



# Wide Area Motion Imagery (WAMI) for Multi-INT Situational Awareness

Bernard Brower, Harris Corporation

[bbrower@harris.com](mailto:bbrower@harris.com)

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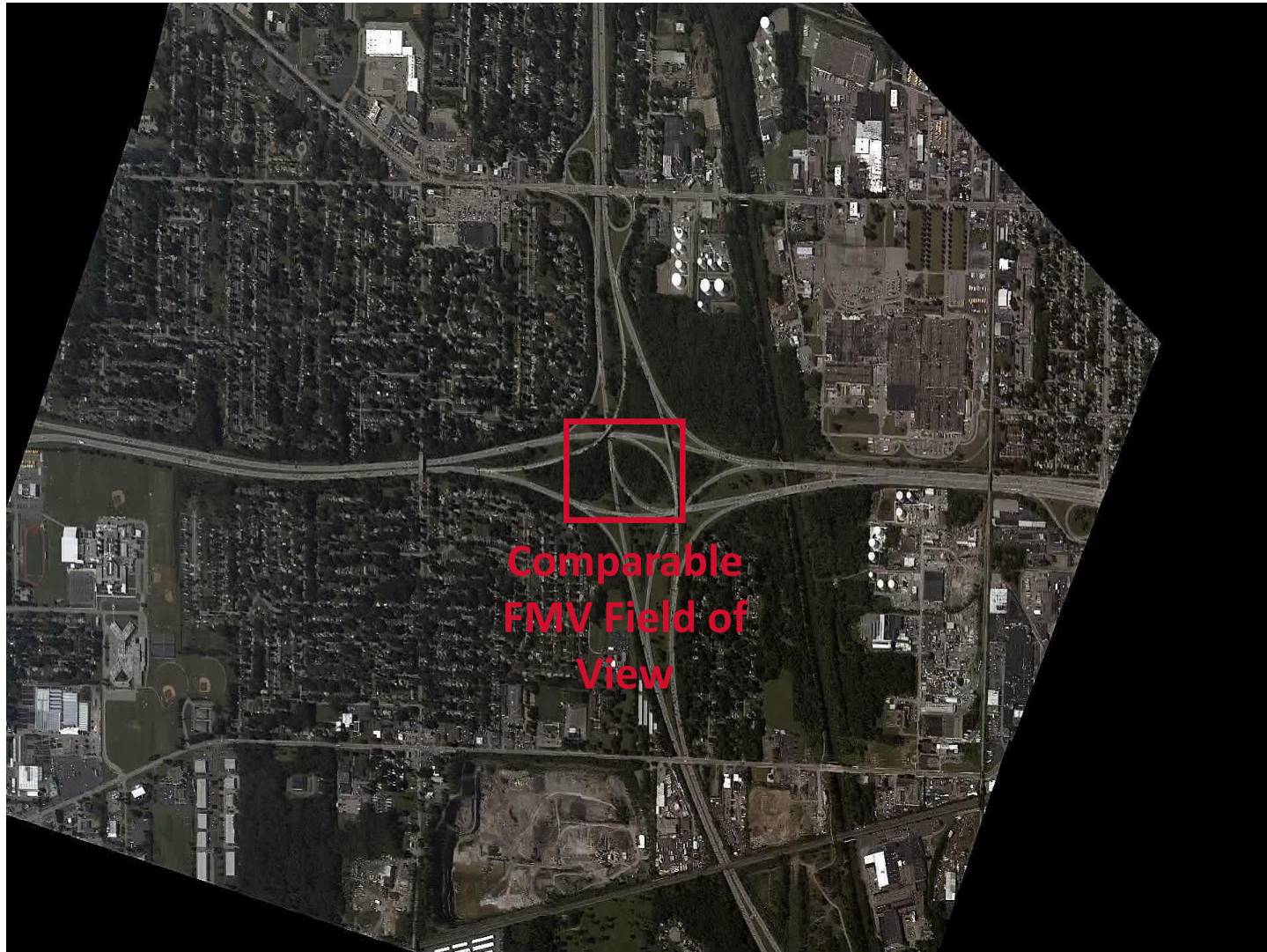
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WAMI ISR assets have only been operational for a little more than 10 years

