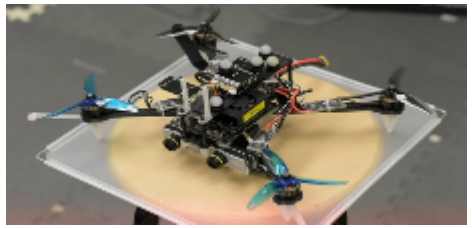
UNCLASSIFIED UNLIMITED RELEASE

SAND2021-7640PE

# NATO Science for Peace and Security Programme

# Mobile Adaptive/Reactive Counter UAS System (MARCUS)



*PRESENTED BY*

Dr. Markus Hopflinger, Dr Rafael Fierro, Dr. David Novick

30 June 2021

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# MOBILE ADAPTIVE/REACTIVE COUNTER UAS SYSTEM (MARCUS)

INTERCEPT UAS

TARGET UAS

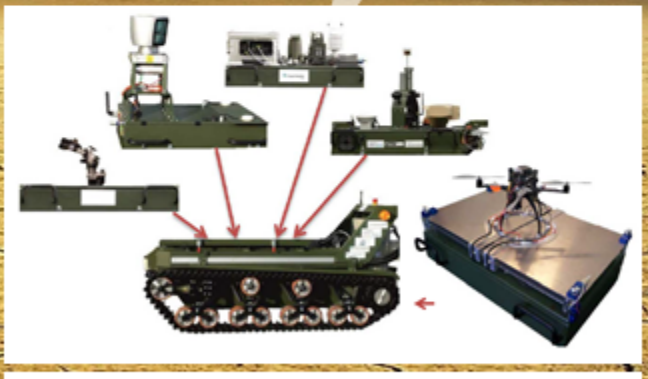
AERIAL DATA & TRACKING

MOBILE GROUND DATA & TRACKING

FIXED GROUND DATA

GROUND CONTROL STATION

FIXED GROUND SENSING & TRACKING

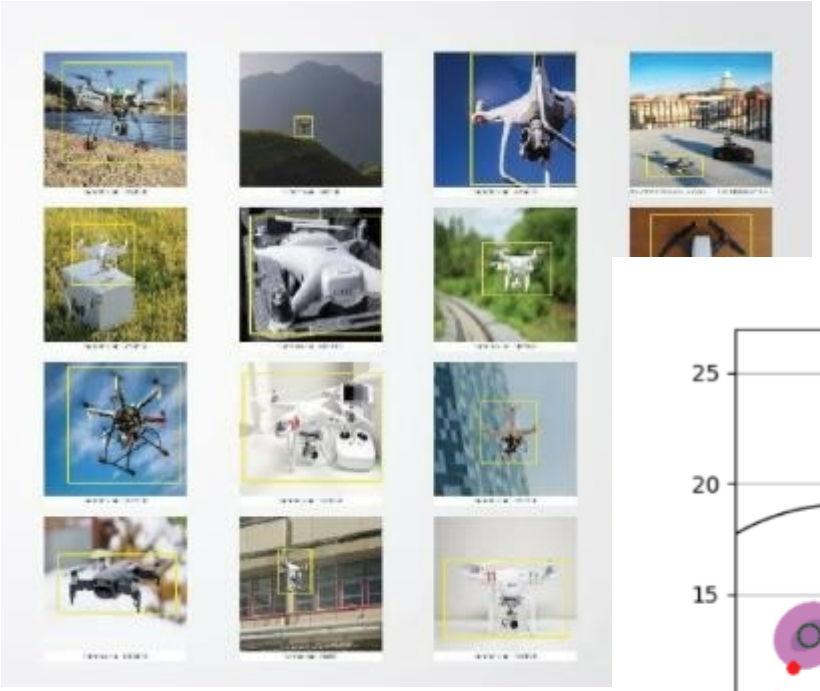


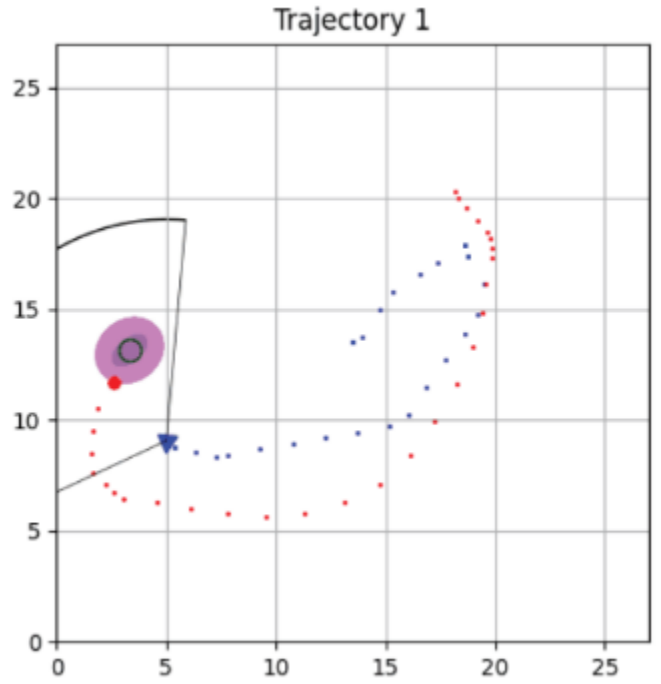
MODULAR MOBILE GROUND SENSING & TRACKING (ARMASUISSE)

