
<td>Revised October 2016</td>
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<tr>
<td>ASTM D910</td>
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</table>
## Fuels used by DoD

<table>
<thead>
<tr>
<th>Air</th>
<th>Land</th>
<th>Sea</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP-8 (F-34) (OCONUS)</td>
<td>JP-8 (F-24) (OCONUS)</td>
<td>F-76</td>
</tr>
<tr>
<td>F-24 (CONUS)</td>
<td>F-24 (CONUS)</td>
<td>ISO 8217 Grade DMA</td>
</tr>
<tr>
<td>JP-5 (F-44)</td>
<td>JP-5 (F-44)</td>
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</tr>
<tr>
<td>JP-4 (F-40) (Arctic)</td>
<td>ASTM D975 (F-54)</td>
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<tr>
<td>AVGAS (F-18)</td>
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</tbody>
</table>

* Army Aviation requires FSII when using commercial Jet A/Jet A-1
** Army Ground does not recommend the use of unadditized fuel
Updates to JP-8 (MIL-DTL-83133J)

- US Air Force Petroleum Office
- Revision published 16 DEC 2015
- Harmonized to greatest extent possible with ASTM D1655 and DEF STAN 91-91

MIL-DTL-83133J - Highlights

• Re-arrangement of Table I to list the requirements therein by categories. The particulate content and filtration time requirements have been moved to a new Table III "Incidental Contaminants." Similar rearrangement was also done in Appendix A for FT-SPK (Tables A-I and A-II) and Appendix B for HEFA-SPK (Tables B-I and B-II).

• Approval of ASTM D7042 "Standard Test Method for Dynamic Viscosity and Density of Liquids by Stabinger Viscometer (and the Calculation of Kinematic Viscosity)" as alternate viscosity test method in Table I, Appendix A, and Appendix B.
• Approval of ASTM D7345 "Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure (Micro Distillation Method)" as alternate distillation test method in Table I.

• Approval of the Ellipsometric Tube Rater (ETR) and the Interferometric Tube Rater (ITR) as ASTM D3241 "Standard Test Method for Thermal Oxidation Stability of Aviation Turbine Fuels" heater tube rating procedures in Table I, Appendix A, and Appendix B.
MIL-DTL-83133J – Highlights (cont)

• Introduction of a new Table III "Incidental Contaminants" which includes:
  – Maximum limits for particulate counting
  – Maximum allowance for Fatty Acid Methyl Ester (FAME) to maximum 50 mg/kg.

• Approval of ASTM D7111 "Standard Test Method for Determination of Trace Elements in Middle Distillate Fuels by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)" as test method for metal content determination for FT-SPK (Appendix A) and HEFA-SPK (Appendix B).
• US Naval Air Systems Command

• Revision published 28 MAR 2016 – 4-6 months

• Specification available for download:
• New synthesized hydrocarbon approved: Synthesized IsoParaffins (SIP) blend components derived from Hydroprocessed Fermented Sugars at a maximum 10 volume percent of the finished fuel. The SIP must meet the requirements in Annex A3 of ASTM D7566.

• Maximum 50 mg/kg FAME added as incidental material.

• FSII content requirement range changed to 0.08 volume % to 0.11 volume %.

• Viscosity at -20°C changed to maximum 7.0 mm²/s.
• ASTM D6379 added as alternate aromatics content test method. When using D6379, the aromatics content requirement is maximum 26.5 volume %. [The maximum 25.0 volume % by ASTM D1319 (referee test method) is unchanged.]

• Thermal stability requirement: Interferometric Tube Rater (ITR) and Ellipsometric Tube Rater (ETR) added as approved methods to determine heater tube deposit thickness. ETR is the referee method, when available; otherwise, ITR. Heater tube deposit ratings by the Visual Tube Rater (VTR) is kept in MIL-DTL-5624.
• Approved synthesized hydrocarbons listed in Section 3.1.1. (FT-SPK, HEFA-SPK) & 3.1.2 (SIP) – reference corresponding Annex in ASTM D7566
  – Table 3 lists additional requirements needed to protect Army ground systems in the event JP-5 is used

• JP-4 requirements harmonized with ASTM D6615 (Jet B)
Updates to F-76 (MIL-DTL-16684N)

- US Naval Sea Systems Command
- MIL-DTL-16684P update – in progress ~ 6 mths
  - Official coordination period – closed 6 APR 17
  - Adjudication & Publish – estimated June 2017

- 2 types of synthesized paraffinic diesels have been approved for use in naval applications (SPKs and SIPs)

- Specification available for download:
• Added a section called "Synthesized Iso-Paraffins from hydroprocessed fermented sugars" to allow for SIP blends up to 20 volume percent maximum.

• Added language to require testing for FAME when delivery of product makes FAME contamination possible. Added language to state that FAME not meeting the definition of biodiesel is also not permitted. Added D7963 as an acceptable method for testing FAME

• Updates to Table 1 – Requirements
  – Corrosion test conditions
  – Storage stability limits
  – Changed reporting requirements to match ASTM
## Approved Alternative Fuels

<table>
<thead>
<tr>
<th>Commercial (ASTM D7566)</th>
<th>Air Force</th>
<th>Army</th>
<th>Navy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fischer Tropsch – Synthetic Paraffinic Kerosene (FT-SPK)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Hydro-processed Esters and Fatty Acids – Synthetic Paraffinic Kerosene (HEFA-SPK)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Synthesized Iso-Paraffins (SIP)</td>
<td></td>
<td>X (Air only)</td>
<td></td>
</tr>
<tr>
<td>FT-SPK plus Aromatics (SPK/A)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Alcohol To Jet – Synthetic Paraffinic Kerosene (ATJ-SPK)</td>
<td>X (Air only)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Services working to stay in line with commercial specifications
Conversion to F-24

- F-24 – Jet A (ASTM D1655) plus 3 additives
  - SDA – Static Dissipater Additive
  - FSII – Fuel System Icing Inhibitor
  - CI/LI – Corrosion Inhibitor / Lubricity Improver

- All CONUS Operations converted by Dec 2014
  - Except arctic locations (Alaska) & certain test applications

- We have limited voice over commercial specs
Use of Biodiesel

• What is Biodiesel?

• TRIPOL – Prohibit the use of B20 tactical applications
  – Signed by Service Control Point Commanders (2014)

• Issues –
  – Oxidation & storage stability
  – High/low temperature properties
  – Water affinity
  – Solvency

• USAF uses B20
  – Microbial Challenge
TRIPOL & DLA Energy Quality

• We work together to support all of the men and women protecting our country – your fuel issues are our fuel issues!

• TRIPOL collaborates/harmonizes all specification changes so it makes it easier for DLA to procure products which can serve the purpose for all Services
Questions