Deploying Low Cost, Small Unmanned Aerial Systems (sUAS) in Humanitarian Mine Action
Two Parts of the 2-Year Project

• 2016 – Determine how commercially available equipment (with some modifications) can help in HMA

• 2017 – Deeper scientific research - flying spectrometers & determining the usefulness of civilian-grade thermal imaging
Survey & Intelligence

• Survey, Planning, Inspection, Intelligence, Reporting
  • Evidence capture
  • An extra tool for intelligence, survey (NTS+), EOD/IED ops, situational awareness, pre-deployment, Cartography/GIS, progress reporting & QA

• Not Detection (at this standard level)
  • Direct identification
  • Pressure on accuracy
Example Data from Micro System

- High Res Visual
- Vegetation Contrast
- High Res Topography & Surface
- Cartography, GIS Outputs
Evidence Gathering - Land Use

Up-to-date Overview

SHA
Major Features & Evidence Points

Road in Use

Craters, evidence of conflict
Evidence Points – Crater example

Fresh Craters

Better NTS (straight to clearance in this case?)
Evidence Gathering – Difficult Places

Image credits: Andy Smith www.nolandmines.com
Access, Risk Assessment, Planning, Progress

Pre-deployment planning, Progress Reporting
Modified Camera – Vegetation Contrast

RGB

Red-Edge (NIR)
Vegetation Contrast - Small Evidence Points
Small Evidence Points
Vegetation Contrast - Buildings & Infrastructure
Very Close Recce & Realtime Video

RGB

Command Wire

Red-Edge post processed
Stitched (mosaic) - High Res Cartography

High Res Ortho Rectified Map

john.fardoulis@bristol.ac.uk
Very High Resolution Topography
Incline/Slope Analysis for Demining Machines
<table>
<thead>
<tr>
<th>Objective</th>
<th>Minimum Separation</th>
<th>Operator &amp; Ops Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>UAS 1</td>
</tr>
<tr>
<td>Photos</td>
<td>30m</td>
<td>✓</td>
</tr>
<tr>
<td>Video</td>
<td>30m</td>
<td>✓</td>
</tr>
<tr>
<td>Inspection</td>
<td>30m</td>
<td>✓</td>
</tr>
<tr>
<td>Close Inspection</td>
<td>10m</td>
<td></td>
</tr>
<tr>
<td>Very Close Inspection</td>
<td>3m</td>
<td></td>
</tr>
<tr>
<td>Waypoint flying (for GIS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Wind speed</td>
<td>25 km/h</td>
<td>UAS limit</td>
</tr>
<tr>
<td>Maximum take-off weight</td>
<td>2kg</td>
<td>5kg</td>
</tr>
<tr>
<td>Minimum visibility</td>
<td>600m</td>
<td>300m</td>
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<tr>
<td>Advanced System(^2)</td>
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<tr>
<td>Max Height(^1)</td>
<td>120m</td>
<td>150m</td>
</tr>
<tr>
<td>Max Distance (LOS)(^1)</td>
<td>300m</td>
<td>500m</td>
</tr>
</tbody>
</table>

\(^1\) Subject to national regulations & operational risk.
\(^2\) Subject to weight limits.
Challenges

- Deployment requirements;
  - Permission from MAC’s & National Authorities
  - Training
  - SOP’s
  - Equipment
  - Proving value
  - Return on Investment
Summary

- sUAS very good for evidence gathering
- Very high resolution (relatively close to the ground)
- Very up-to-date
- Can improve safety
- Fast, can save time
- Additional data/evidence = better decision making, more confidence
Summary

• Close recce, real time video (EOD/IED), advanced sentry (EOD)
• Utility – pre-deployment planning, QA, risk assessments
• Reporting - progress reporting (time-series snapshots), post clearance, economic impact
Thank you!

Let’s talk!

john.fardoulis@bristol.ac.uk