

[dstl]

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Ministry
of Defence

Airborne Full Motion Video Research Dataset

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 - How can signal processing assist the imagery analysis community?

Military Imagery Analysis

- Imagery Intelligence (IMINT) Analysts use data collected from fixed-wing aircraft, helicopters, Unmanned Air Systems (UAS), balloon/mast mounted cameras, remote turrets on ships and vehicles, and covert/buried cameras.
- The emphasis is on imagery/data collection that allows analysts to answer the customer's intelligence requirements.
- Customers range from the strategic-level (with a product turn-a-round measured in days), to the tactical-level where an under-fire Rifle Section wants the analyst to identify where the gunman is located (with a response expected in seconds/minutes).
- The analytical process can be intensive and take considerably more time than collection.
- The IMINT products often utilise other sources of intelligence, and increasingly open source imagery/data, in order to enhance the relevance and accuracy of the analysis provided.

Imagery Analyst Tasks & Products

- Detailed Target Analysis (DTA)
 - Dimensions of all buildings (internal and external if possible)
 - All access points into buildings (doorways, windows, roof hatches etc...)
 - Access to the facility/compound (gates, walls, fences, paths, tracks, etc...)
 - Types and purpose of buildings (residential, storage, agricultural etc...)
 - Any other detail that can be observed (presence of vehicles, animals, armed personnel, non-combatants, trip hazards etc...)

“Everything that a soldier would want to know before he sets foot in the target area”

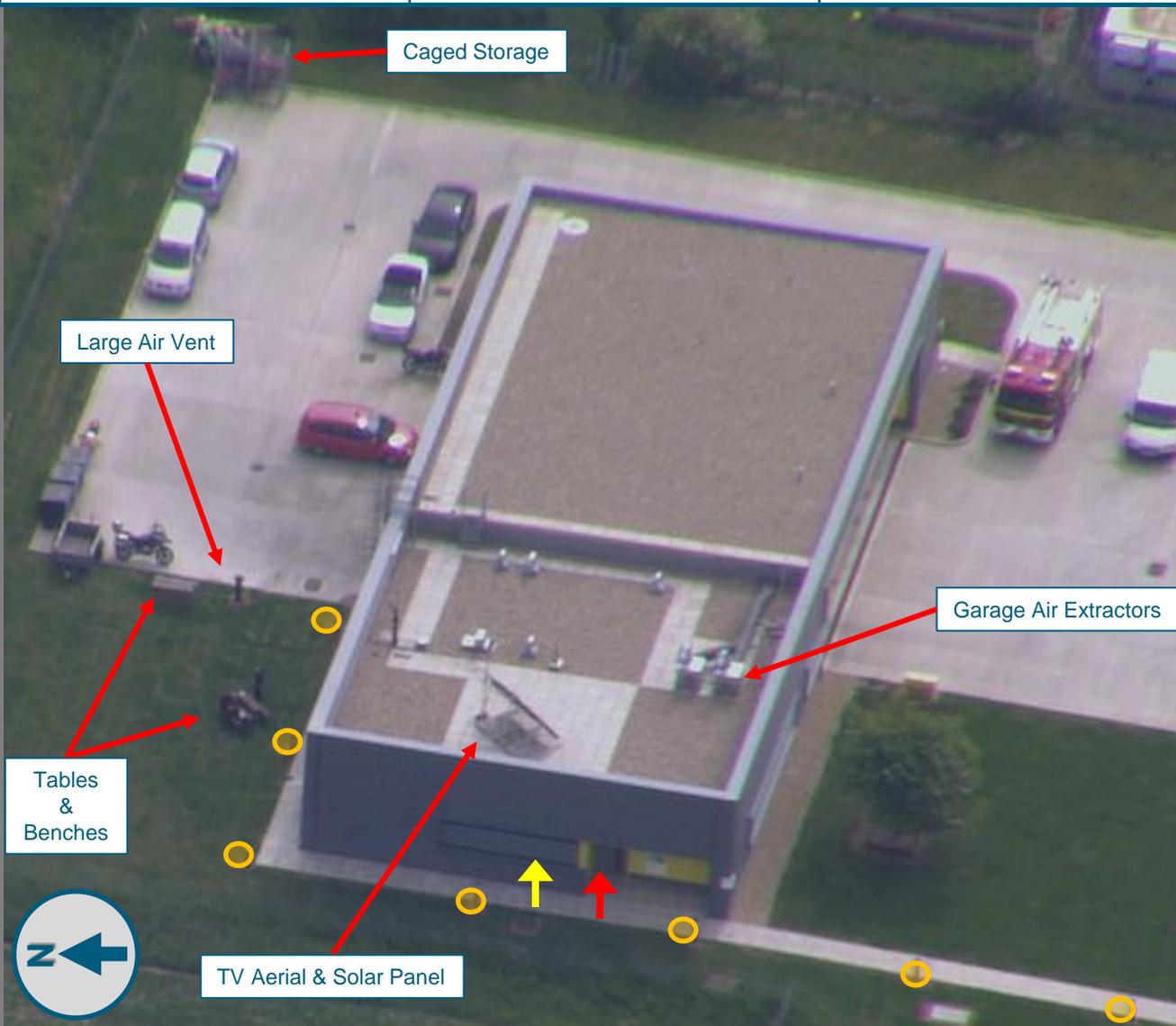


IMAGE DETAIL:

Fire Station imaged from the West.

