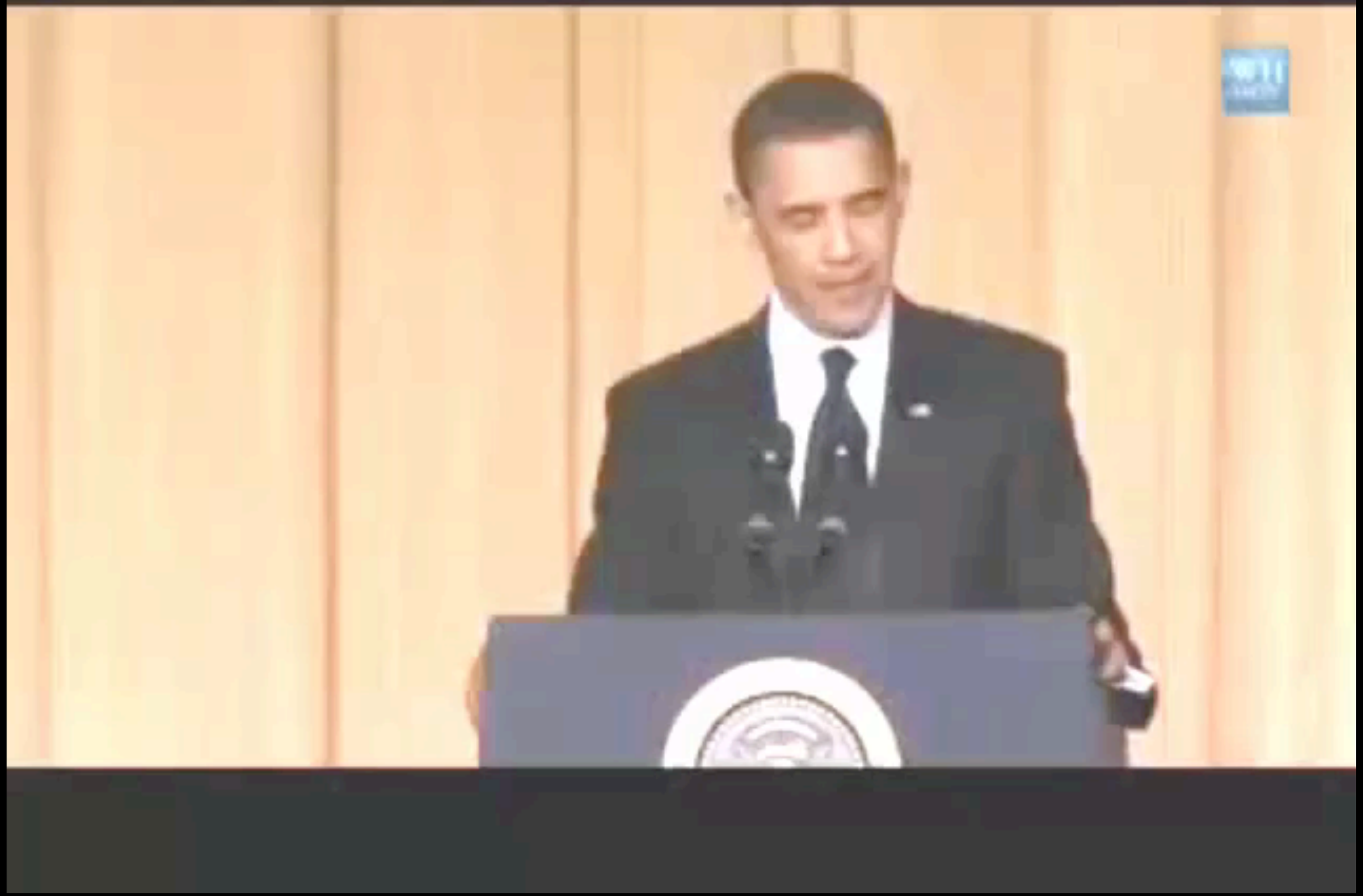
ethical and IHL issues in military robotics

proliferation, autonomy and prohibition

ISODARCO january 2013

Noel Sharkey
University Sheffield UK
ICRAC



UAV, UCAV, RPA, drone

MQ-1 PREDATOR WITH HELLFIRES (USAF)

UAV, UCAV, RPA, drone

perceived accuracy

expansion of the battlespace

moral buffer?

TBIJ CIA Drone Strike statistics

Pakistan 2004–2013 strikes: **359** killed: **2625-3440**
Obama strikes: **307**
civilians killed: **473-889** **Children killed: 176**
injured: **1264-1424**

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Somalia 2007 – 2013 strikes: **10-23** killed: **58-170**
Civilians killed: **11-57** **Children killed: 1-3**

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are Drone attacks now action short of war?

will they lower the threshold for war?

"It is well that war is so terrible, or we should grow too fond of it."