# armasuisse S+T

# University of New Mexico

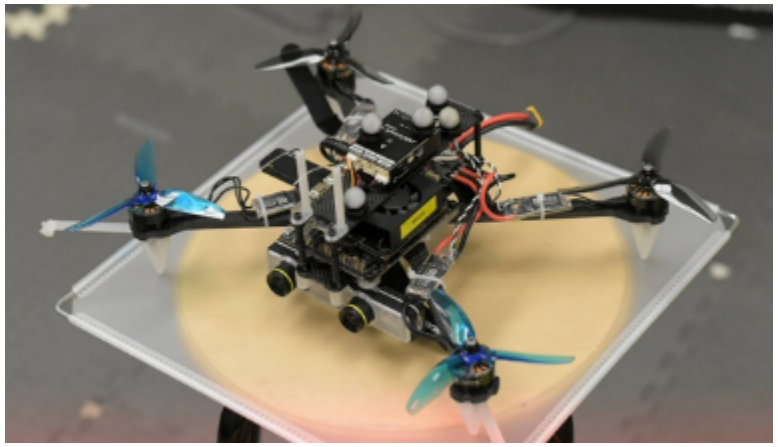
Machine Learning for UAS detection

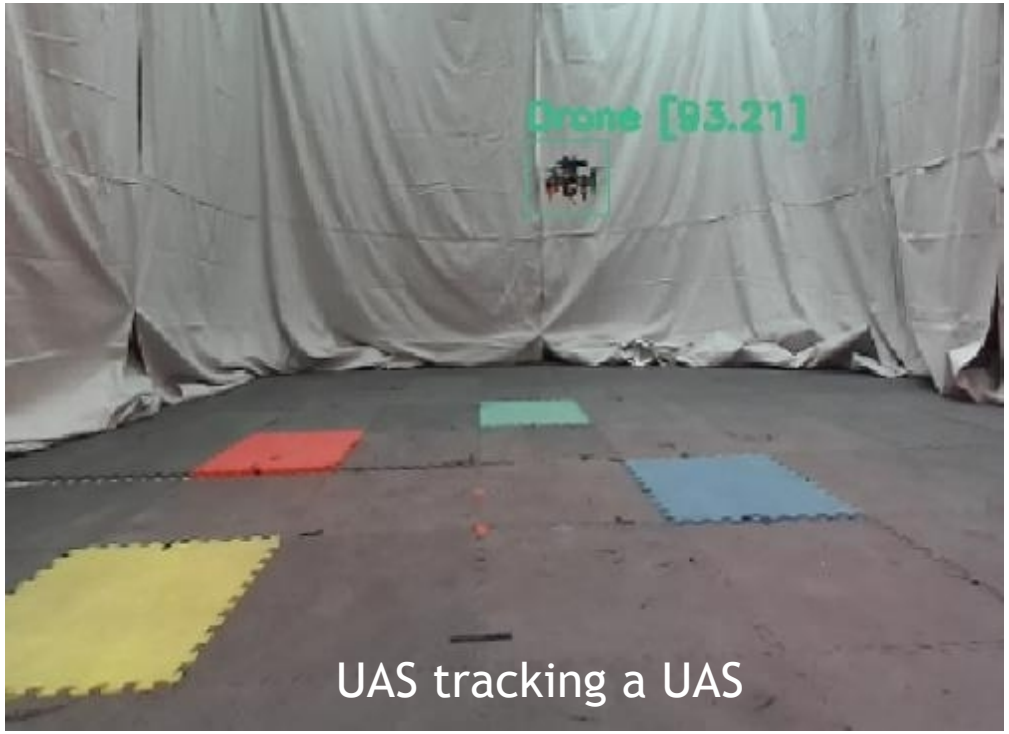





Deep reinforcement learning
active target tracking

UAS testbed