- Technology started with Lawrence Livermore National Laboratory (LLNL).
  - 2002 started the Sonoma Project for nonproliferation applications
- First operational WAMI system was the Constant Hawk system that deployed to Iraq in 2006
  - Developed as a Quick Reaction Capability focused on counter Improvised explosive device (IED)
  - Original only a forensic tool that was used to do analysis of events that happened in a given day
- US Air Force Research Labs developed with Los Alamos National Laboratory Angle Fire (later Blue Devil) – for support of Marine missions
  - This system was mainly a situational awareness system that enabled multiple views to a ground station
- US Air Force Big Safari Program Office started the development of Gorgon Stare sensor for the MQ-9 Reaper Unmanned Aircraft System (UAS)
  - Podded system (for UAS) that includes day/night capability and can do both the forensic mission and the real-time situational awareness mission
- A variety of different WAMI sensors have been developed in the last 10 years
  - US Army AWAPSS, LodeStar, Dragon Eye, LEAPs, Kestral, Redkite, Persistent Surveillance System, ARGUS, CorvusEye

# Wide Area Coverage for Forensic Purpose (watch everything)

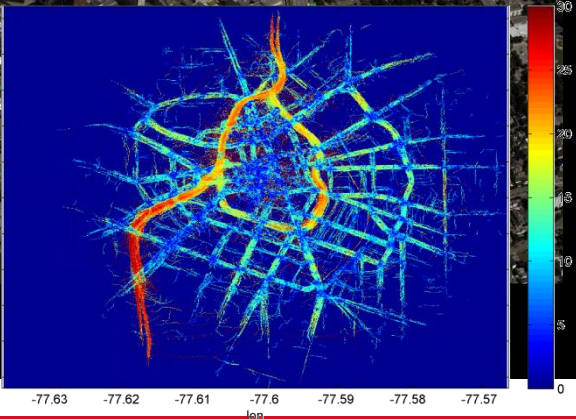
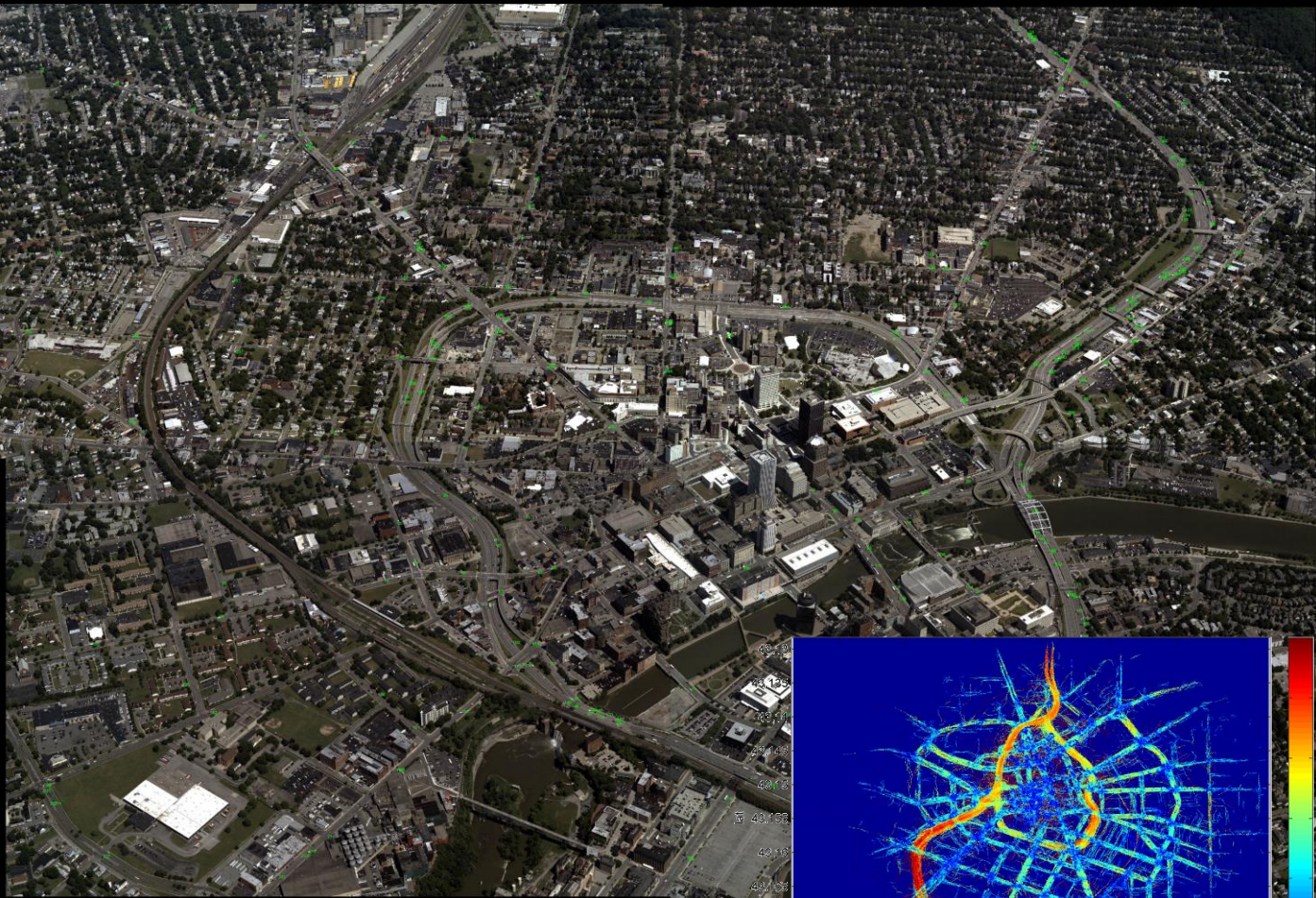