Robert E. Lee, at Fredericksburg

2. Proliferation

driven by commercial interest

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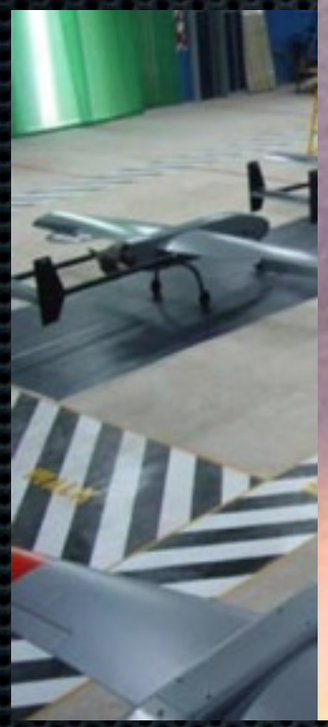
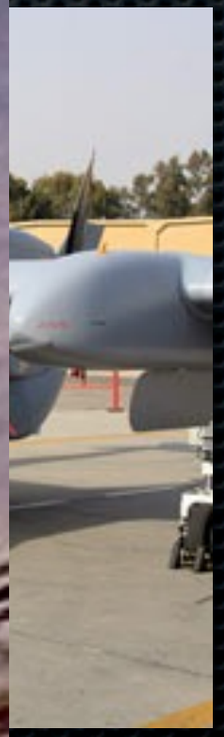
driven by commercial interest

countries developing
and/or
purchasing military robots

proliferation of military UAVs

proliferation of military UAVs



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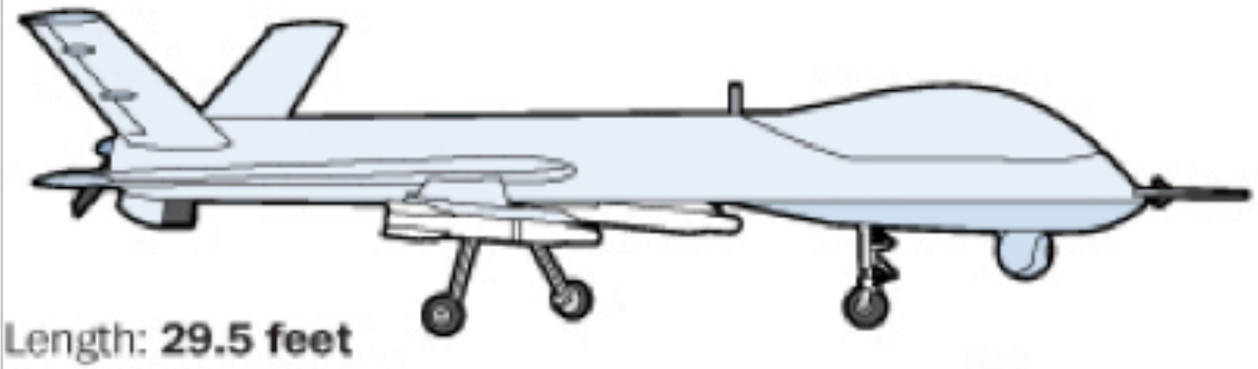
CAPTURED
RQ170 – هواپیمای پیشرفته جاسوسی آمریکا



Length: **29.5 feet**
Range: **2,485.5 miles**
Maximum speed: **174 mph**
Maximum altitude: **16,404 feet**

翼龙

Yilong (Pterodactyl)

This medium-sized, propeller-driven drone is China's answer to the U.S. Predator and MQ-9 Reaper drones — with a similar V-tail configuration. Its manufacturer, Aviation Industry Corp., says the Yilong has undergone test flights and is now the only drone being freely sold on the international market that can be used for both reconnaissance and strikes.

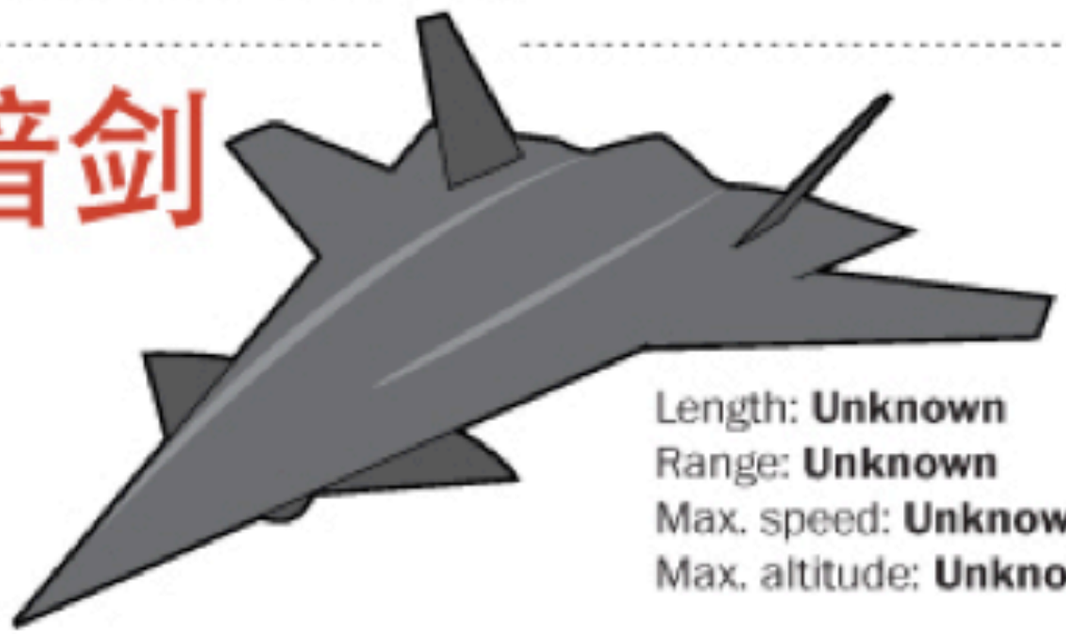
Xianglong (Soaring Dragon)

