Fire Department of Dortmund

On benefits of UAV in research and fireground operations

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Feuerwehr

Dortmund

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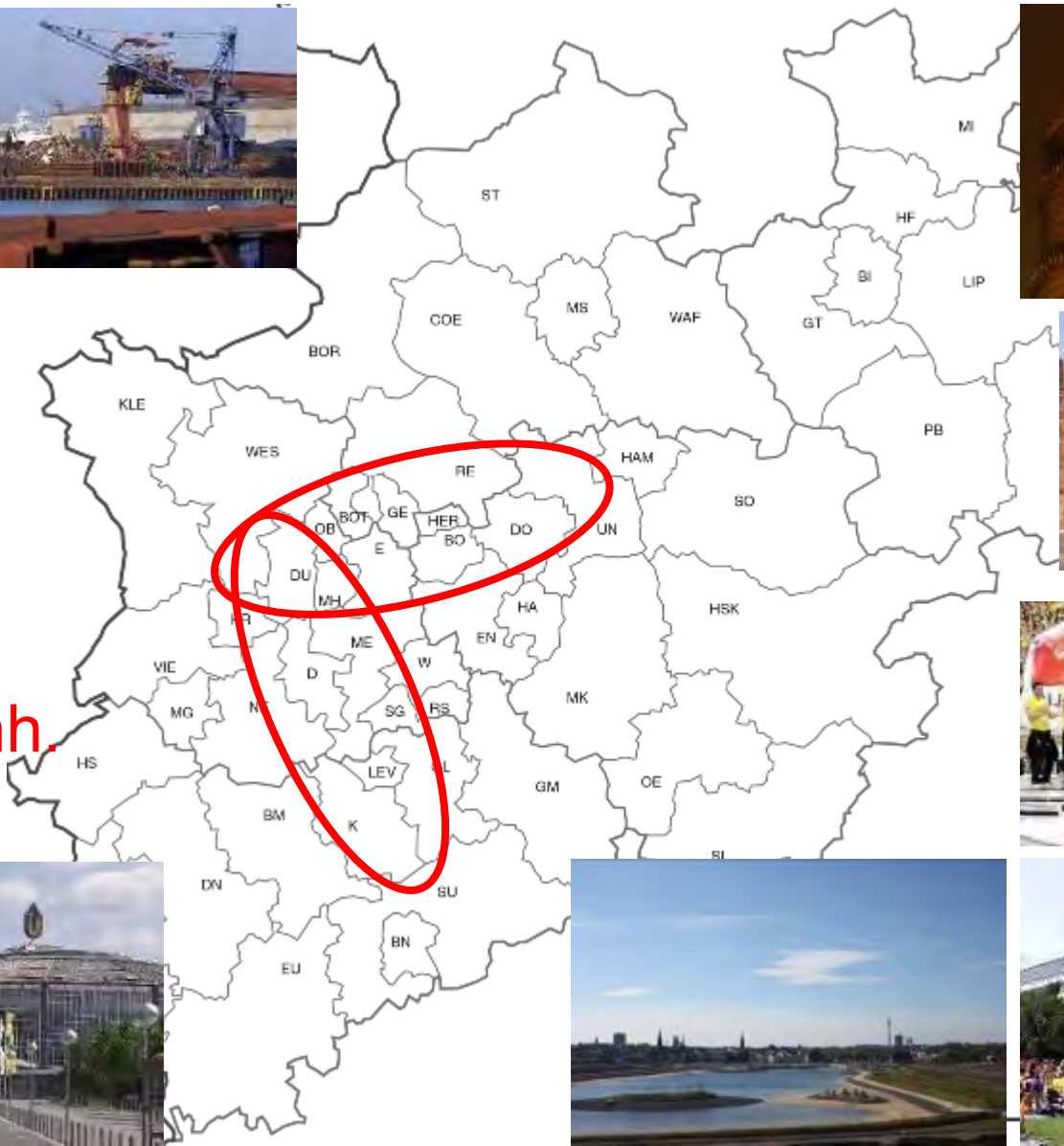
600.000 inh.

280 km²

D ≈ 22 km

>6.000.000 inh.



