The Sky is Falling Down

Unmanned Aerial Vehicles as Emerging & Disruptive

Technology Threat Assessment

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Non-Sensitive Information
Releasable to the Public

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Background

Modern technology changes have decreased the price of Unmanned Aerial Vehicles (UAVs) making them more accessible to guerilla or radical forces.
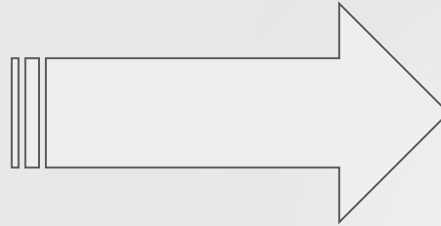
Drones will become the new 'technicals'' of the modern day battlefield

The past and the future

Technicals from Libya

Top: Explosives equipped drone captured in Iraq
Bottom: Hamas explosives airdrop drone

Why Drones?

Commercially available drones have been the platform of choice due to :

- Relatively low cost
- Flexibility to change the payload of the drone (e.g. cameras, weapons, sensors) depending on the mission
- Anonymity

Big Drones League

Medium-Altitude Long-Endurance (MALE) drones :
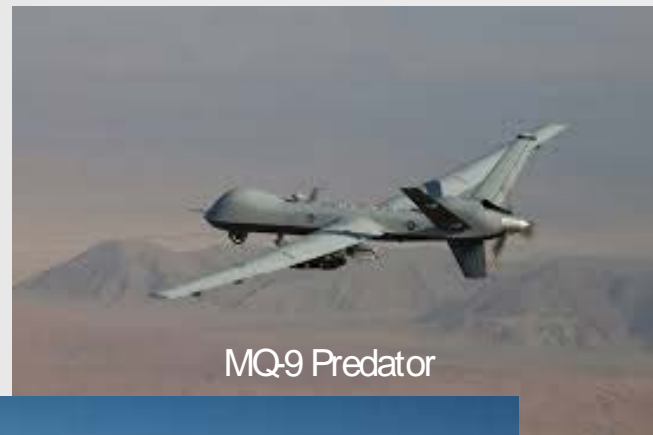
      Operational Altitude: 25,000 and 50,000 feet

    Operating time : 24-hours

High-altitude, long-endurance (HALE) drones:

      Operational Altitude: 60,000 feet

      Operating time: 32 hours

MQ-9 Predator

RQ-4 Global Hawk

The Islamic State (ISIS) Drone Program Case Study

ISIS developed its own drone program without any financial aid from a state actor

Used or modified already existing off-the-shelf commercial drone dev[...] makeshift flying machines

Provided detailed instructions online

صورة توضح الشاشة المستخدمة والتي تستلم الفديو مباشرة من جهاز ارسال الفديو المثبت على الطائرة بدون الحاجة الى مستلم خارجي يثبت على ظهر الشاشة حيث تحتوي على جهاز استقبال داخلي مع انتينا عدد ٢ لأفضل صورة اج دي

The Islamic State (ISIS) Drone Program Case Study

Fully operational logistics cycle

Location: Raqqa, Syria

Timeframe: ~ early 2017

Training center

IED Weaponization Base

Modification & Maintenance Base

Storage Facilities

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Threat Identification

The use of drones as an attack vector

Intelligence, Surveillance and Reconnaissance (ISR)

Real time information with high resolution cameras

Identify the location of facilities, personnel, vehicles

Coordinate a later strike: Reconnaissance, Surveillance, and Targeting Acquisition(RSTA)

Drone Bombing

➔ Demonstration for their tactical capabilities

➔ Suicide or Ordnance Airdropping (JPADS)

➔ More quick & precise than mortar

➔ In short : a flying-precise IED

Image source:https://www.mirror.co.uk/news/world-news/isis-using-increasingly-unconventional-weapons-9928395

Electronic Warfare

State of the art attacks, out of the terrorist groups capabilities for now.