Produced by Aviation Industry Corp., this is the Chinese version of the U.S. RQ-4 Global Hawk — an advanced, high-altitude, long-duration drone designed for reconnaissance. The main difference is that the Xianglong has only a fraction of the Global Hawk's range; its manufacturer says it is intended for operations limited to the Asia/Pacific region.

翔龙

Length: **45.9 feet**
Range: **4,660 miles**
Max. speed: **466 mph**
Max. altitude: **57,000 feet**

暗剑



Length: **Unknown**
Range: **Unknown**
Max. speed: **Unknown**
Max. altitude: **Unknown**

Anjian (Dark Sword)

This conceptual model generated huge buzz when unveiled by Shenyang Aircraft Co. in 2006 because it represents the aspirations of the Chinese to design something even Western powers don't have yet — a supersonic drone capable of air-to-air combat as well as ground strikes. No one knows whether it can really be achieved and how far along in development the model is.

"The United States doesn't export many attack drones, so we're taking advantage of that hole in the market"

Zhang Qiaoliang, Chengdu Aircraft Design and Research Institute,

Current Export Restrictions

Missile Technology Control Regime (MTRC)
34 countries (informal and voluntary)

restricts *export* of UAVs capable of carrying a payload of 500 kilos at least 300 kilometers

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US: **International Traffic in Arms Regulations (ITAR)**

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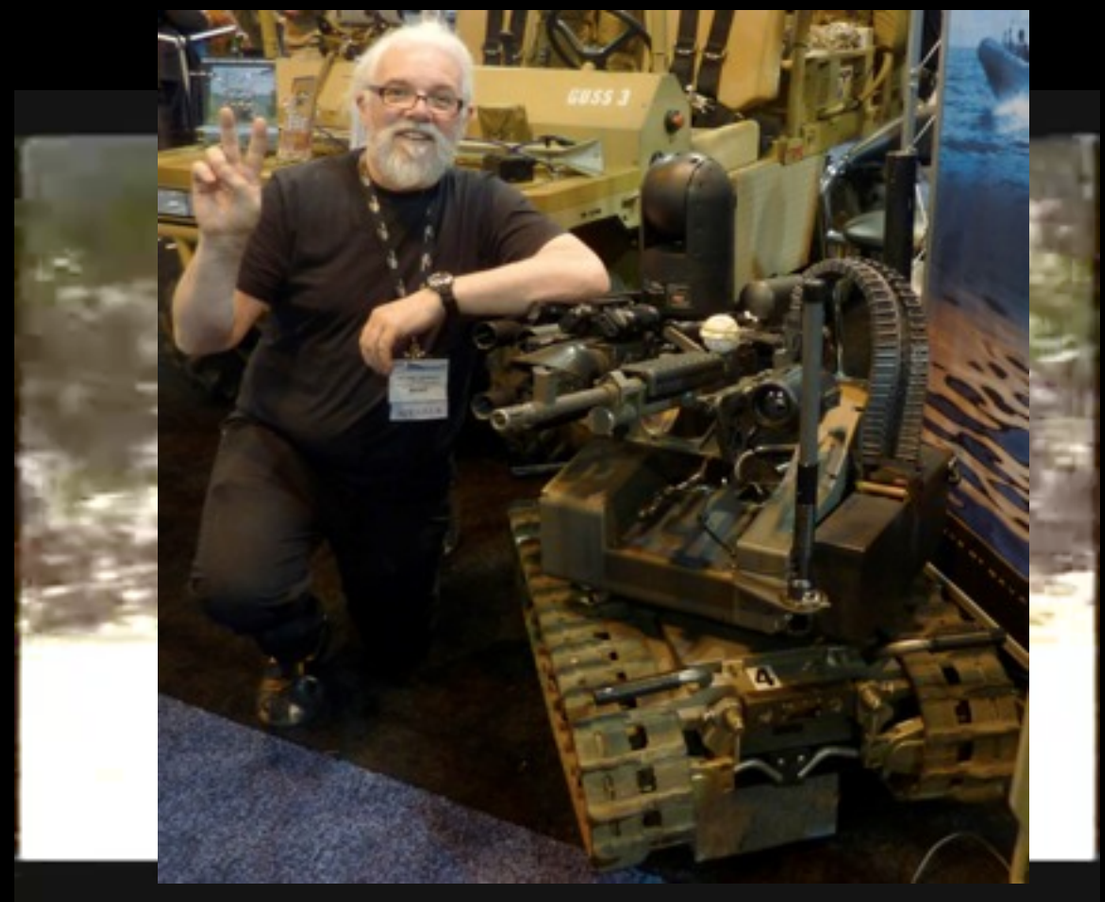
US: **International Traffic in Arms Regulations (ITAR)**