**Comparable  
FMV Field of  
View**

# Real-Time Situational Awareness



# Track Every Mover Across an Entire City...

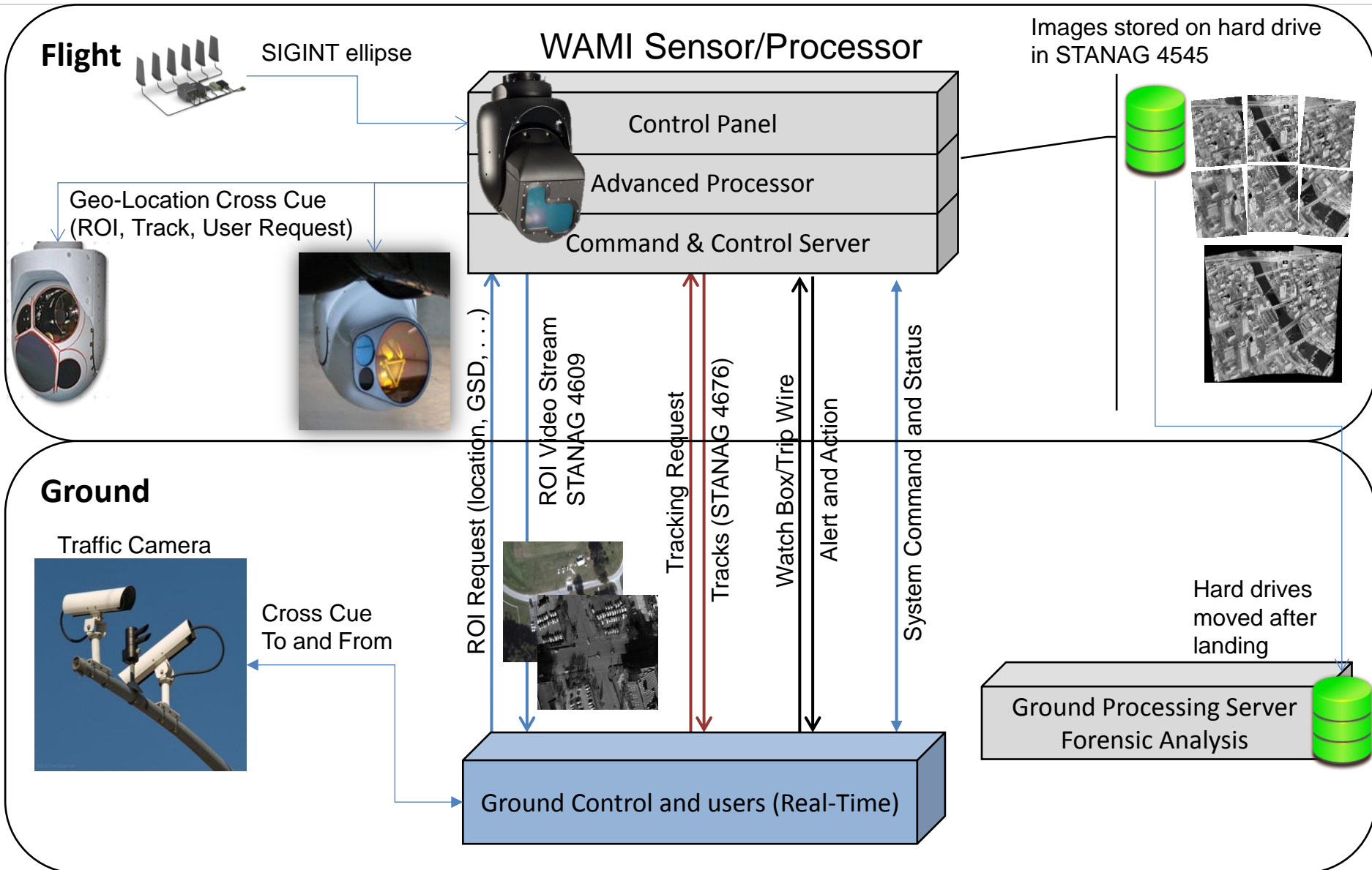


# Tracking all Vehicles in real time



- Full Motion Video (FMV) system are the most common multi-sensor combination with WAMI
  - WAMI has the large area, good resolution that can be used for situational awareness for the entire area and can cross cue an FMV system based on an event, an automated a trigger or a users request
  - FMV can zoom into an area of interest and have higher resolution and frame rate than the WAMI
- Cross Cue a scanning HSI system based on a trigger in the WAMI tracking or user interactions
  - A high value target is being tracked – and the HSI scan may detect materials of interest
- A SIGINT detection – identifies the object but has poor Geo-location capability (improves over time and multiple hits)
  - The SIGINT detection is laid on top of the WAMI (showing the activity in the possible area of the SIGINT emitter)
  - As the SIGINT accuracy improves (with more detects) the WAMI is automatically zoomed in
  - Correlation of tracks that have been within the SIGINT ellipse can be tracked

