Characterization of C-130 Combustion Emissions During Aeromedical Evacuation Engines Running Onload

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Introduction

Severe eye, nose, and throat irritation from occupational exposure to aircraft combustion emissions has been observed. These emissions are complex, multi-component mixtures that contain hazardous contaminants, as previously identified in environmental studies. The majority occur on the ground at engine start and idle due to inefficient combustion. We investigated which contaminants migrate into personal breathing areas during a C-130H aeromedical evacuation engines running onload (AE ERO).

Methodology

Simultaneous sampling (area) was conducted in the following aircraft locations:
- Background (B)
- Cockpit (CP)
- Cabin Forward (CF)
- Cabin Aft (CA)
- Loadmaster (LM)

Test Sampler

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<th>Test Sampler</th>
<th>Description</th>
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<tr>
<td>Ultrafine Particle Concentration</td>
<td>Thermoelectric sample (N0600, N7300, N7908)</td>
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<td>Volatile organic compounds</td>
<td>Polycarbonate filters, TEM (N0600)</td>
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<tr>
<td>Ultrafine organic compounds</td>
<td>Multi-pocket filters, TEM (N07300, N7908)</td>
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<td>Sulfuric acid</td>
<td>Quartz filter cassette, TEM (N0600)</td>
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<td>Elemental composition</td>
<td>Particle morphology, TEM (N7300)</td>
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<tr>
<td>Particle morphology, TEM (N7908)</td>
<td>Elemental composition, TEM (N7908)</td>
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Results

VOC/CO

Unburned Jet Fuel

Ultrafine Particles

Cassette filter results: N0600, N7300, N7908 were below reporting limits. In retrospect, N0600 was not suited for this exposure due to volatile Nano size particles.

Conclusions

This research identified contaminants in C-130H combustion emissions that migrate into personal breathing areas during engine start and idle. VOC were comprised of known irritants and EPA Hazardous Air Pollutants in concentrations and compound types that increased from cockpit→ cabin → loadmaster areas. Ultrafine particles were found in 10^6 particles/cc concentrations and were dominated by soot of irregular morphology and composition. This exposure may adversely impact aeromedical evacuation crew members, flight crews, flight line personnel, and patients, whose health is already compromised.

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References