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# Update on the US Army's Fuel Contamination Detection Efforts

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# Bagram Airfield



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# Contamination



photos courtesy of Army Petroleum Center

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photo courtesy of Army Petroleum Center





## Bottom Line



- Documented Events
  - Discovered 15 Fuel Related Incidents
  - Undocumented incidents assumed
- Testing Requirements and Compliance
  - Deficiencies Found in both Controlled and Uncontrolled Environments
- Recommendations/Course of Action:
  - Research and test refueling equipment/modifications that can potentially detect water and particulates of any kind
  - Develop and Enforce procedures that can detect foreign material in fuel tank before Aircraft Operation
  - Detect and prevent contaminated fuel from entering aircraft



# Contamination Incidents



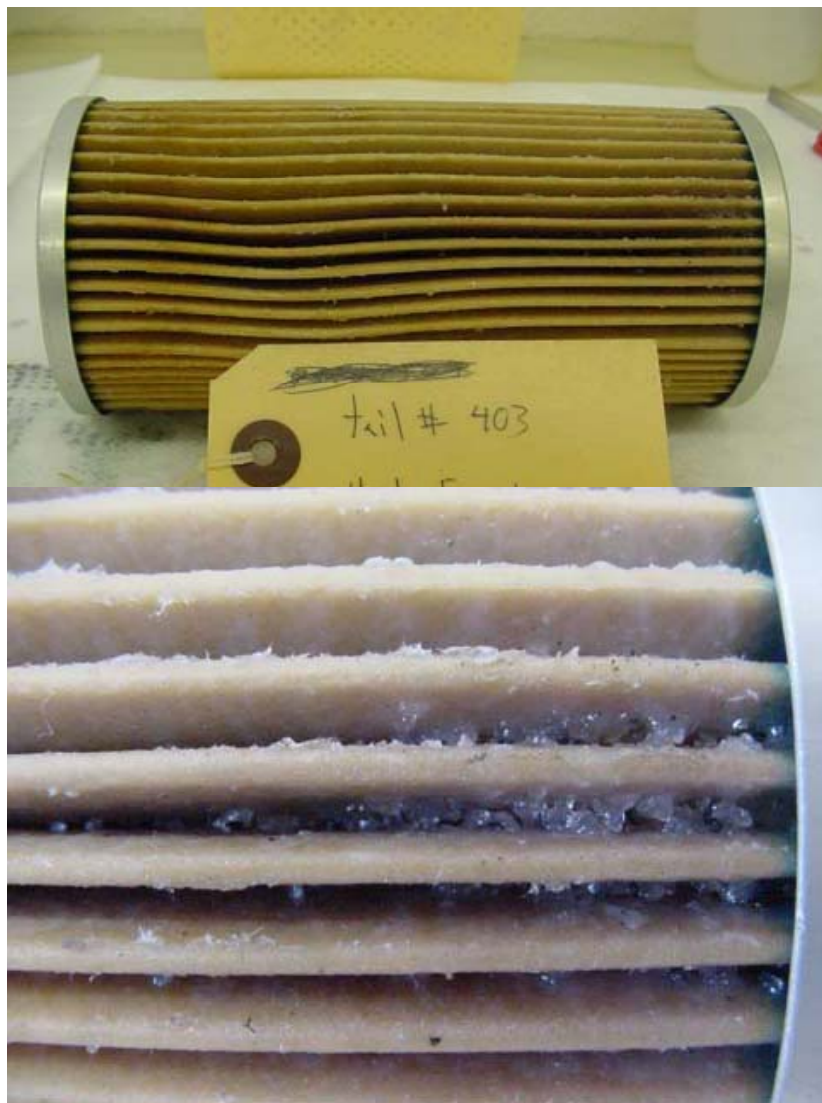
| Occurrence | Date/Year | Aircraft | Remarks                                                                                     |
|------------|-----------|----------|---------------------------------------------------------------------------------------------|
| 1          | 20-Jun-05 | T-37     | Two T-37 USAF Refueled and Flameouts Sheppard AFB Fuel Truck Filter Failed SAP (TX)         |
| 2          | 21-Apr-05 | UH-60L   | No 1 Engine Fuel Bypass caution light illum and extinguished; Unknown cause (Farah)         |
| 3          | 14-Mar-06 | MH-47E   | Filter Contam; Boeing worked but could not identify. Early discovery of SAP (UNK)           |
| 4          | 18-Feb-07 | MH-47E   | Loss of No 2 Eng and crashed; Contam sand, dirt, fiber no metal (Afghanistan)               |
| 5          | 19-Sep-07 | MH-47E   | Duel engine flame out. Contamination Super Absorbent Polymers SAP Ft. Campbell              |
| 6          | 7-Nov-07  | MH-47E   | Fuel contam in tanks and No 1 eng filter; sand, colored flakes, and metal Ft. Campbell      |
| 7          | 17-Feb-08 | OH-58D   | Prior to takeoff, Fuel filter Bypass and acft cleared the FARP area and shutdown w/out incd |
| 8          | 7-Mar-08  | OH-58D   | Fuel filter bypass message and landed safely - HMU replaced w/out incident                  |
| 9          | 7-Mar-08  | OH-58D   | Crew refueled and immediately rec'd fuel filter bypass message. Landed changed filter       |
| 10         | 11-Mar-08 | AH-64    | Four Dutch AH-64 Contaminated with SAP in Italy                                             |
| 11         | 4-Sep-08  | MH-47E   | Contaminate fuel SAP discovered and cleaned out of fuel cell and engines Ft. Campbell       |
| 12         | 22-Sep-08 | MH-47E   | Reopened investigation/Contam discovered in Robertson Internal Tanks Ft. Campbell           |
| 13         | 7 Jan 009 | UH-60M   | Dual Eng flameout Contaminated with water and particulate                                   |
| 14         | 2009      | C-130    | USAF Jet Fuel Contamination with Fatty Acid Methyl Ester (FAME) BioFuel                     |
| 15         | 20-Feb-09 | AH-64D   | No 2 eng flame out Fuel Sample contaminated, Water and Stuff in fuel Ft. Rucker             |