Tasks of FDDO

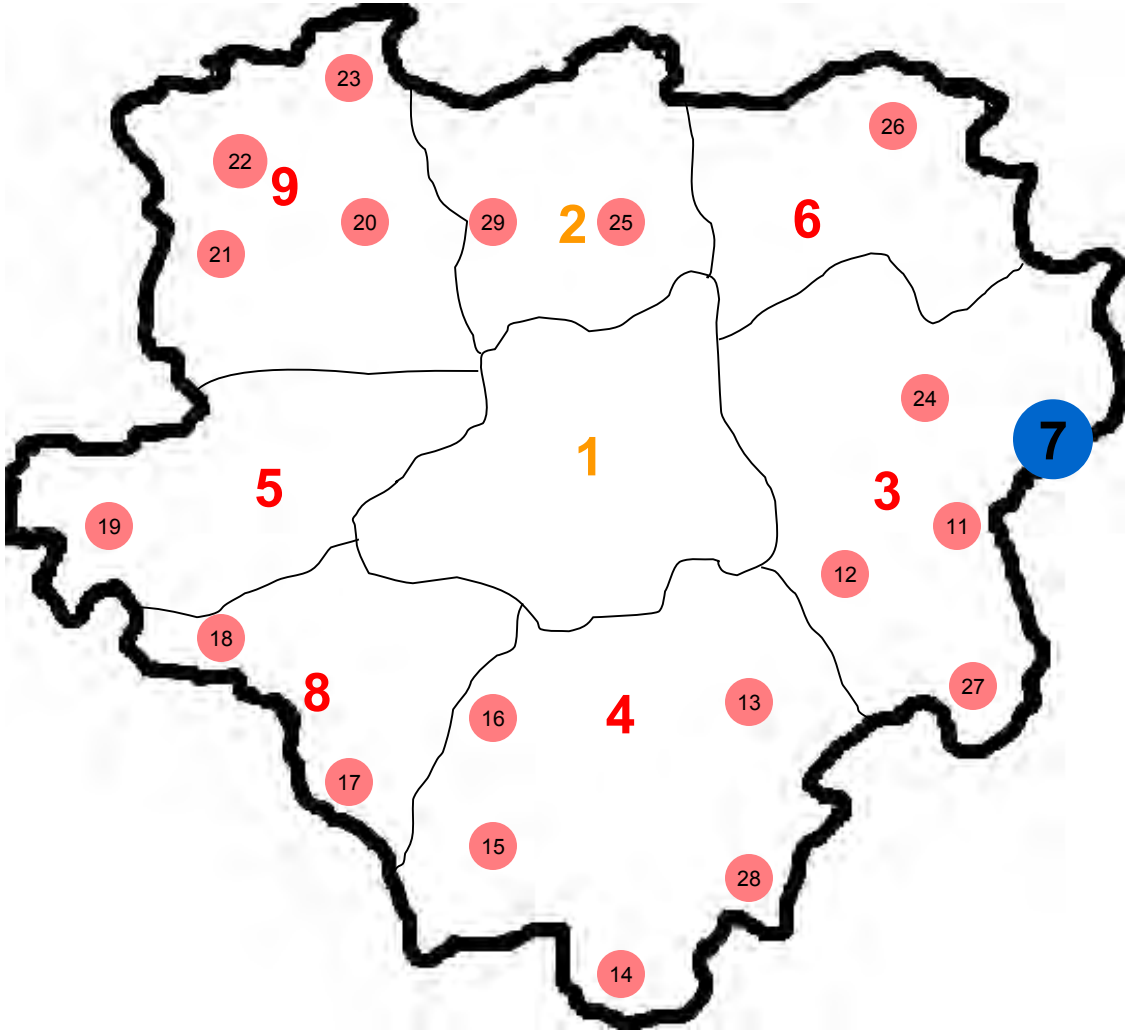
- Fire Department
  fire suppression
  fire prevention
  (integrated) command and control center

- Emergency Medical Services
  (integrated) command and control center

- Disaster Management

→ structural planning mandatorily required by law

Stations



- 8 professional fire stations
- 19 voluntary fire stations
- 16 EMS stations
- airport fire & rescue

24/7 Functions on Duty

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command & control	8 + 9		=	17
station 1	16 + 5	+ 6	=	27
station 2	16 + 2	+ 5	=	23
station 3	10	+ 4	=	14
station 4	16 + 2	+ 4	=	22
station 5	10 + 1	+ 2	=	13
station 6	10	+ 2	=	12
station 8	10 + 6	+ 2	=	18
station 9	10	+ 2	=	12
total			=	158

Special Units

- heavy rescue
- CBRN
- height rescue
- water rescue
- decontamination
- water supply
- logistics (catering)
- command
  & communication
- analytical task force

Everyday Workload vs. Mass Incidents

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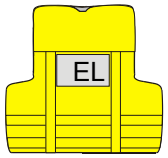
everyday workload:
approx. 1.600 emergency calls / day
resulting in:

- 25 … 35 fire / technical incidents
- 250 … 350 EMS incidents

extreme weather conditions may cause a major increase of incident numbers

- flash flood 2008JUL26f + 691 incidents
- storm Kyrill 2007JAN18ff + 2.152 incidents