# WAMI Block Diagram





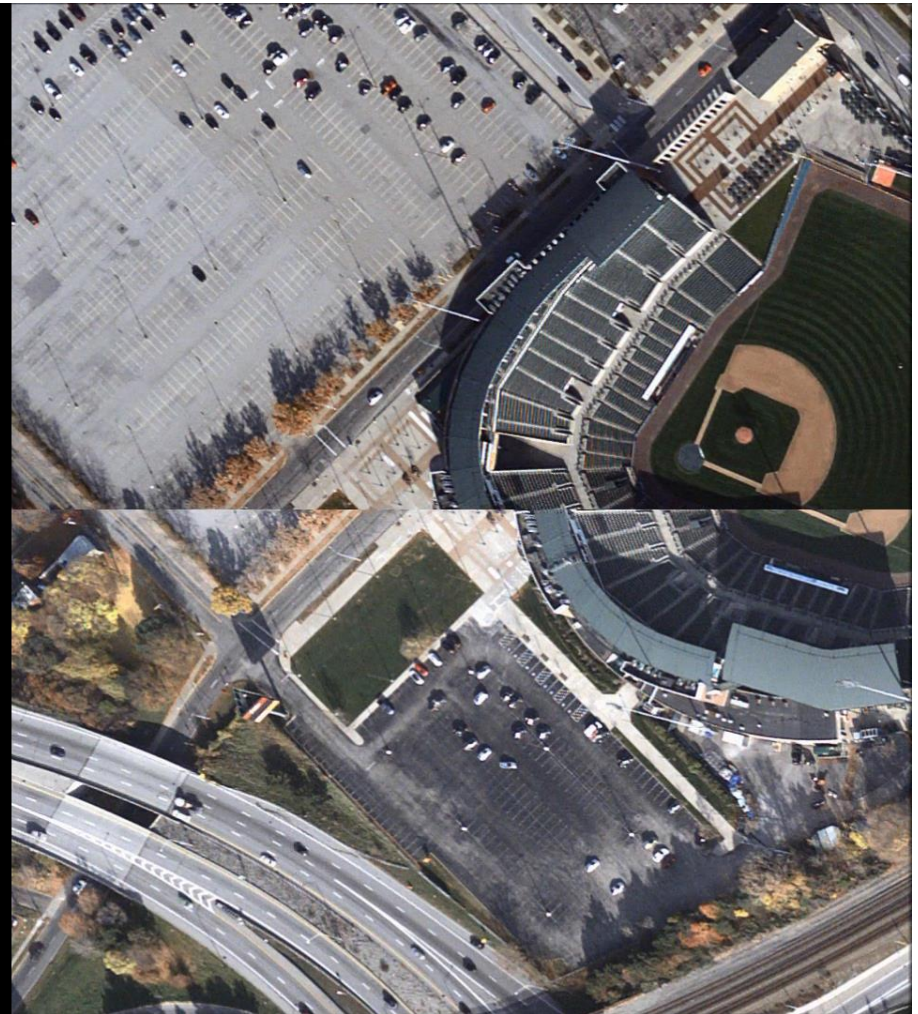
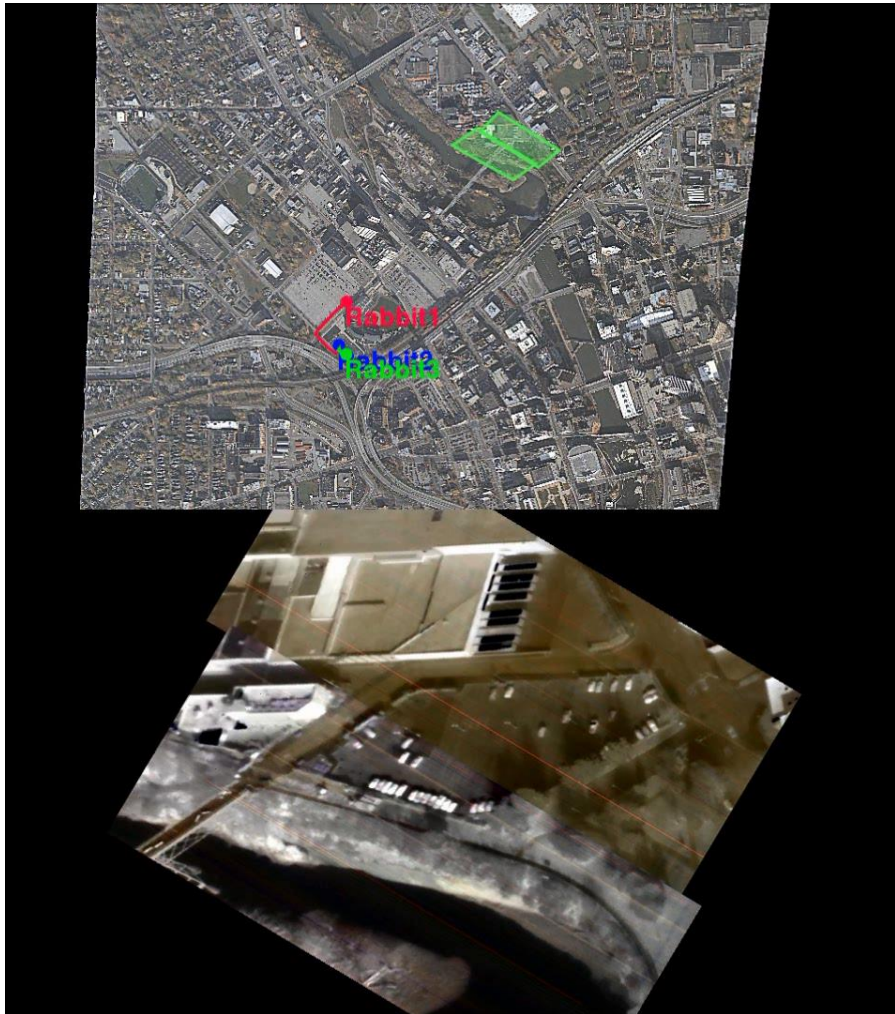
The screenshot displays the CorvusEye GNUI software interface. On the left is a map window titled 'CorvusEye GNUI' showing a geographic area with roads like 'US 69' and 'FM 2795'. A red arrow labeled 'Airplane track' points to a specific location on the map. Below the map is a 'Video Streams' table with the following data:

ID	Sensor	Location Type	Current Location	GSD (m/px)	Video Size	Viewers
0	EO	Fixed	32.881487 N 95.762226 W	0.250	640 x 480	●●●●●●
1	EO	Fixed	32.873573 N 95.766295 W	0.402	640 x 480	●●●●●●
2	EO	Fixed	32.876468 N 95.769629 W	0.199	640 x 480	●●●●●●

On the right, three video stream windows are shown, each displaying an aerial view of a road intersection. The windows are labeled 'Stream ID: 0', 'Stream ID: 2', and 'Stream ID: 1'. Each window includes a timestamp '2016-09-30 17:56:49', sensor information 'CorvusEye 1500CM EO', and geodetic coordinates. The 'Stream ID: 1' window also features navigation controls at the bottom.

Trip wire is armed, and when triggered – a new ROI is started to track target

# Cross Cue of Hyperspectral



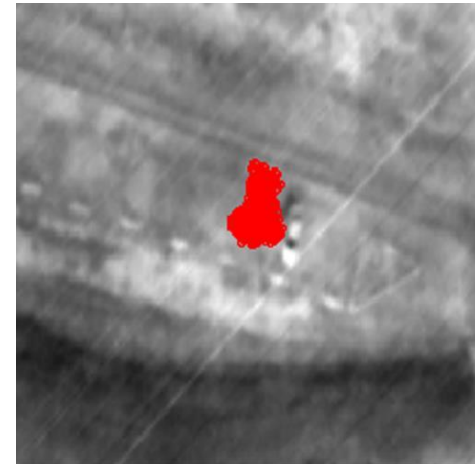
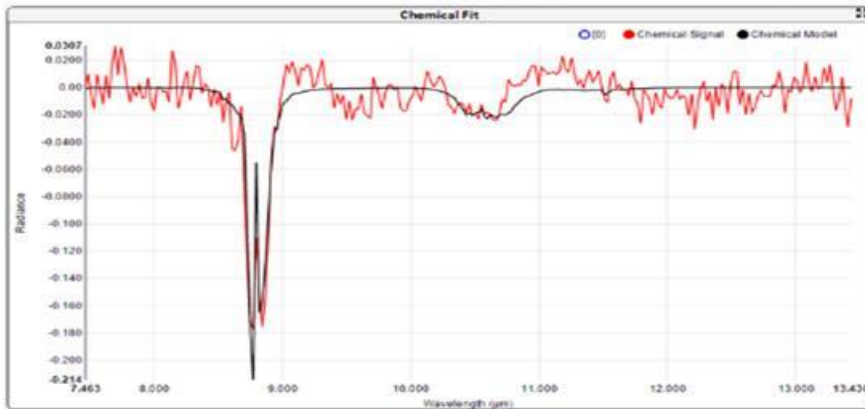
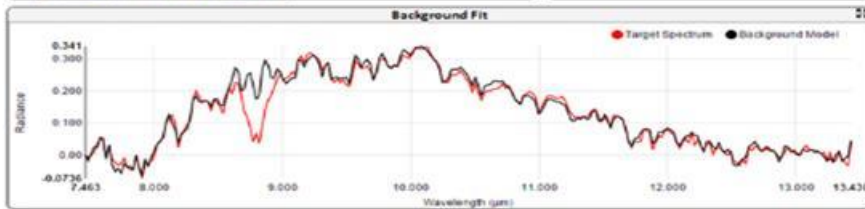
# Material ID from the cross cued HSI system