Electronic warfare manned aircrafts will soon be replaced by drones

Small drones with limited EW already exist

DangerDrone - Bishop Fox

Threat Matrix

			Impact			
			0 **Acceptable** Little or No Effect	**1** **Tolerable** Effects are Felt but Not Critical	**2** **Unacceptable** Serious Impact to Course of Action and Outcome	**3** **Intolerable** Could Result in Disasters
Likelihood	Improbable	Risk Unlikely to Occur			Electronic Warfare	
	Possible	Risk Will Likely Occur				
	Probable	Risk Will Occur				ISR, Drone Bombing

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Interdiction Plan

Mitigate the Drone Threat

Planning at a higher level
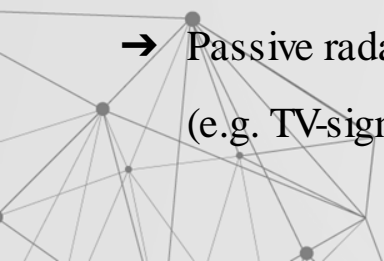
1   Detection of drone

2   Identification of ally or hostile/ Verification of intent

3   Elimination/ Mitigation of threat

Detection of Drone

Existing or experimental technology:

➔ Visual identification with or without assistance (e.g. cameras with image processing identification algorithms).

➔ Software assisted visual identification and neural network classification to identify and predict drones trajectory

➔ Acoustic detection focusing on humming sound frequency of the propellers

➔ A combined method of visual and audio, using an array of microphones and cameras

➔ Passive radar (as an alternative to conventional radar), which exploits existing infrastructure (e.g. TV-signal towers) as transmitters of opportunity

Identification of Drones

Key points:

➔ More drones are expected to occupy the airspace

➔ Distinction between friendly and hostile drones

➔ Already existing technology: ADS-B

➔ Proposed - Future technology : FAA remote ID
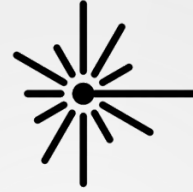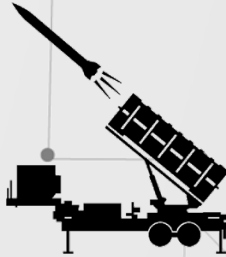
Elimination/ Mitigation of threat

Drone Net

Signal Jammer

Electro-Magnetic Pulse

Laser

Missile

Conventional Weapon

Birds of Prey

No-Fly Zone

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Evaluation Plan

Assessing the impact and re-designing the Interdiction plan

Evaluation Plan

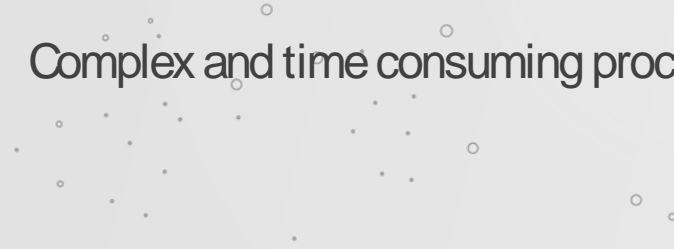Red teaming evaluation scenario

Determine the effectiveness of drone countermeasures

Proposed Aspects:

      Threat Emulation

      Operational Impact

Complex and time consuming procedure

Threat Emulation

Objectives:

➔ Challenge the full scope of the defences counter measures

➔ "Real attack" using drones as attack vectors

➔ Different plan for each "Target" (Infrastructure, Personel, Vehicles)

Operational Impact

Objectives:

➔ Determines the survival and continuity of the operation

➔ Quantification of realistic impacts against a selected target

Conclusion and Future Planning

Current legal framework has to be revised

Define operational framework

Evaluation and refinement of current personnel training

Standardisation of action against mentioned threats

Targets	Threat	Vulnerabilities	Mitigation
Military	Delivery	Infrastructure - Hardware	Hardware
Critical infrastructure	Disruption	Software	Software
Public/Private space	Eavesdropping	Operational	Legal
Civilians	Electronic Warfare	Training	Operational
	Casualties	Legal	Training
			Standardisation

Figure: Summarization of proposed mitigation plan

Questions?

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