Command Structure: 3rd alarm



IC

A-level officer

command post

logistics / staging

section 1

BLO 1

section 2

BLO 2

section 3-med

leading emerg. doctor

1. LZ

2. LZ

3. LZ

RTW/NEF

On-scene incident command

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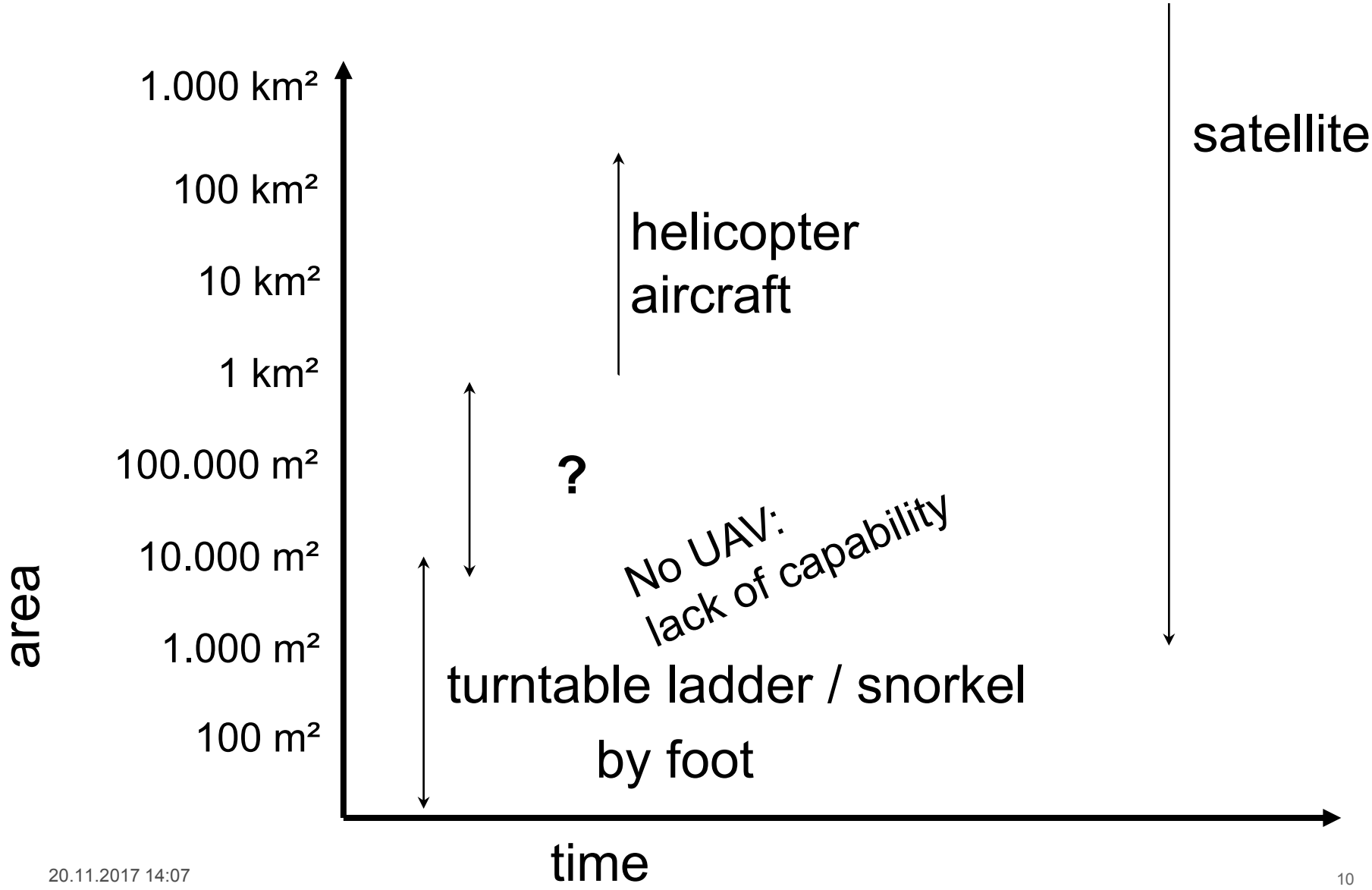
established in case of local major / mass incidents

supports IC with a command staff

equipped with direct data link to CCC


1.000 km²
100 km²
10 km²
1 km²
100.000 m²
10.000 m²
1.000 m²
100 m²
area
time
satellite
helicopter
aircraft
?
No UAV:
lack of capability
turntable ladder / snorkel
by foot

how far to go… ?

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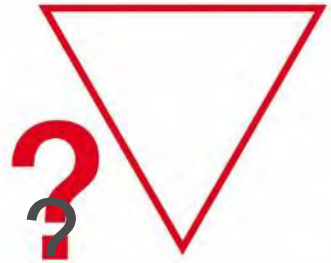
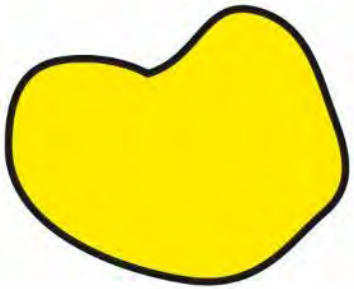
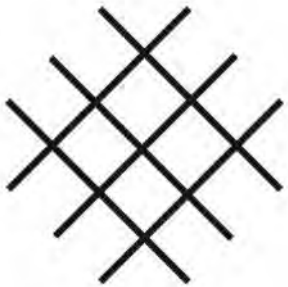


danger for personnel… ?