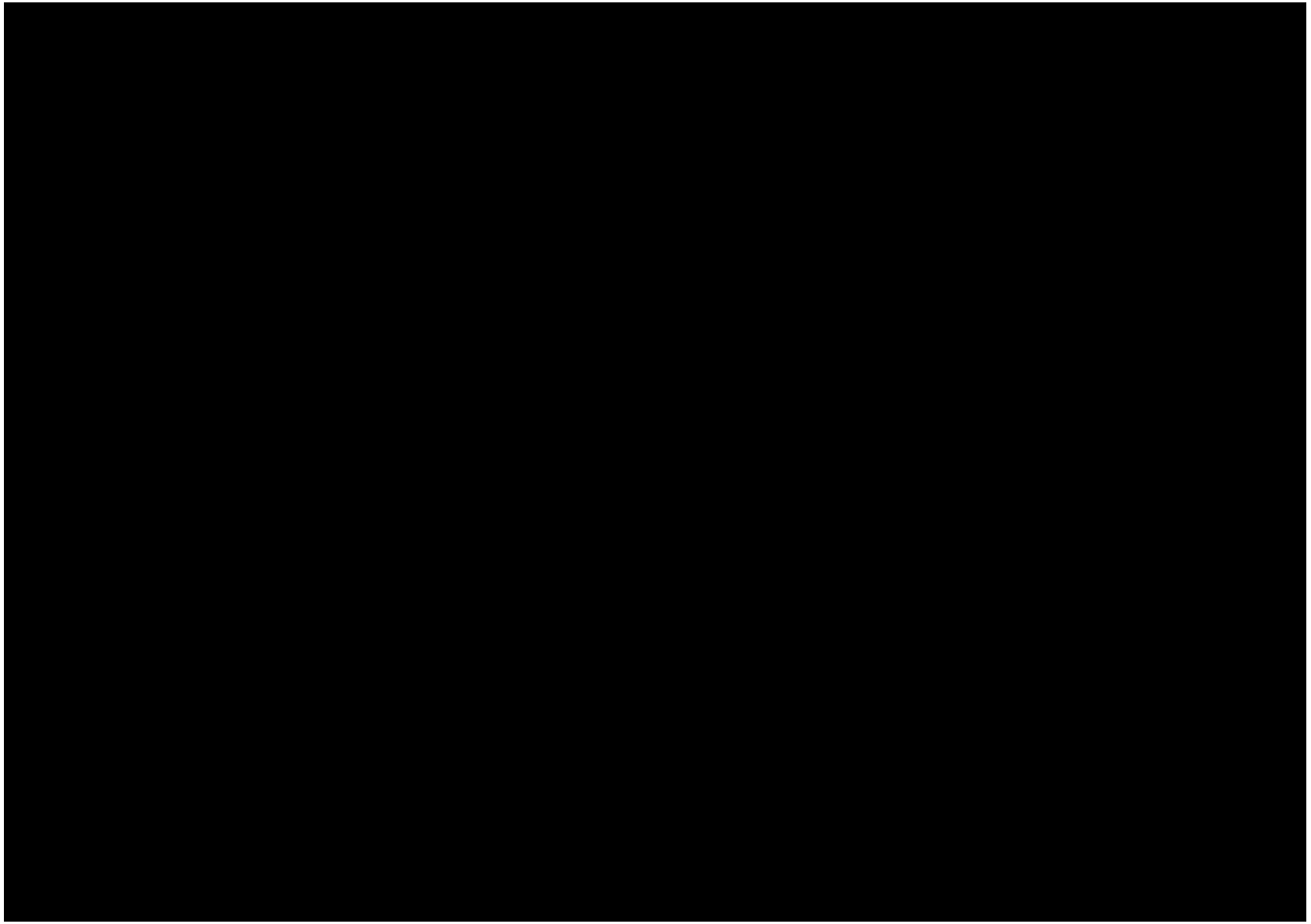



UAS tracking a UAS

# University of New Mexico

## Runtime assurance

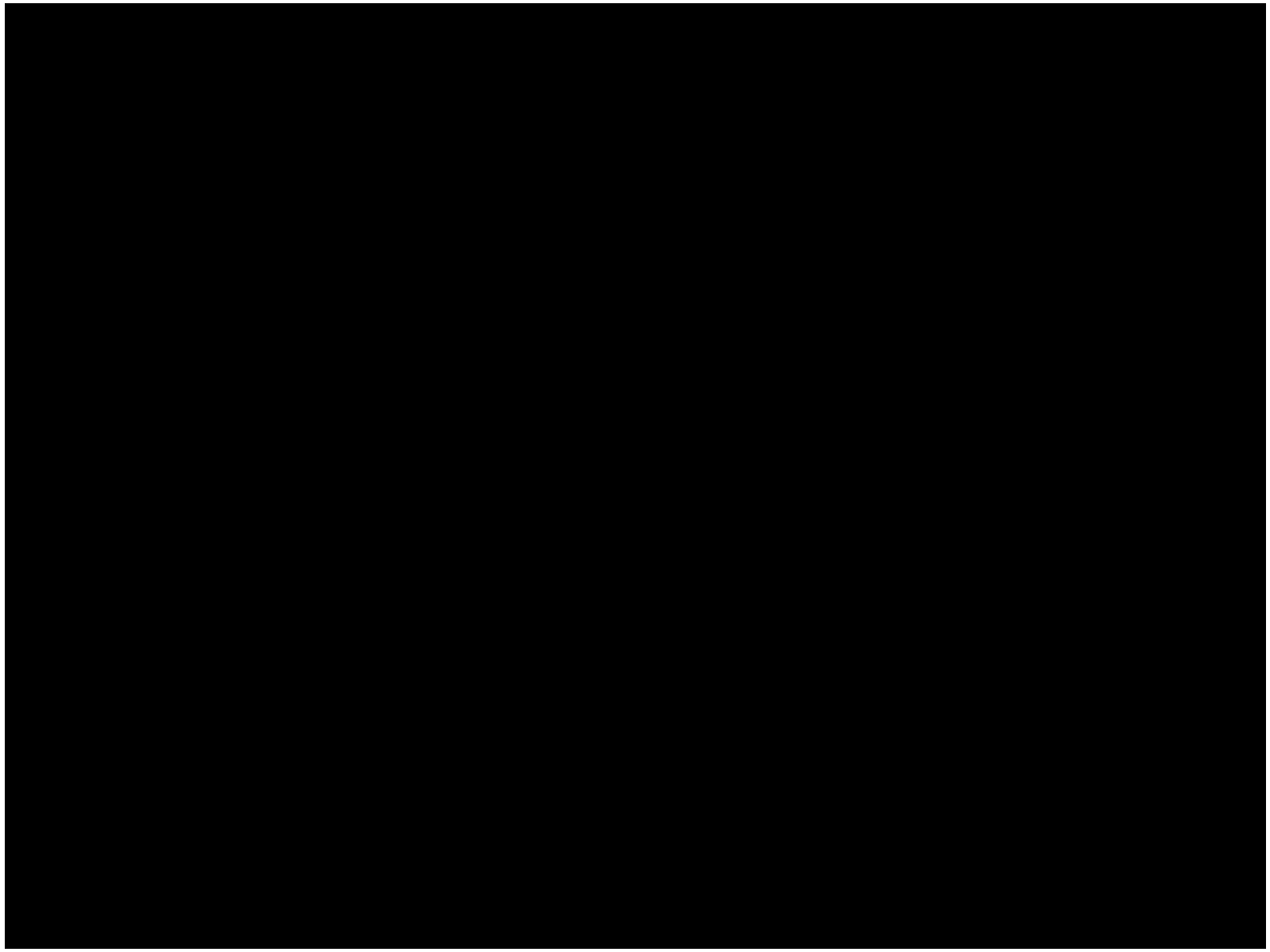
- Use unverified controller to make important decisions
  - Performance controller
  - Safe controller