ASSESSMENT: The Fire Station is rectangular in shape, measuring approximately 60m x 20m x 6m. The building itself has two distinct working areas. An office/administration area is located on the Western side of the building, whilst the Eastern side is most likely garages and storage for heavy equipment.

The primary pedestrian access to the building is via a covered doorway in the Southwest corner. The large window on this side of the building is covered in the same metal bars as seen on the South side of the building.

The caged storage area to the Northeast of the building is most likely used to store oil, lubricants, paints etc... Large vehicle tyres were amongst the pile of equipment to its' rear. **ASSESSMENT ENDS**

KEY:

- Windows
- Pedestrian Door
- Area Lighting

Imagery Analyst Tasks & Products

- Activity Analysis / Storyboard

This is often produced as a record (with analysis and assessment) of a particular event observed. This can be in relation to the identification of suspicious activity (e.g. by a vehicle or persons), or in support of a Positive Identification (PID) incident in which analysts have identified and categorised:

- Military/Criminal/Insurgent associated locations.
- Military/Criminal/Insurgent vehicles and equipment.
- Weapons carried or operated by Military combatants, Criminals or Insurgents.
- Explosive or IED related manufacture and/or its placement.



B1 with LBW

C2

B2 with RPG

B3

C1

OP7 Hut

B1 & B2 with weapons

IMAGE DETAIL:

At 0845hrs, 2x Insurgents (B1 and B2) were observed leaving the OP7 Hut and stood to the rear of a Red Pickup Truck (C1). After several minutes they were joined by another Insurgent (B3), who arrived in a White Pickup Truck (C2).

At 0955hrs, B3 opened the rear of C2 and handed B1 and B2 an unloaded Long-Barrelled Weapon (LBW) and an RPG. Whilst they stood in the area comparing weapons, B3 placed a large bag in the rear of C1

B1 and B2 then placed the weapons in the rear of C1 and got into the vehicle cabin. Both vehicles then left the vicinity of the OP7 Hut, travelling Southwest on the all-weather track.

ASSESSMENT: The LBW is assessed to be a AK-variant rifle, whilst the RPG is assessed to be either unloaded or fitted with an OG-7 warhead. B3 is believed to be a Lethal Aid Facilitator who has retrieved the two weapons from a local hide. **ASSESSMENT ENDS**

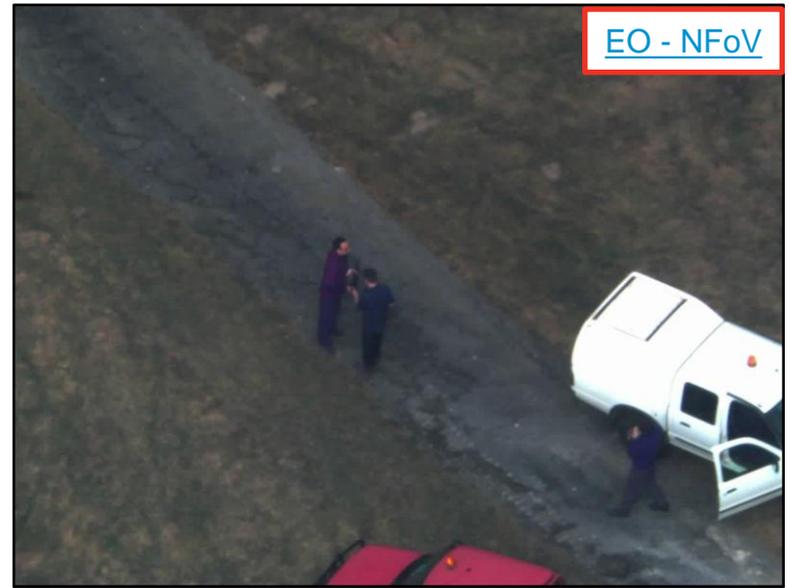
Imagery Analyst Tasks & Products

- Route Reconnaissance
- Battle Damage Assessment (BDA)
- Habitation Analysis
- Pattern of Life Study
- Helicopter Landing Site (HLS) Study
- Mapping & Mosaics

EO – WFoV



EO - N FoV



IR – White Hot

- **Releasable militarily relevant imagery**
 - With example intelligence products
- **~10 hours of high-definition airborne video**
 - EO Wide and Narrow Field of View, IR and Low Light TV
 - Sensor position, orientation, field of view digital metadata
 - *MPEG video in MXF container*