Examples: ANCHORS und TRADR

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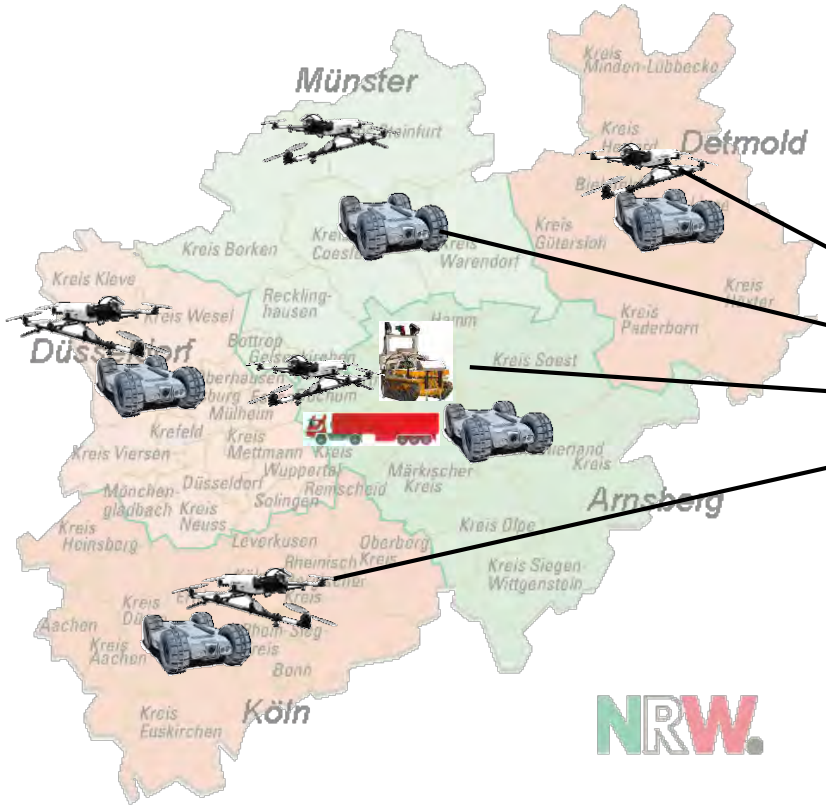
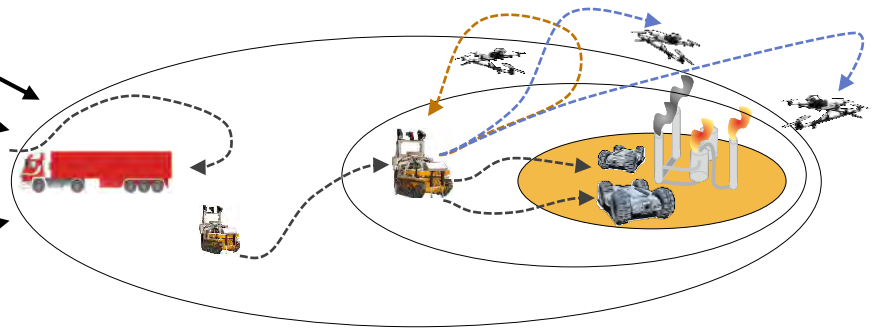
Added value using UAV





multi-functional sensor carrier

- optical
  - IR
  - C-/RN-detection
  - …

scaleable system

- manual
- semi-autonomous
- autonomous

local

regional

UAV – type and equipment

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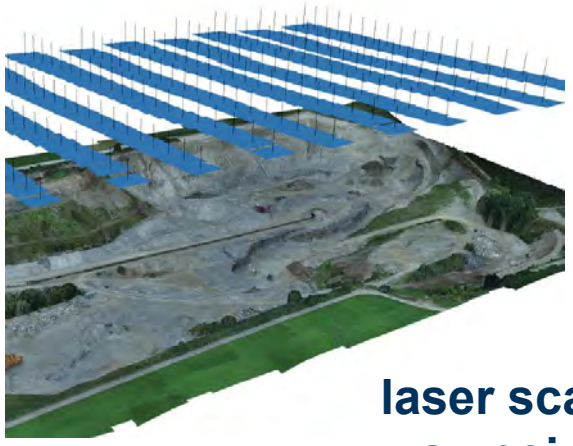
AscTec Falcon 8, Octocopter

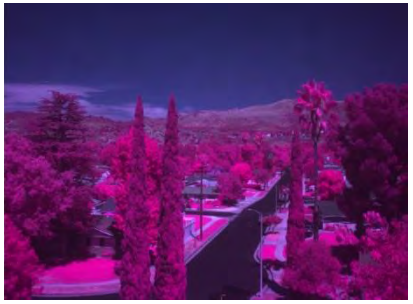
- vis camera: Lumix DMC-TZ61, 30x zoom
- IR camera: Flir Tau2 640, 19mm lens
- ext. display: Black Pearl, 7“ / 5,8GHz div.config.

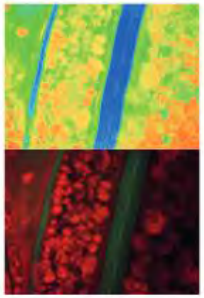


aerial view

laser scanning
way point navigation
geo-referenced

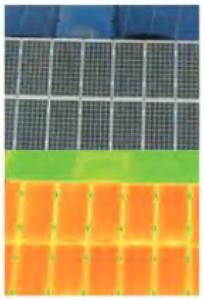
NIR



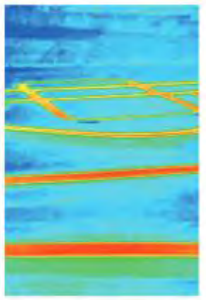


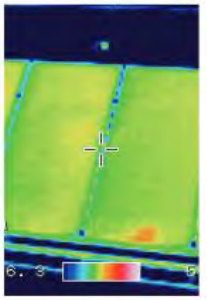
3D models

RGB



thermale IR





sensor example: Chemical detection (GfG)