# University of New Mexico

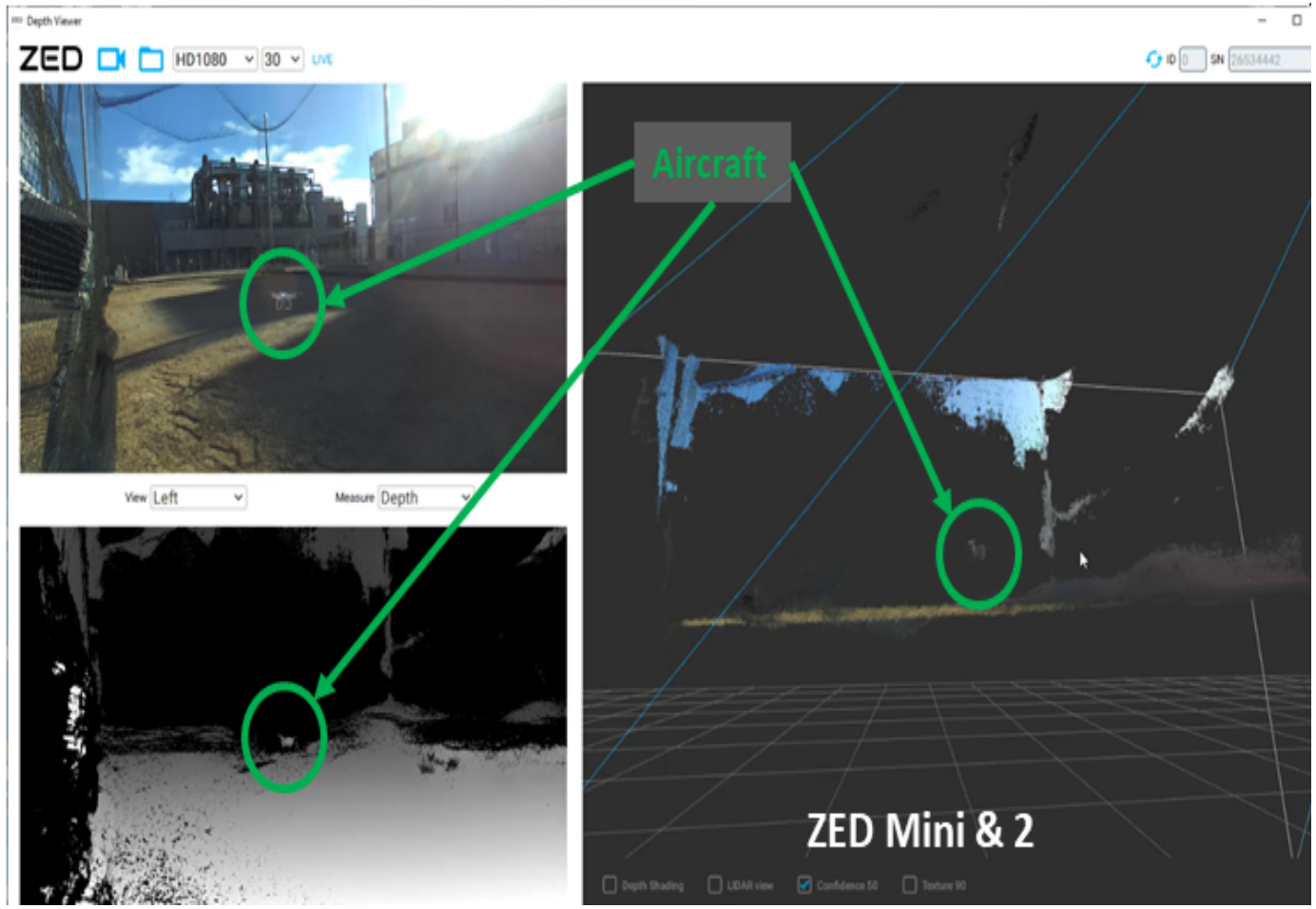
## On-board detection