September 6 2012 easing of restriction to allow US sales of drones to 66 unspecified countries


01
A3

from Russia with love



US MAARS

USAF roadmap 2009-2047

USAF roadmap 2009-2047

Man-**in**-the-loop

progresses to

Man-**on**-the-loop

Will we entirely automate warfare one day?

what does autonomy mean?

what does autonomy mean?

- takeoff and landing
- navigation
- obstacle avoidance
- object classification
- target location & selection

autonomous decision making

autonomous decision making

IF vehicle in GPS specified region

AND

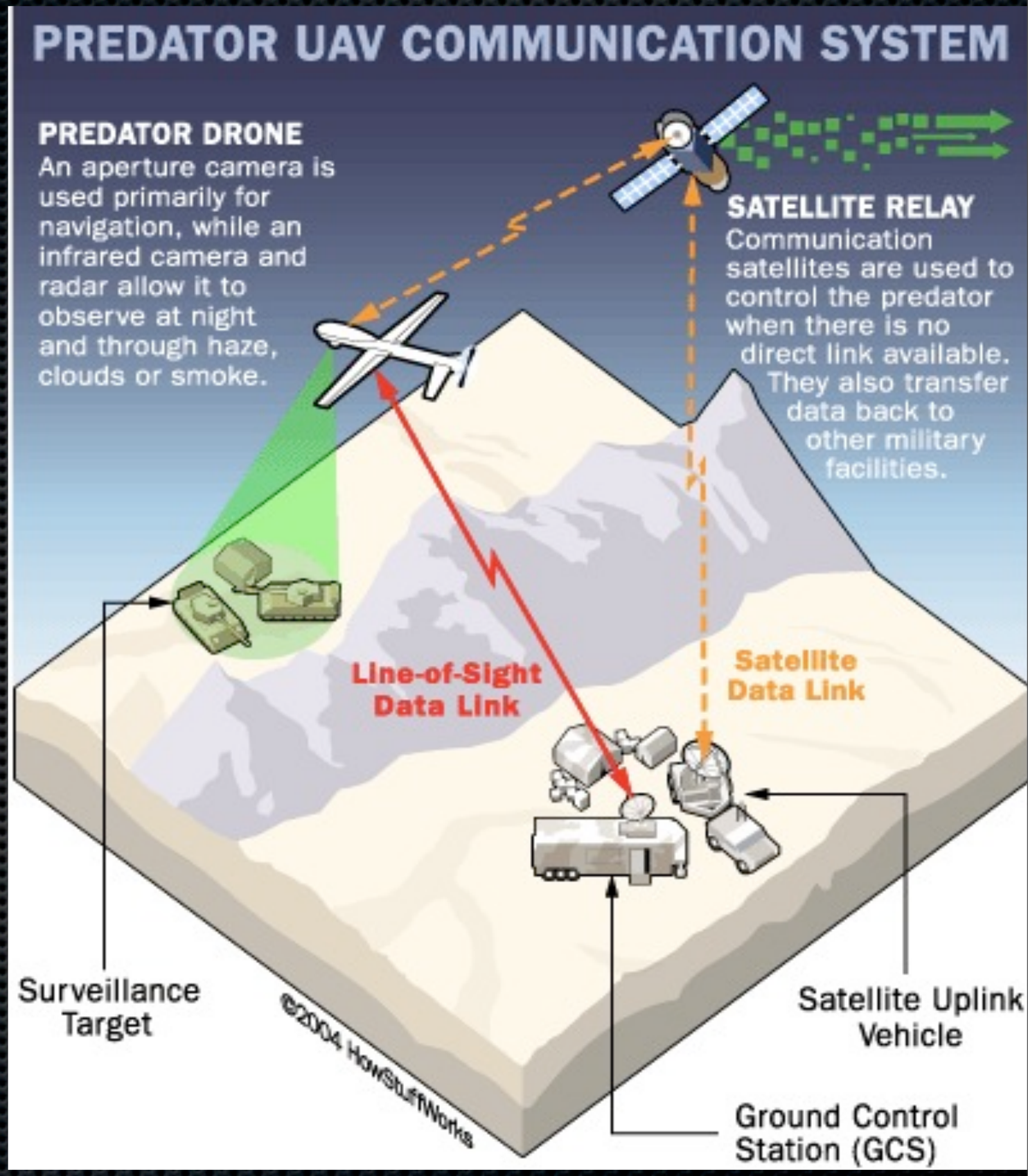
heat signature detected

THEN

select target and release weapon

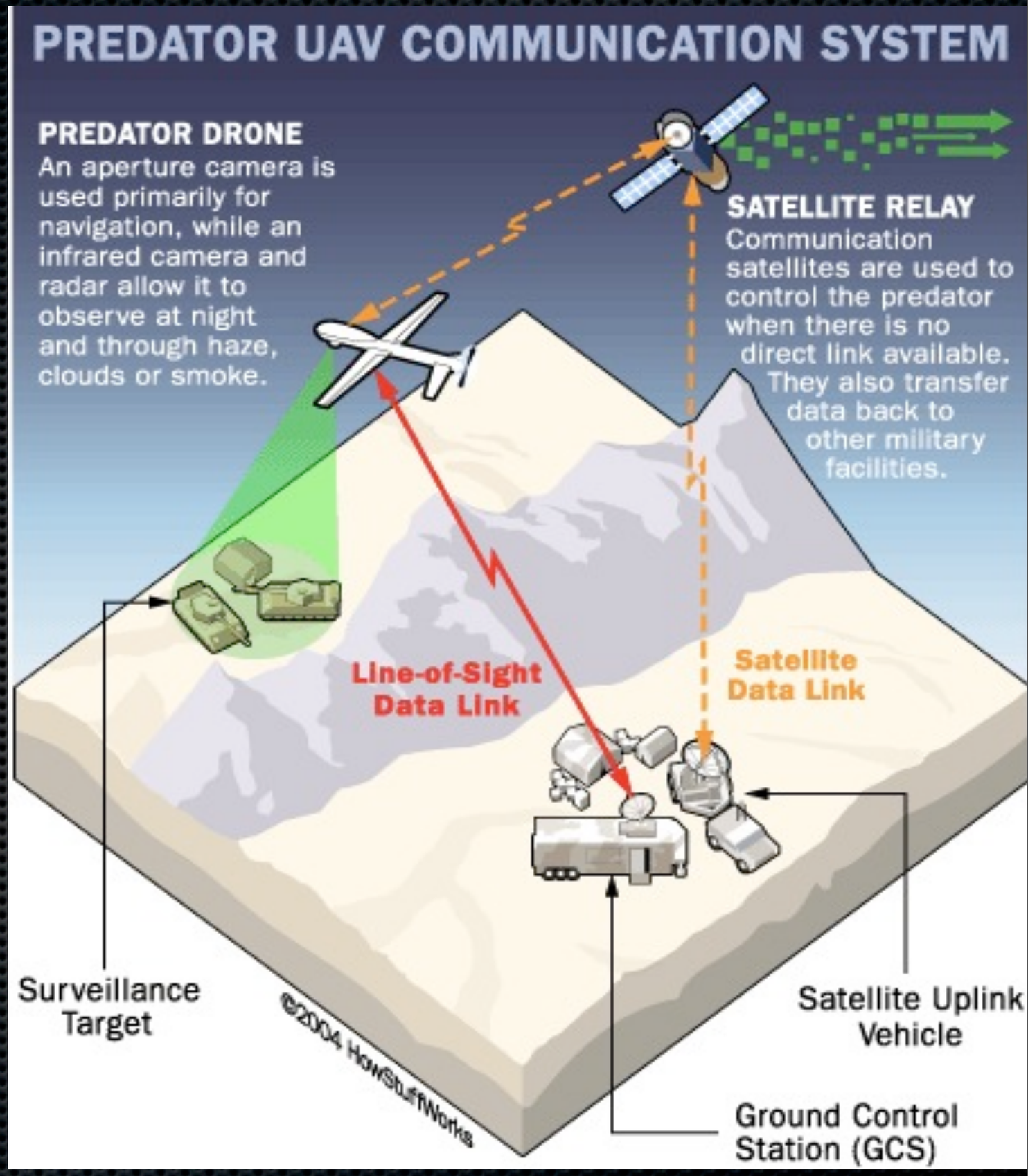
why autonomy?

why autonomy?



why autonomy?