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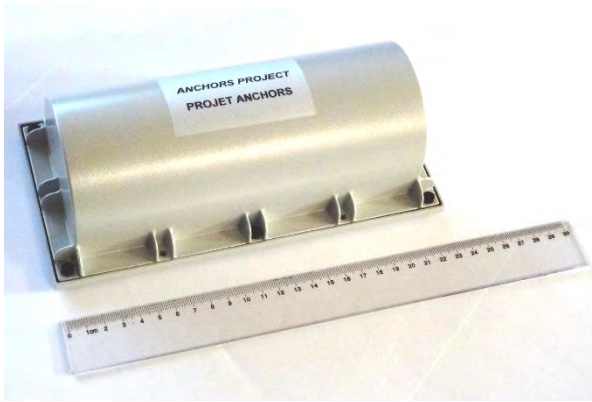
photo ionization detector (PID)

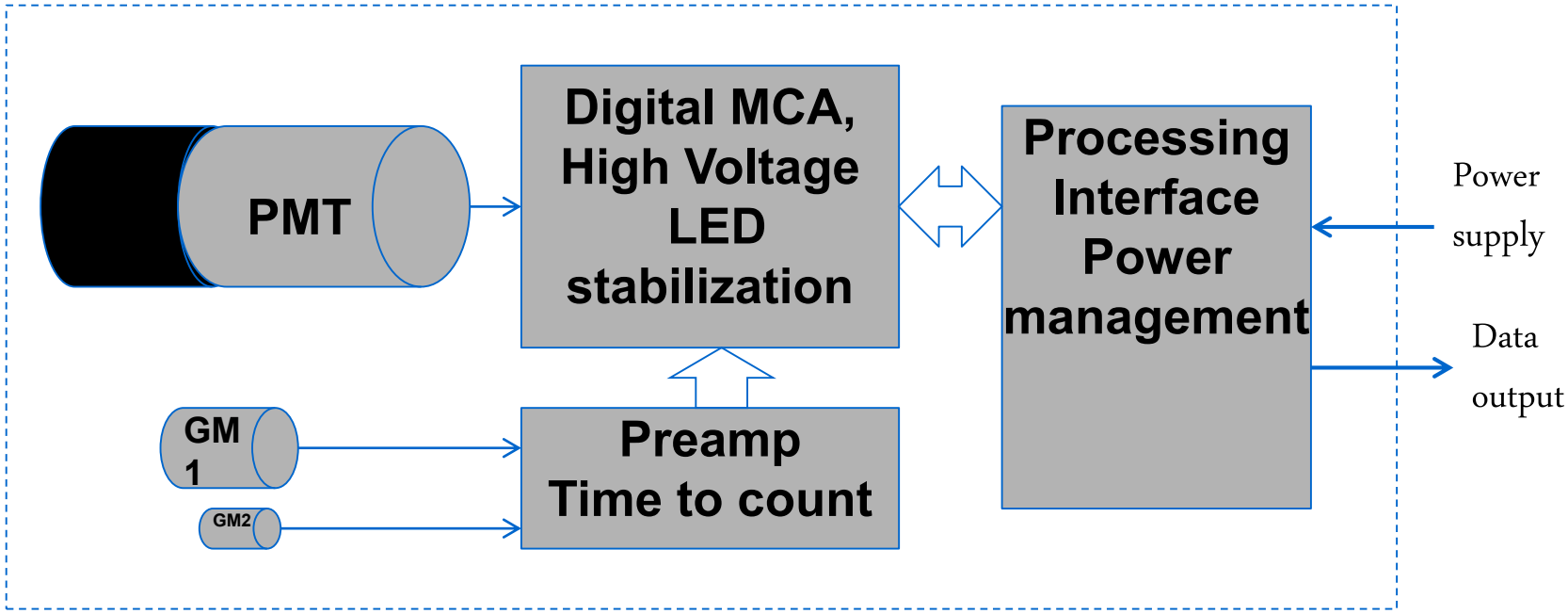
- carbon monoxide (CO)
- hydrogen sulfide (H_2S)
- oxygen (O_2)
- temperature
- volatile organic compounds (VOC)
  - z.B.: acetone, benzine/fuel, benzene, propene, toluene, xylene, etc.