Challenge to the R&D community

- How can advanced signal processing and machine vision techniques assist Military Imagery Analysis?
 - To support real-time exploitation
 - To support retrospective analysis
 - To extract intelligence from archived datasets

Detailed Target Analysis Example



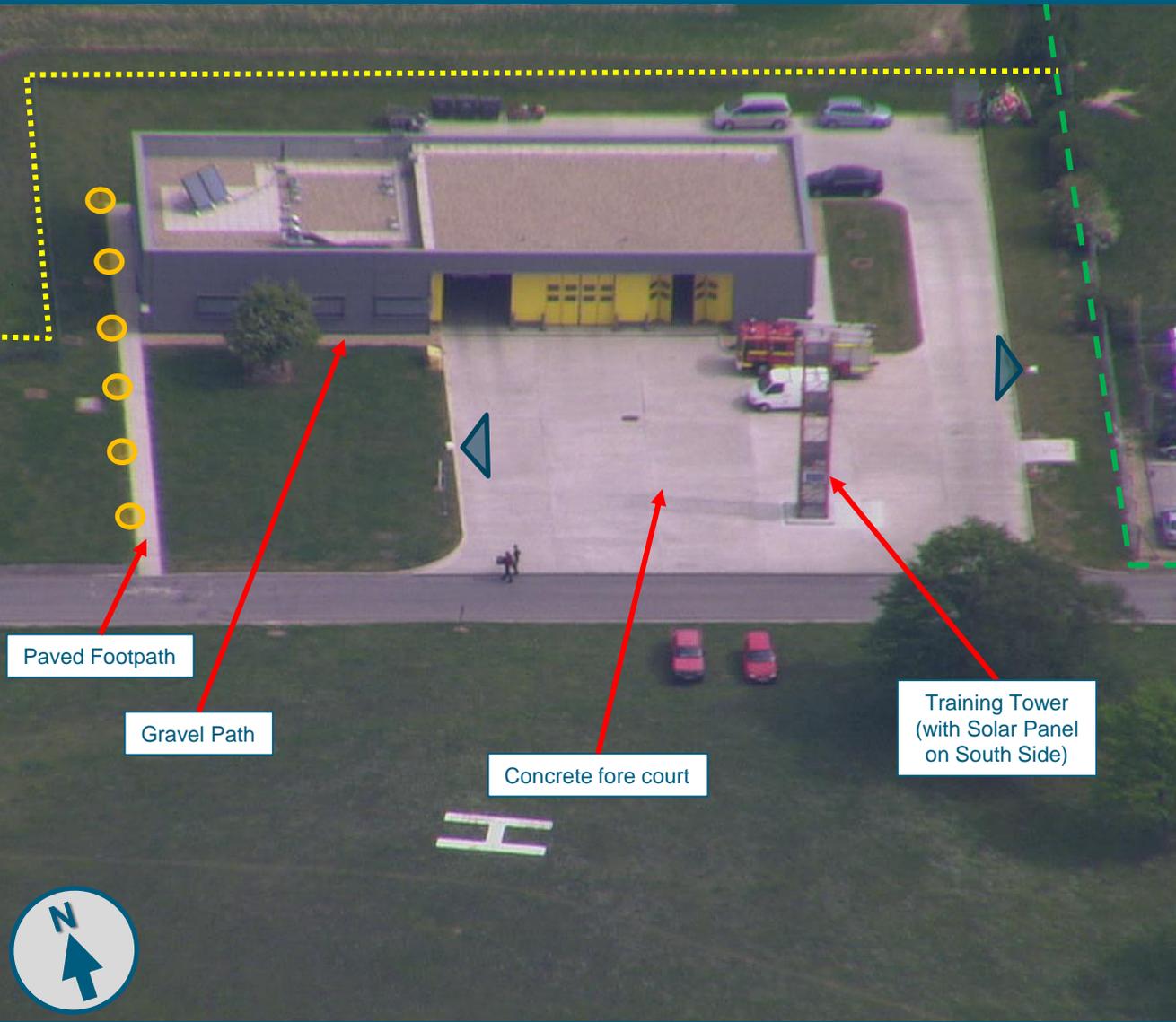


IMAGE DETAIL:

Fire Station imaged from the South.

ASSESSMENT: The Fire station can be approached easily from the South and West. Fences to the North and East will slow any ingress / egress.

A high count of two fire engines and six other vehicles were observed in the station's parking areas. INS were only observed parking their vehicles on the grass opposite the station.

ASSESSMENT ENDS

KEY:

- 1m Fence
- 2.5m Security Fence - - - - -
- Elevated Spot Lighting ◀
- Area Lighting ○

Summary

- You've seen what we do with Full Motion Video data
 - How would you do it?
- Please register interest with me:
 - John Dawson : jdawson@dstl.gov.uk

Any questions?

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