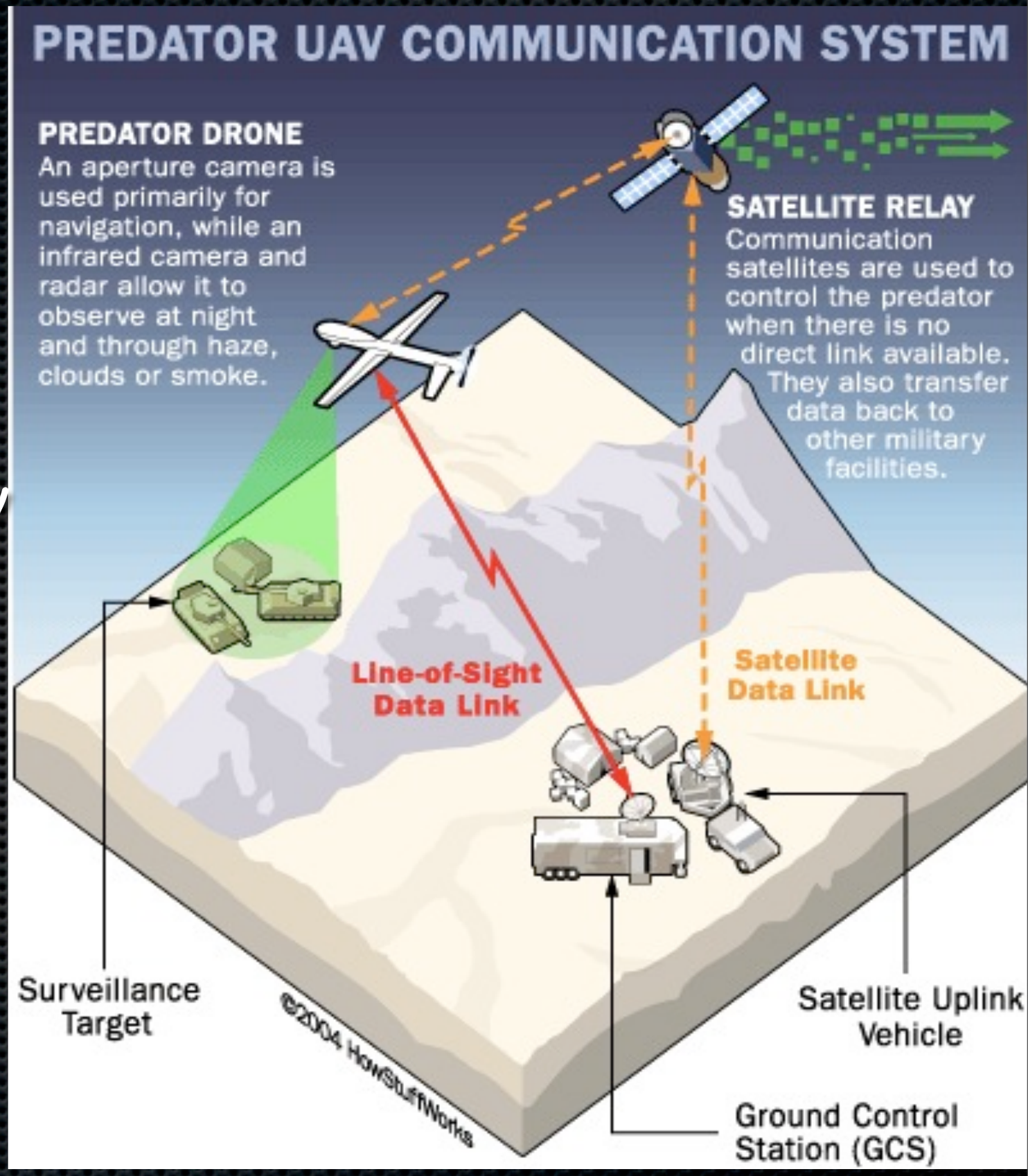
signal jamming



why autonomy?