AIRSHIELD
Schutz vor Mensch und Umwelt

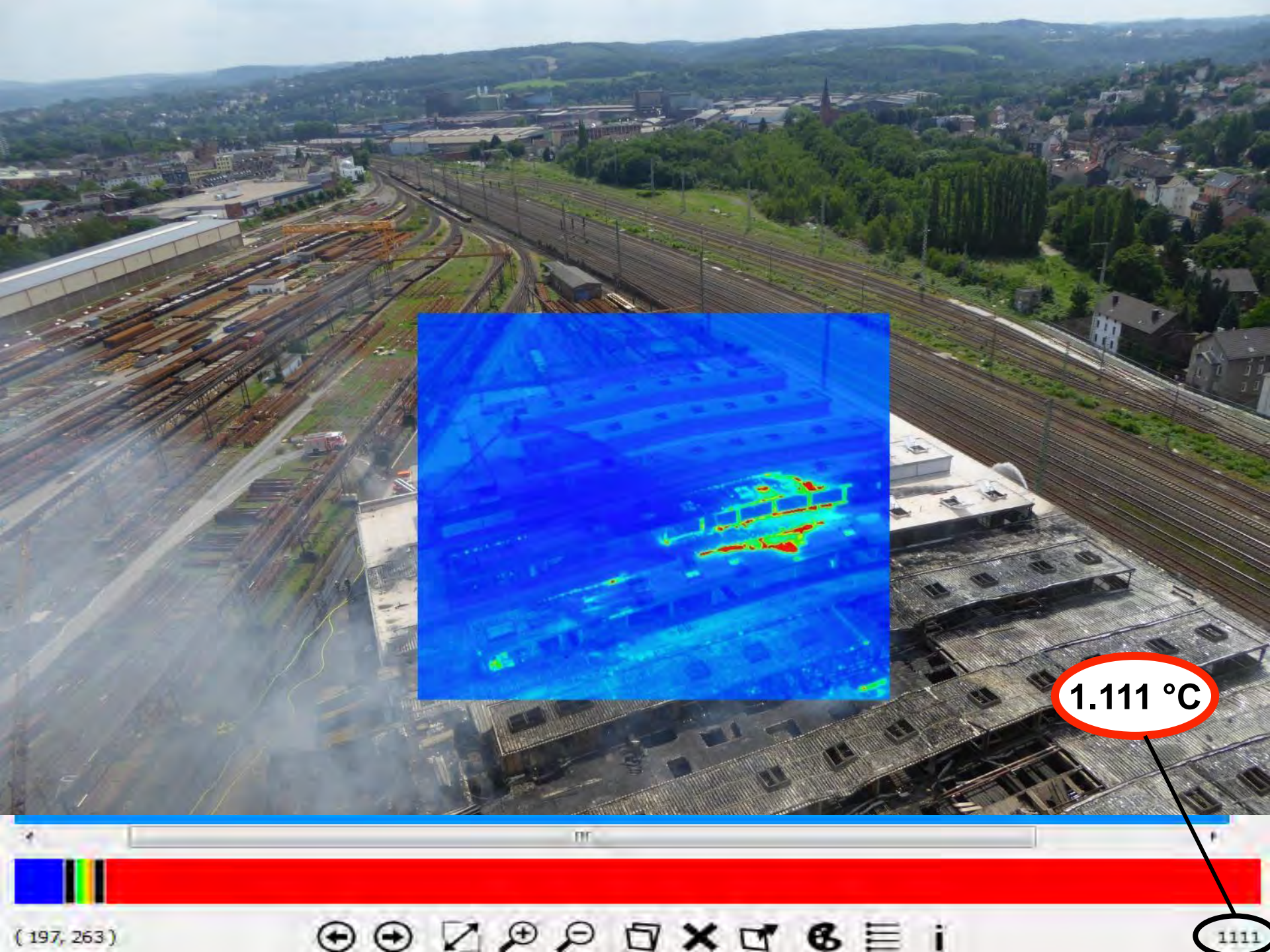
sensor example: R/N detector (Mirion)

- background … 10 Sv / h
- < 600 g
- 3 detectors, self-controlled switch
- detecion / measurement / localization / identification