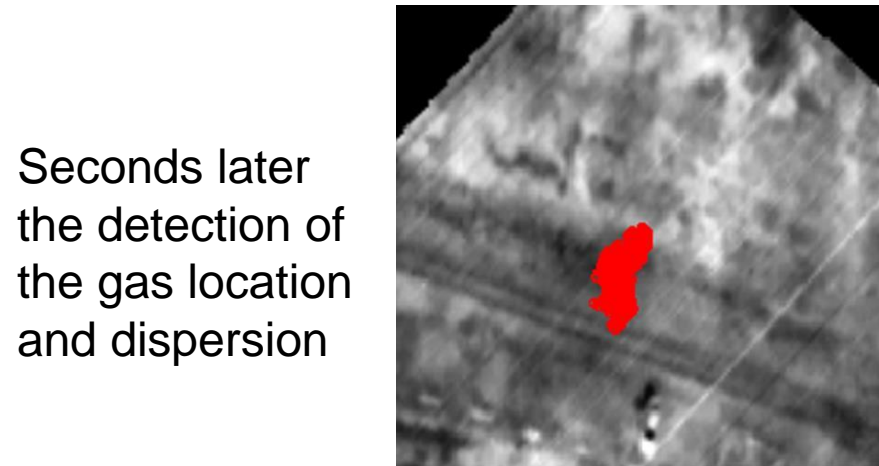
ChemID: Pixel 247, Line 261

[20151118\_150948\_hsi\_v2\_cal\_0019]

Matched Chemicals							
Chemicals	CLdT	Relative	MDQr	MIQr	Alpha	N-Alt	Sim Score
[0] (GAS/PNNL): 1,1-DIFLUOROETHA	-286.2	1.00	11.7	11.7	71.3	0%	0% 78%