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# Fuel Filter With SAP



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# Summary of Incidents



- US Air Force
  - 2 - T-37 Super Absorbent Polymer
  - 1 - C-130 FAME Fatty Methyl Ester
  
- Foreign Military Sales
  - 4 - AH-64 Super Absorbent Polymer
  
- US Army
  - 1 - UH-60L/M      Unknown - Water and Particulates
  - 6 - MH-47 E      Particulates and Super Absorbent Polymer
  - 3 - OH-58D      Unknown - Water and Particulates
  - 1 - AH-64D      Unknown - Water and Particulates



## Engineering Change



- Joint effort with US Navy NAVAIR to miniaturize Autogrape technology from Physical Sciences Inc., into a field portable or laboratory instrument.
- Effort performed at US Army TARDEC Fuels & Lubricants Research Facility to evaluate Velcon VCA-CV02 Portable Contaminant Analyzer, and other inline contaminate detection technologies.
- AMRDEC SBIR efforts to develop inline contaminate detection technologies.



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# Portable Fuel Contamination Detector



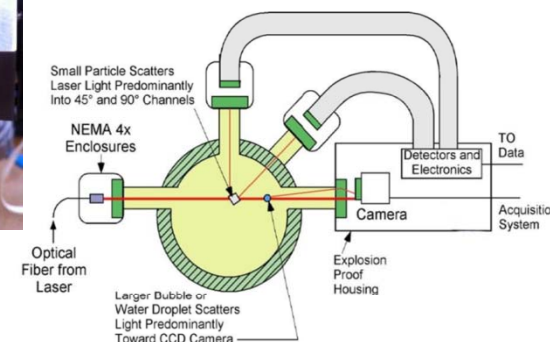
- Technology developed under the Navy SBIR program by Naval Air Systems Command's (NAVAIR) Naval Fuels & Lubes Integrated Product Team with Physical Sciences Inc.
- Independently detects Free Water (0-50ppm  $\pm$ 2ppm) and Sediment (0-20mg/l  $\pm$ 0.5mg/l)
- Navy/Army joint program, prototype to be developed, will be available in FY11.

## Ground Fuels Test Kit

Free Water & Particulate (Clear and bright)

## Aviation Fuel Contaminant Test Kit

Free Water (aquaGlo)  
Particulate (gravimetric)



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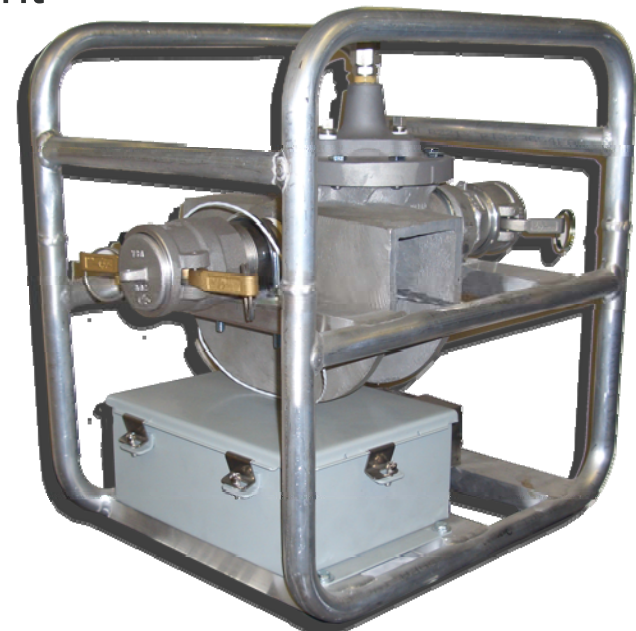
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# Inline Water and Particulate Detection



- US Army TARDEC Fuels & Lubricants Research Facility at SwRI work directive to evaluate inline contaminate detection technologies.
- Velcon VCA-CV02 Portable Contaminant Analyzer.
- Parker ACM 20 particle counter
- Parker iCount particle counter
- Faudi Jet Guard sensor
- Optec turbidity sensor
- Sigrist turbidity sensor



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## Phase I SBIR Efforts



- Phase I SBIRs effort jointly awarded through AMRDEC.
  - Point Source, Inc
  - Physical Optics Corporation
  - Artium Technologies, Inc
  - Progeny Systems Corporation



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