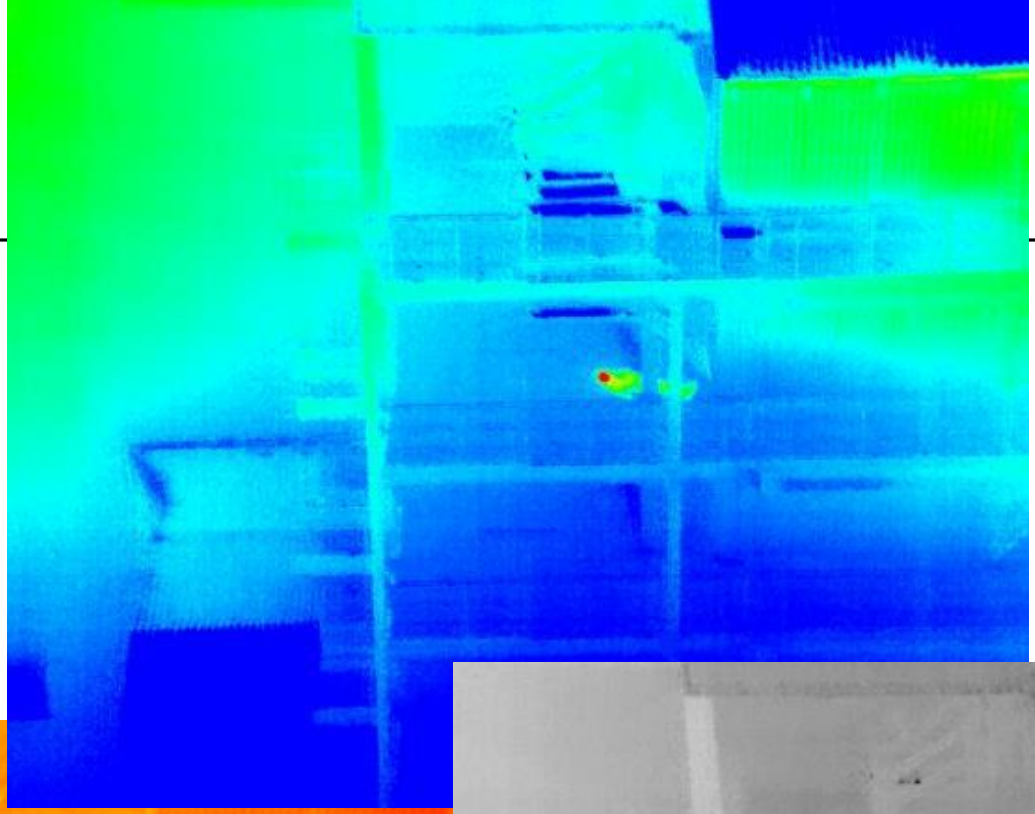


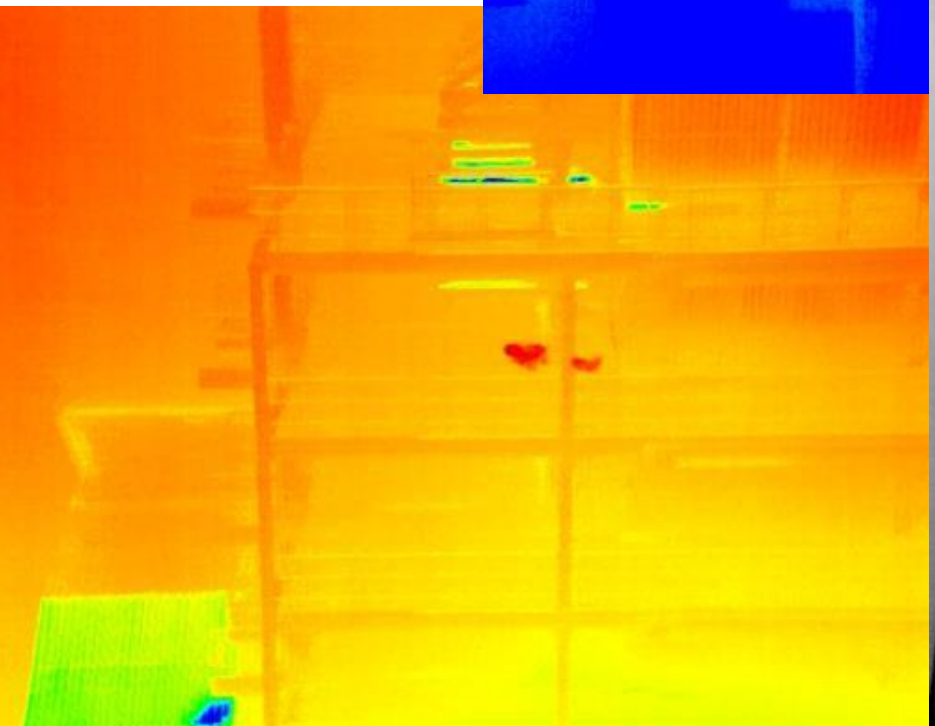


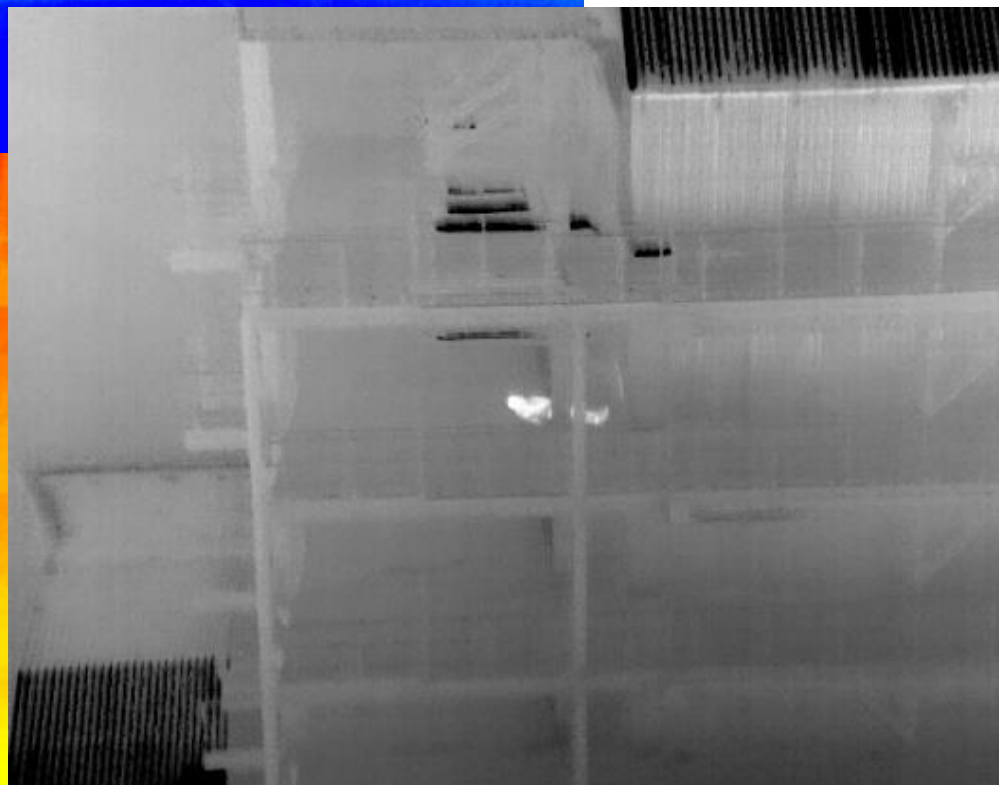
Quelle: Mirion


1.111 °C
(197, 263)
1111

Search Operation







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TRADR
in Amatrice

20.11.2017 14:07

Bilder: TRADR / CNVVF

Concept of Operation

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- define scenarios
  - major fires, complex objects
  - widespread incident scenes
  - search of missing persons
  - special scenes (collapse, IED, …)
  - documentation
- determine tactical needs
  - realtime photo/IR transmission
  - post-processing of pictures, cross-cut IR/vis)
  - consider multiple displays