signal jamming

deep mission capability

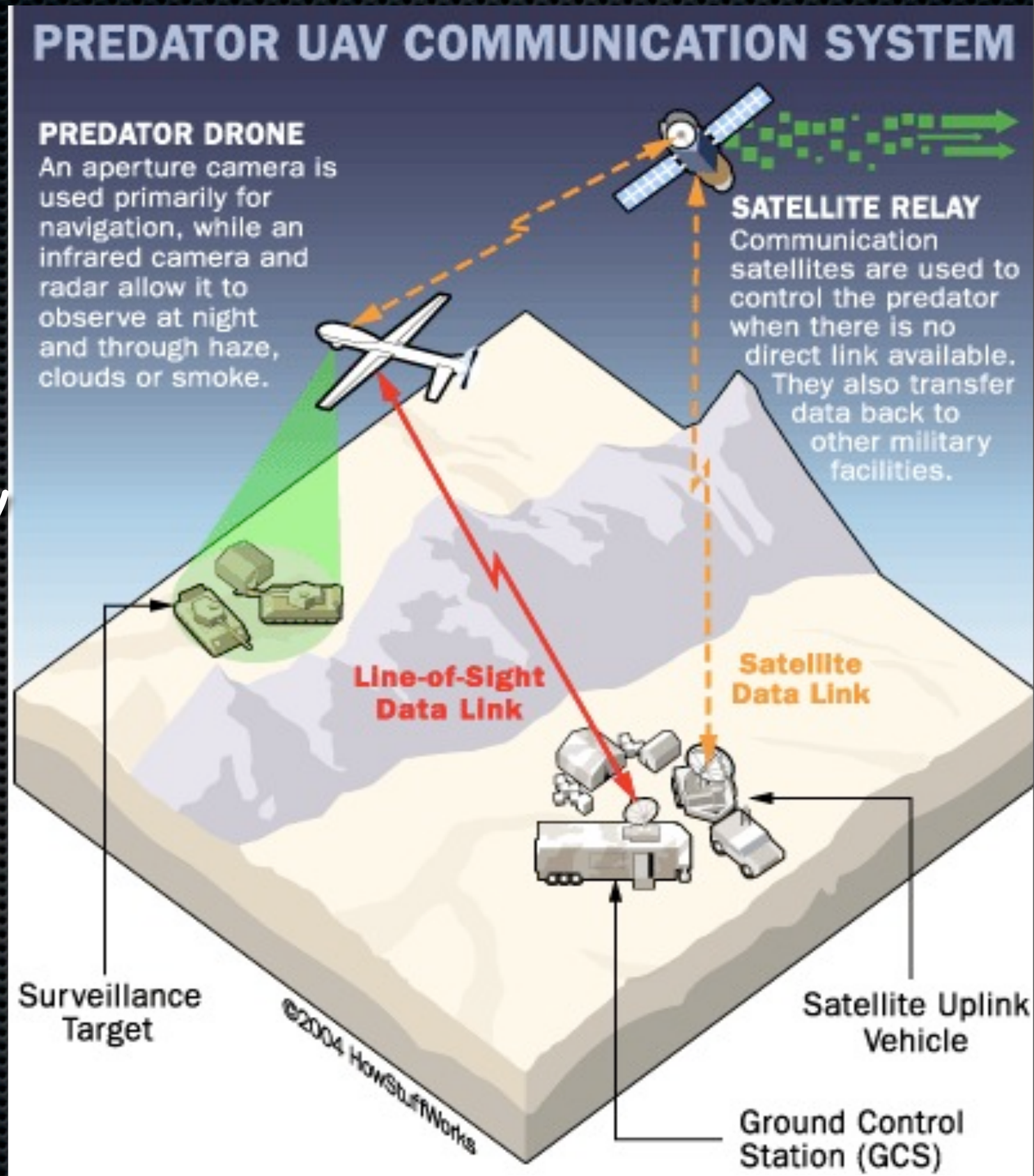


why autonomy?

signal jamming

deep mission capability

less expensive



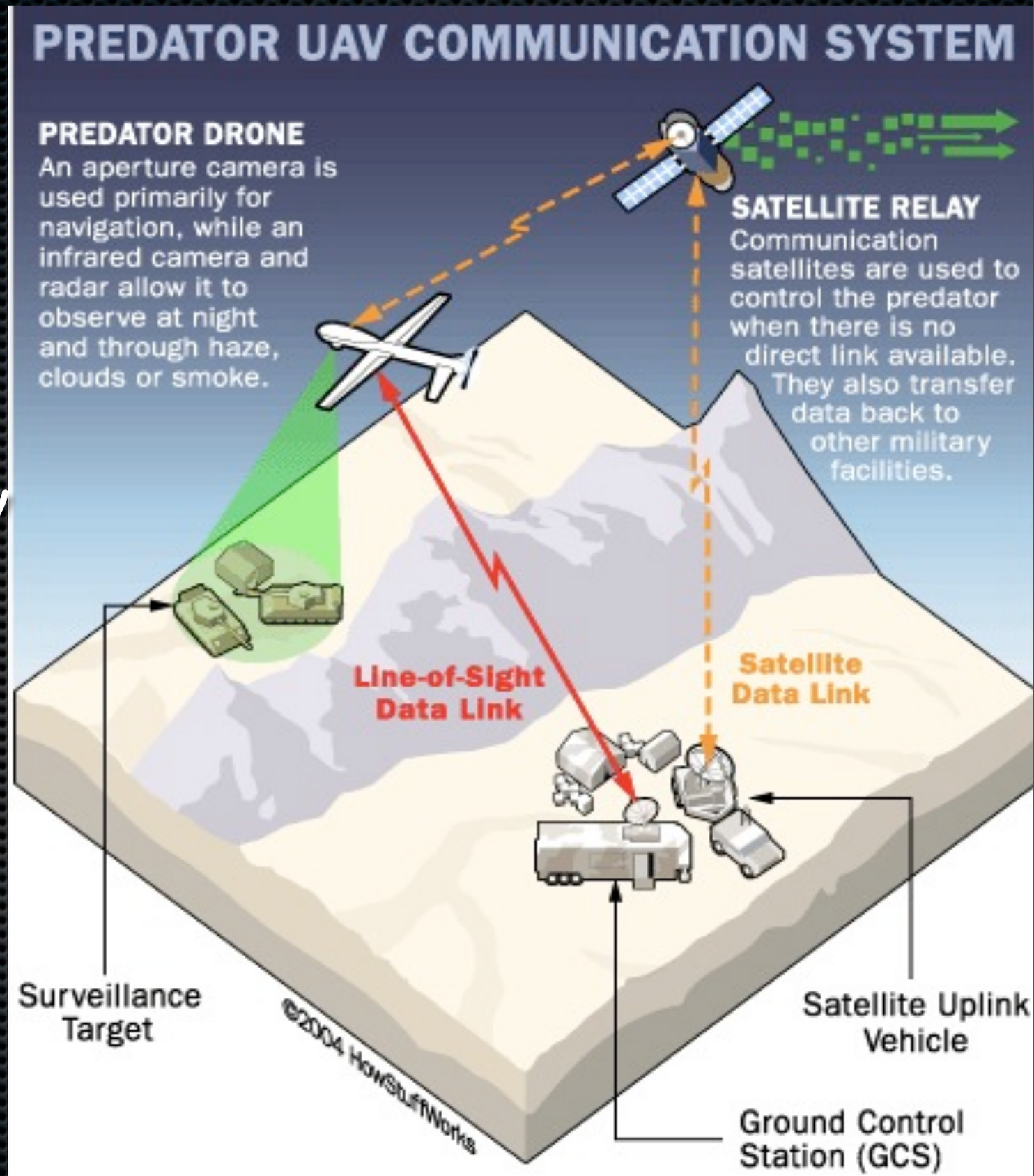
why autonomy?