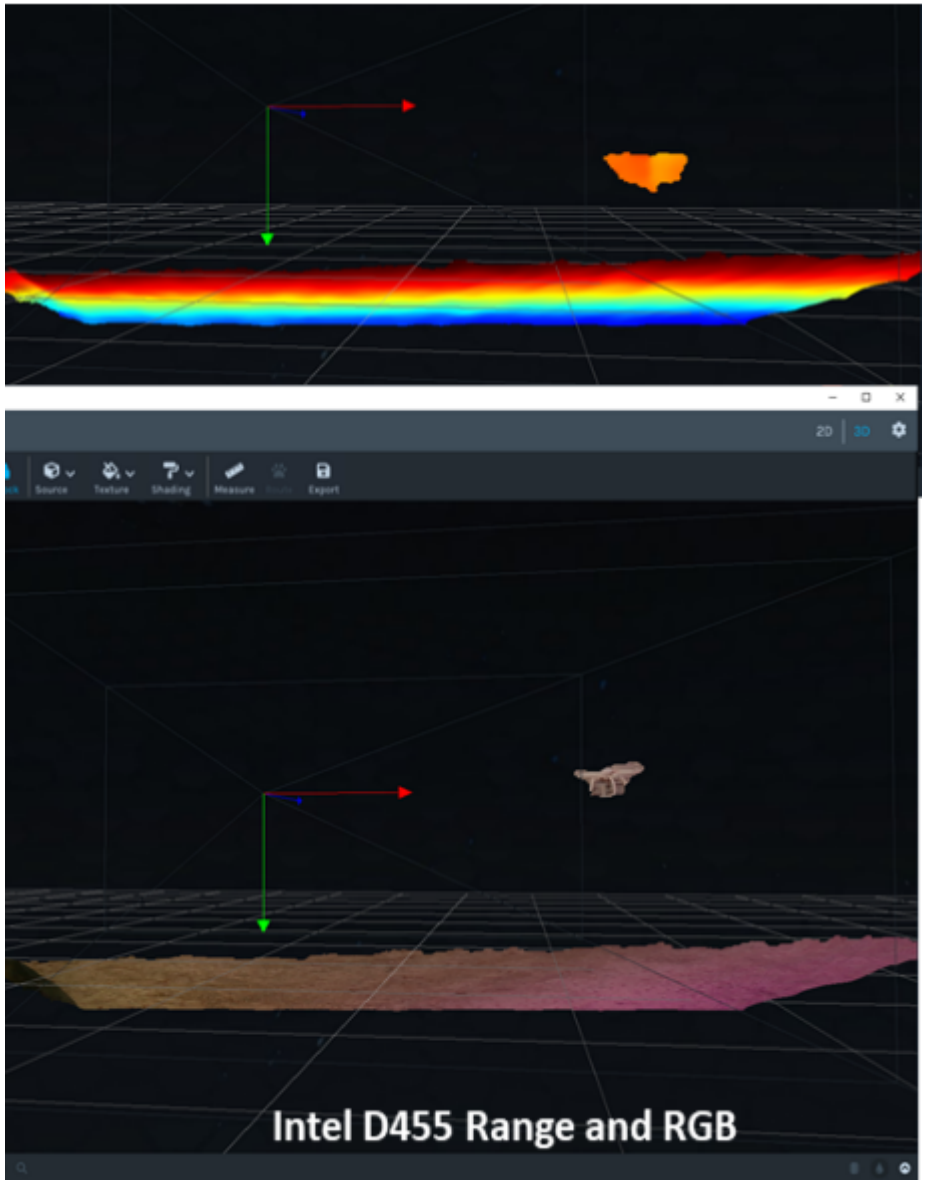
- ML UAS detection using Stereo camera
  - Visual detection and tracking