With the eyes of …

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pilot …

… incident commander

Operational concept

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- determine operating unit → special task
  - vehicle / onboard stowage
  - concept of qualification
  - battery charging management
- personnel: recommend 1/1/4 = 6
  - liaison officer
  - crew commander
  - 2 pilots (steering, backup & UAV support)
  - image analysis specialist
  - engineer/driver & technical support

Area Management

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clearly determine and cordon starting/landing area

Integration in Incident Management System

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- update pre-determined attendances
- alsways support of incident command
- define and communicate availability and limits
- take care: controlled air zones / no-fly zones

Conclusion

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- UGV and UAV
  - expand operational capabilities
  - increase oparational safety
- current legal situation still limits the use of UAV
- legislation needs to take into account
  - privileges for disaster management organisations
  - flights beyond line of sight
  - autonomous use
  - expand weight limitations

Future Vision: „Fire Service Copter“

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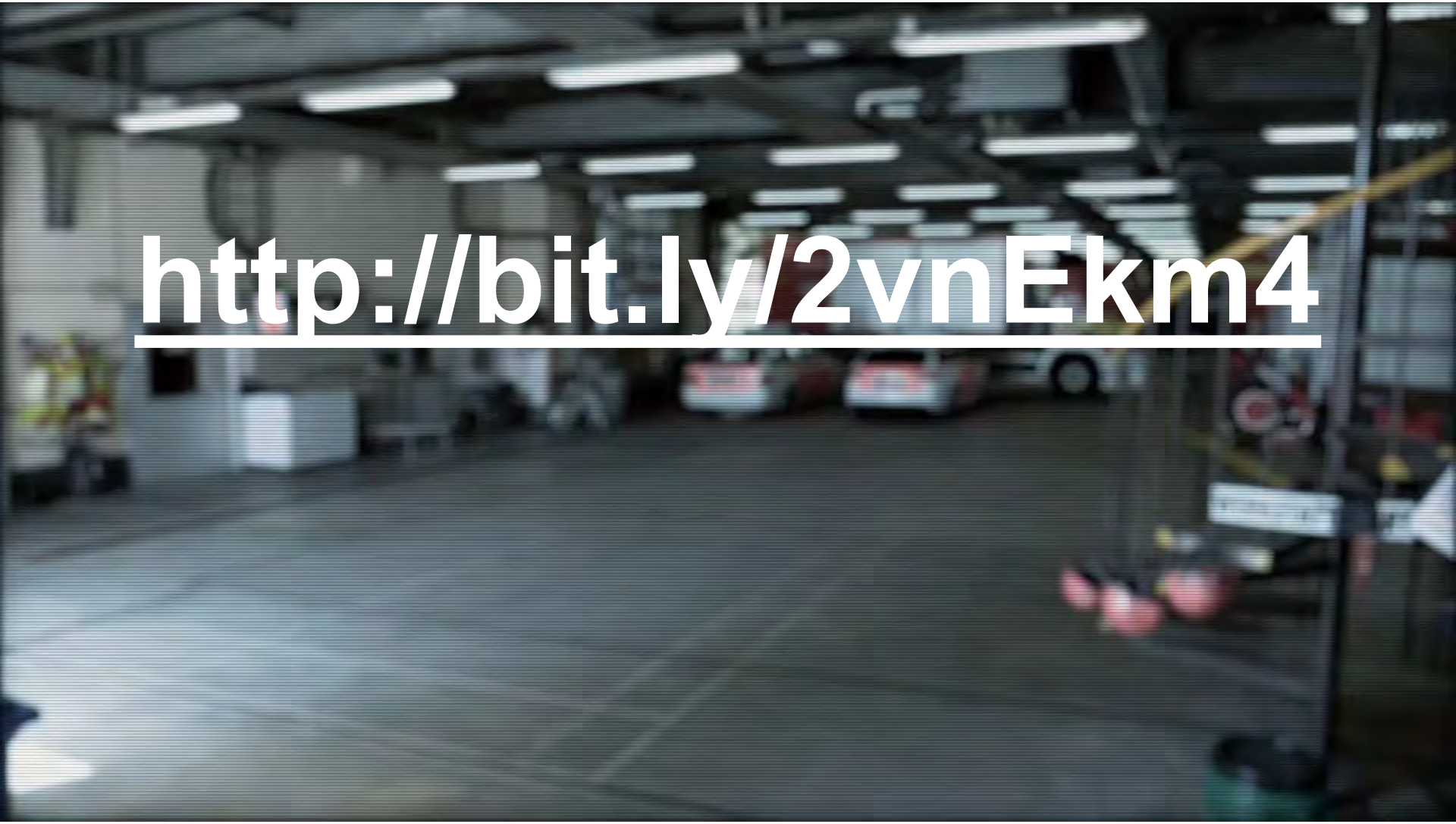

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