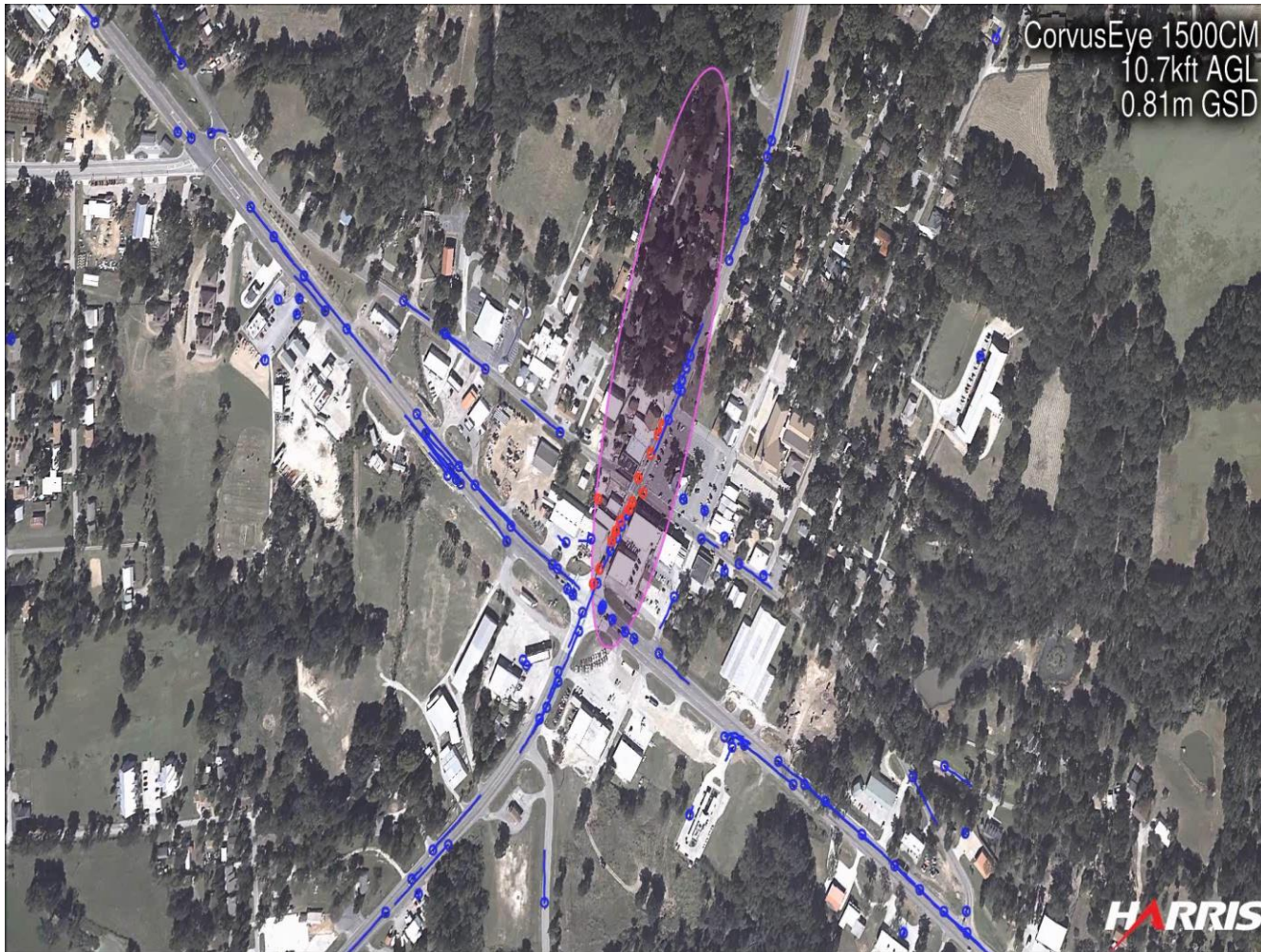


The original release of gas from the passenger side of the car



Seconds later the detection of the gas location and dispersion

# Correlation of SIGINT with WAMI/Tracks



Correlation of SIGINT ellipse with track data (red are possible correlation)

- WAMI ISR technology continues to evolve with improved processing power and more advanced algorithms
  - Increased automation of detection and tracking of objects, identification of events, development of normalcy and activity based intelligence
- The large continuous coverage of a WAMI system makes it ideal for the situational awareness for the correlation of multiple sensors/multiple INTs
  - Large day/night coverage, real-time processing and forensic data

## Two Main WAMI interactions with other sensors

- Cross cueing from the WAMI sensor – based on an event/watch box/tripe wire/detection of non-normal behavior
  - Cross cue an FMV system to get a closer look (better resolution and frame rate)
  - Cross cue of an HSI sensor to detect and identify objects
  - Cross cue to ground sensor (traffic camera) to get a closer look
- Cross cueing to the WAMI sensor
  - Start a Region of Interest stream or a watch box or tracking objects based on SIGINT collect
  - Start a tracking ROI of an object that triggered a ground based sensor