# Sandia National Laboratories

A suite of sensors… RGB-Depth cameras



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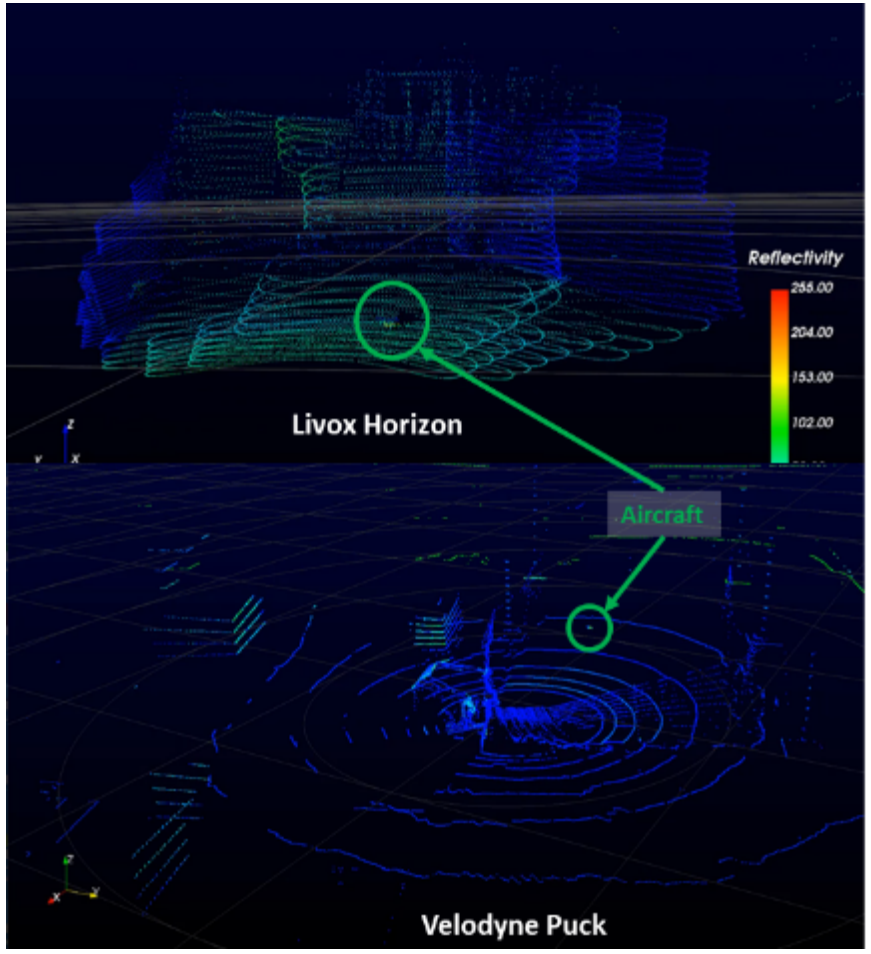
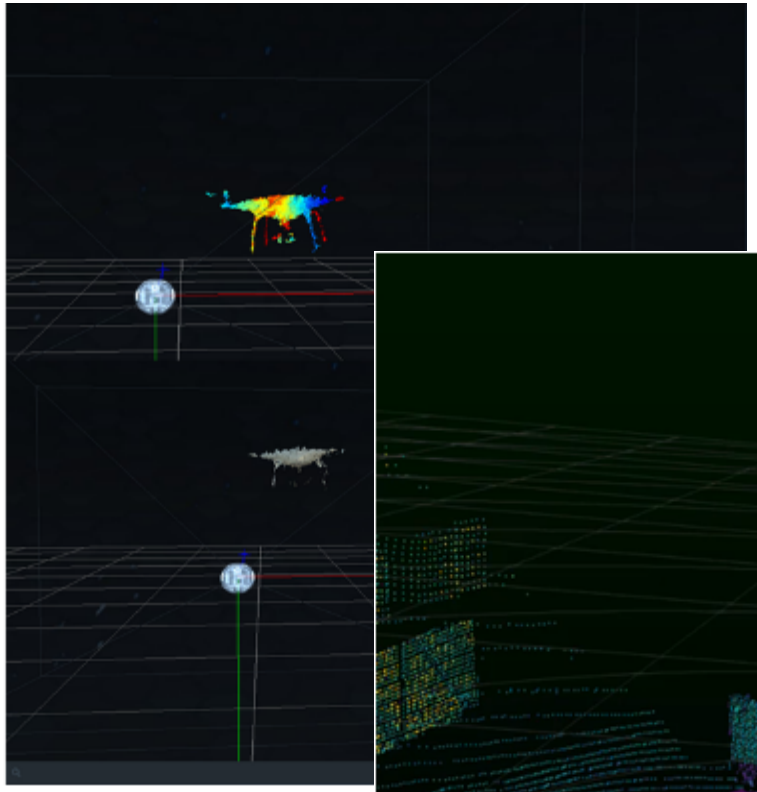
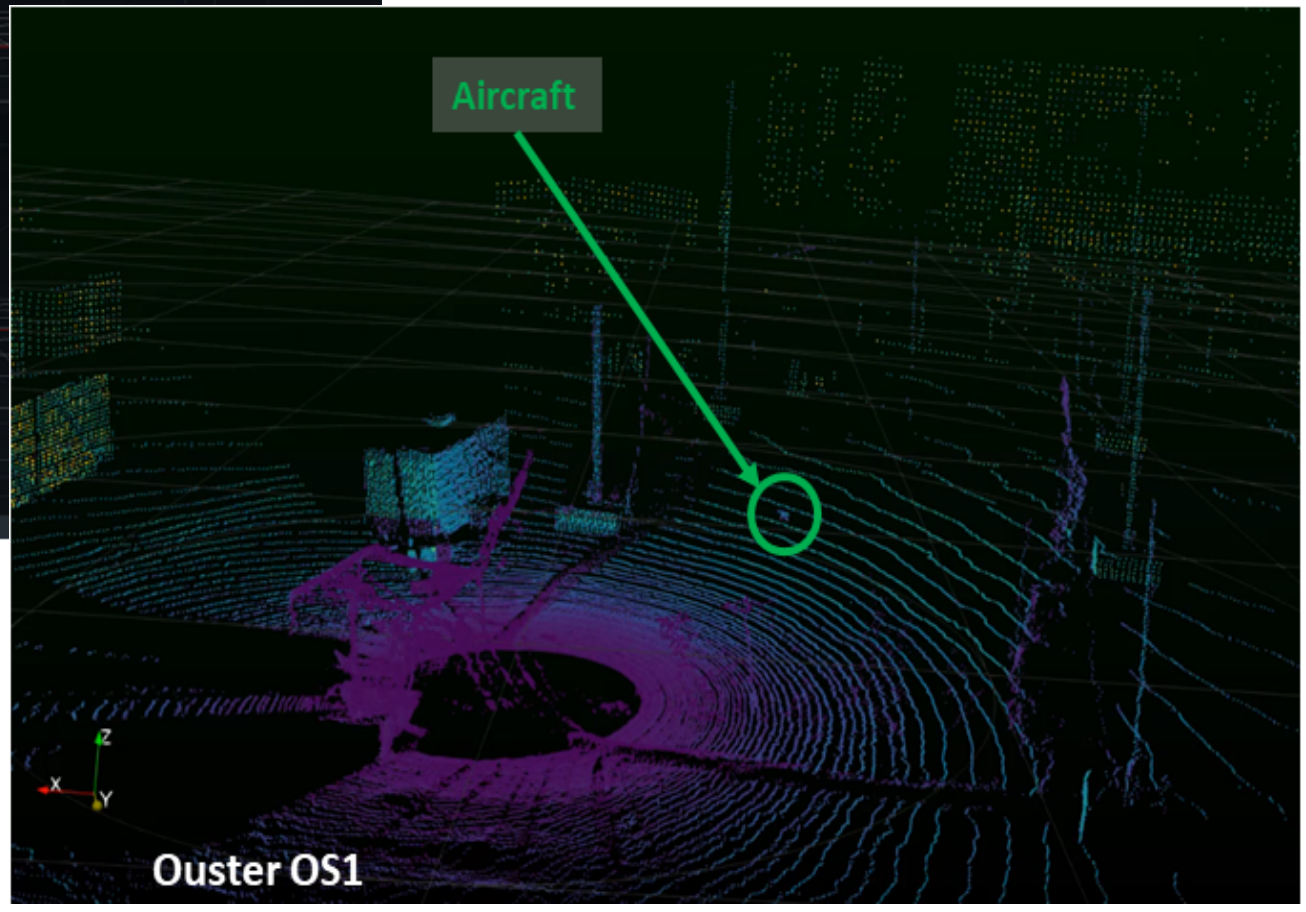
A suite of sensors… LiDAR





