Finnish Rescue Services practices for preventing forest fires
- Now and in the future

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Forest & Photonics
7-8.10.2019
Content of presentation

- Dealing the forest fires in Finland
- Current practices in drone usage
- Future ideas
Forest fire system in Finland

Goal is to protect
1. human life
2. property
3. environment

- Fire prevention
  - Education and advice
  - Forest fire index
  - Open flame prohibition

- Early warning
  - Education and advice
  - Mobile phones
  - Aerial viewing
  - Satellite

- Fast and efficient rescue work
  - Education and advice
  - Fire brigade
  - Aerial Fire fighting

Rami Ruuska, senior inspector, MOI, Department for Rescue Services
Forest fires 2019

- 2817 forest fires *until 5.10.2019
- 11 over 10ha forest fires 2019
Average amount of the years 2015-2017 of Forest and wild land fires = 1924

https://prontonet.fi/Pronto3/online3/OnlineTilastot.htm
Rescue Services in Finland

• MoI, regional administrative agencies (6)
• 22 Regional Rescue Departments
• 850 fire stations
  - professional, contract, factory, military
• 5000 professional firefighters
• 15000 voluntary firefighters
• 4000 vehicles
• 540 boats and others

Fire brigades' response time according to the first rescue unit this year and last year

<table>
<thead>
<tr>
<th>Year</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>Average</th>
</tr>
</thead>
</table>
Dealing the forest fires in Finland

- 26 fire observation routes
- Flight clubs/associations
- Tendering process (North Finland AVI)
- Finnish Air Rescue Society (SAR)
- National umbrella organisation for volunteer air rescue services
- Includes 38 associations & base
- Over 70 airplanes
- Over 1200 volunteers
- Over 200 fires detected 2018

Forest fire observation flights 2010 - 2018

Kuva: Yle / Uutisgrafiikka
Authorities air units

Border guards

AB412 (4)
Super Puma (2)
AW119 Ke Koala (4)

(FINHEMS)

EC 135 (6)

Defense forces

NH90
Departure for a wildfire flight activates when:

- The Finnish Meteorological Institute's forest fire index is rising above the set limit
- In most parts of Finland the value is 4.1
- Departure twice daily if index is higher than 5.4.
- The forest fire warning is given by index 4.0.
- Flights starts at May to the end of August.
Forest fire warnings
Beat bog fire, Taipalsaari, June 2019
Over 10ha area
Content of presentation

- Current practices in drone usage
<table>
<thead>
<tr>
<th>Operations</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspections of/securings a fire alarm system</td>
<td>1</td>
<td>12</td>
<td>8</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>Assistance operations</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Animal rescue operations</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>First responce operations</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Human rescue operations</td>
<td>5</td>
<td>3</td>
<td>6</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Traffic accidents</td>
<td>2</td>
<td>9</td>
<td>13</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>Vehicle fire</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Wild fire</td>
<td>1</td>
<td>8</td>
<td>58</td>
<td>42</td>
<td>109</td>
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<tr>
<td>Additional checking and verification operations</td>
<td>1</td>
<td>15</td>
<td>37</td>
<td>41</td>
<td>94</td>
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<tr>
<td>Other fires</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Inspections of/securings a fire alarm system</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Building fire</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>17</td>
<td>31</td>
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<tr>
<td>Risk of building fire</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td></td>
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<tr>
<td>Collapses / risks of collapse</td>
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<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Loss prevention operations</td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Executive assistance operations</td>
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<td></td>
<td>1</td>
<td></td>
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<tr>
<td>Oil spills</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>12</td>
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<tr>
<td><strong>All in total</strong></td>
<td>10</td>
<td>81</td>
<td>148</td>
<td>139</td>
<td>378</td>
</tr>
</tbody>
</table>

Years / sum

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>All in total</th>
</tr>
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Drone usage in the Finnish Rescue Services 2016 - 2019
• KYMPE started using drones 2016
• 36 trained drone operators, 6 RPAS units
• 56 operator are currently trained in online course

• Drones are just tools for supporting incident commanders decision making process and for providing wider situational awareness

• Minimum effort / Maximum output
• Development project - **Tools for Rescue Service’s RPAS Management**

• Basic clearing models – incident commander – one command – needed protocol – process

• **RPAS SOP / videos / Download from link below**

• 3D models / Fire investigations / training incident commanders in real environment

• Kouvola land survey cooperation
  ➢ Trimble MX2 panorama
  ➢ Trimble MX2 Mobile laser scanner
  ➢ DJI Phantom 4PRO / Picture cloud Agisoft
  ➢ Geoslam ZEB/REVO RT laser cloud
  ➢ Digital City modeling
  ➢ Blender, Unity, Unreal, 3Dmax
26.3.2017 Detached house fire (warehouse)
2017 Sawmill fire (warehouse)
Content of presentation

• Seeking the future.....
Combining data, Drones, sensors

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Cause of wild fires (Finland) A natural event or phenomenon (lightning etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>128</td>
</tr>
<tr>
<td>2017</td>
<td>100</td>
</tr>
<tr>
<td>2018</td>
<td>826</td>
</tr>
<tr>
<td>2019</td>
<td>329</td>
</tr>
<tr>
<td></td>
<td><strong>Total amount</strong></td>
</tr>
<tr>
<td></td>
<td><strong>1383</strong></td>
</tr>
</tbody>
</table>

- Drones → U-space → lightning coordinates
- Using drones for assessment of POI (hotspot, fire)
- Use AI + machine vision
- Expected results → degrease burnt wild land areas, save human resources, improve coordination of fire fighting teams, save time and money
Robots - hose line mules?
Robots - hose line mules? Using fire nozzles?
Robots and limitations

The current state and future outlook of rescue robotics

Jeffrey Delmerico, Stefano Mintchev, Alessandro Giusti, Boris Gromov, Kamilo Melo, Tomislav Horvat, Cesar Cadenas, Marco Hutter, Auke Ijspeert, Dario Floreano, Luca M. Gambardella, Roland Siegwart, Davide Scaramuzza

...efforts from the research community to develop systems that are robust and capable enough for real-world rescue scenarios has been insufficient.

...While some of the efforts from the research community are more forward-looking than the current requirements for field deployment, it is necessary to consider the time required to reach a technology readiness level that can be used in critical situations.

...ground robots are infrequently deployed in active rescue environments, but have found use in the types of inspection and assessment tasks that occur during the recovery, prevention, and preparation phases of the disaster cycle. Aerial robots, on the other hand, have achieved a level of field readiness that has enabled their use in both recovery and response stage operations.
Creating future

Thank you for your attention

Teemu Veneskari
7.10.2019

A Nineteenth Century Vision of the Year 2000

Aerial firemen, 1900s French Postcard
Jean-Marc Côté