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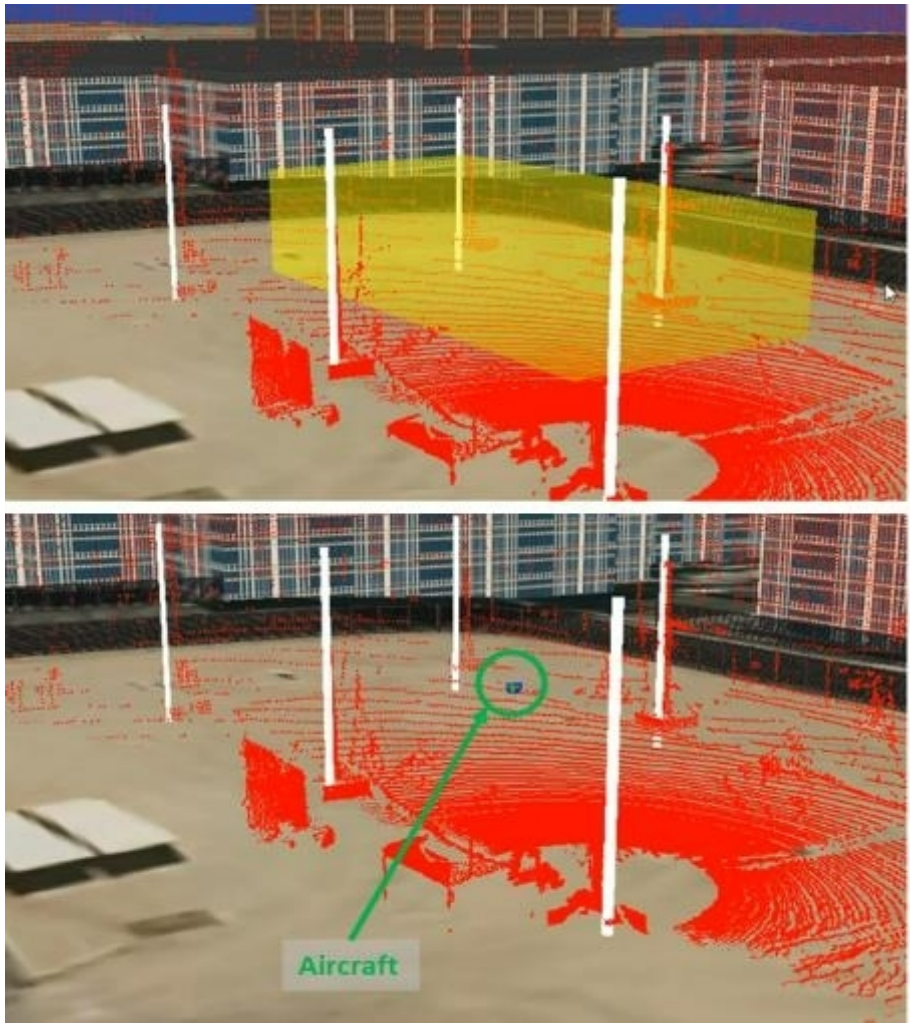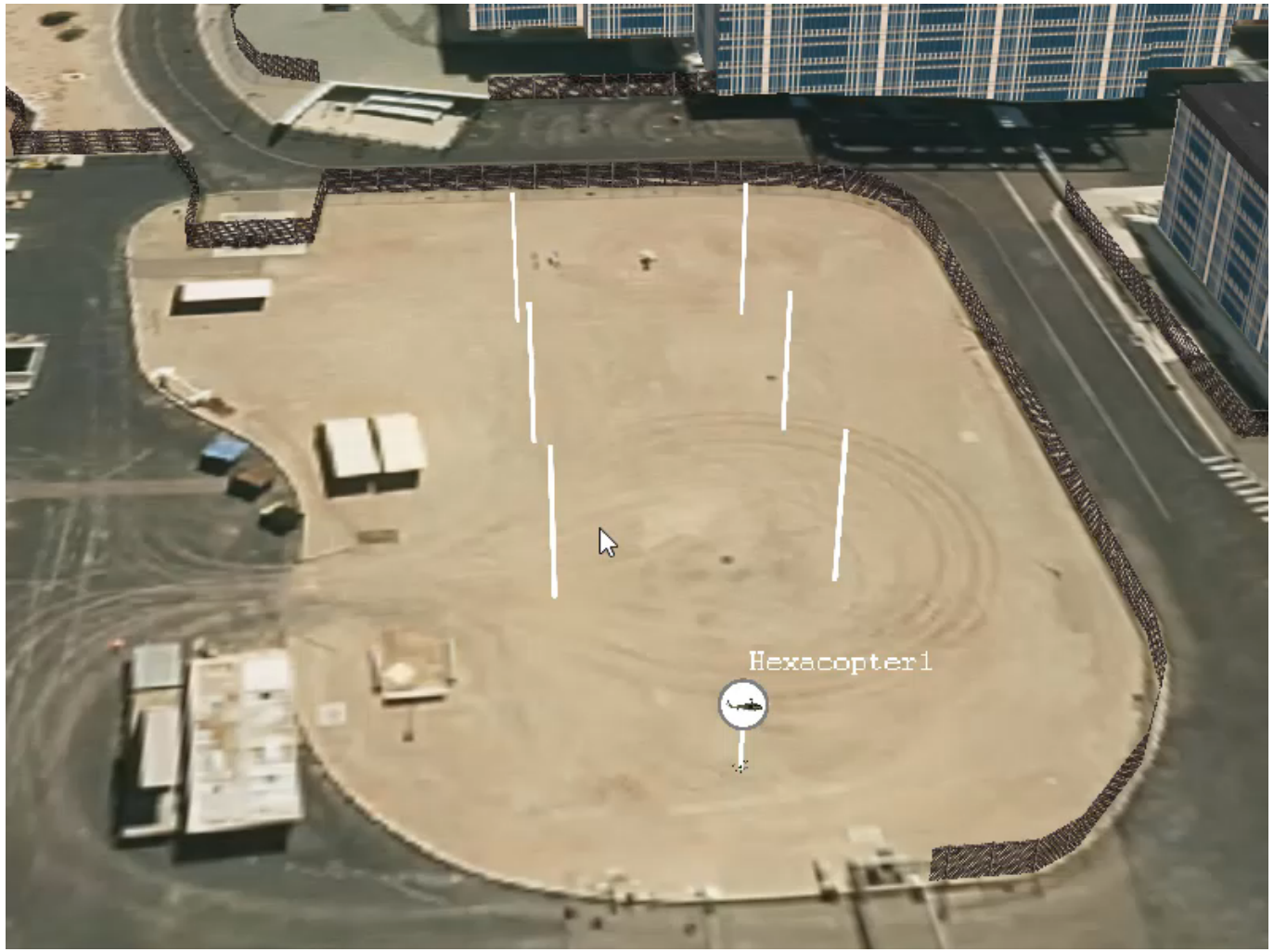
Live/Virtual construct