signal jamming

deep mission capability

less expensive

pace of battle



why autonomy?

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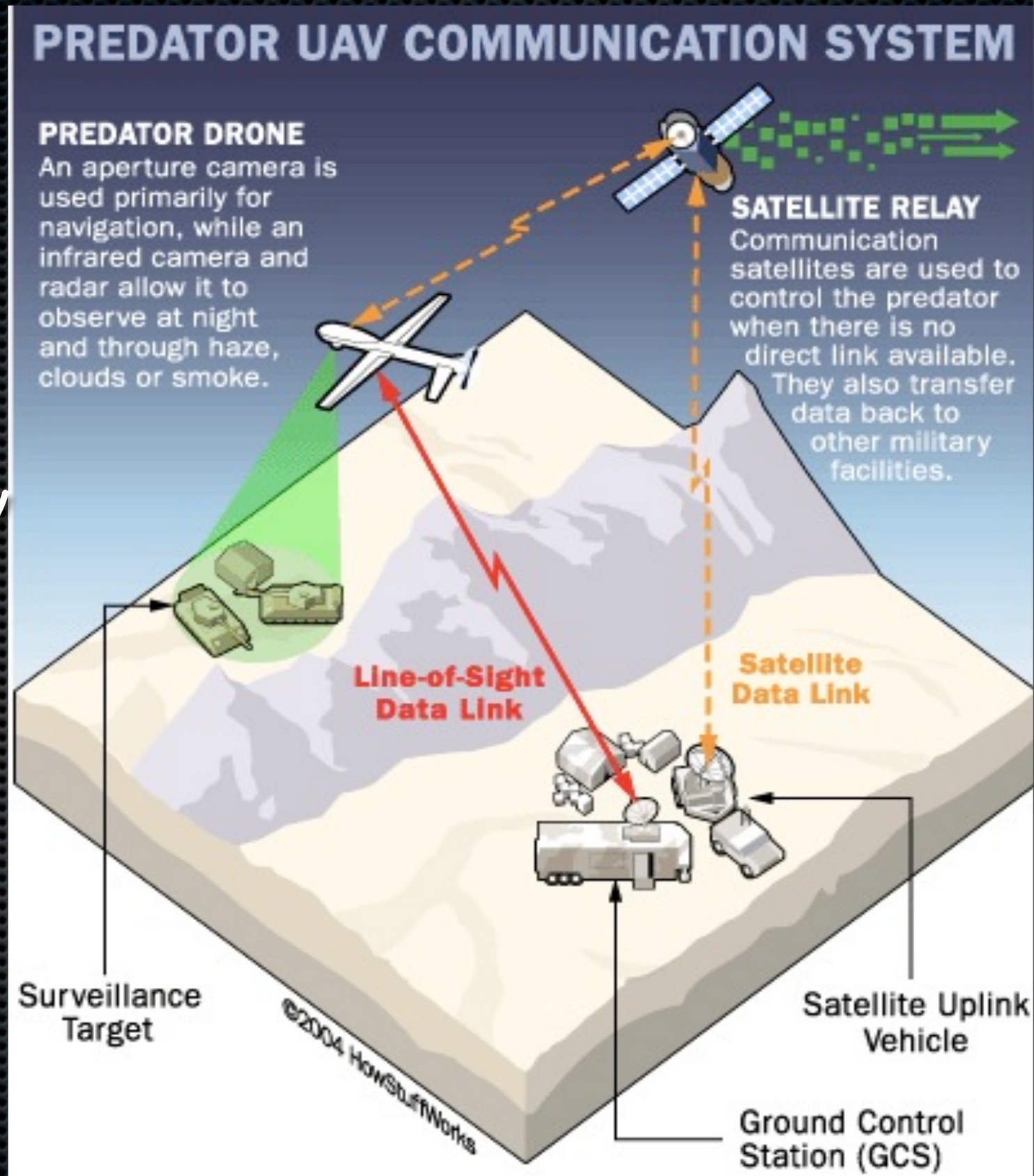
pace of battle

air to air combat



robots to decide

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Autonomous warfighting robots are high on the agenda of all US forces

robots to decide

Autonomous warfighting robots are high on the agenda of all US forces

"*The lawyers tell me there are no prohibitions against robots making life-or-death decisions*"

Gordon Johnson
Joint Forces Command at the Pentagon
New York Times 2005

robots to decide

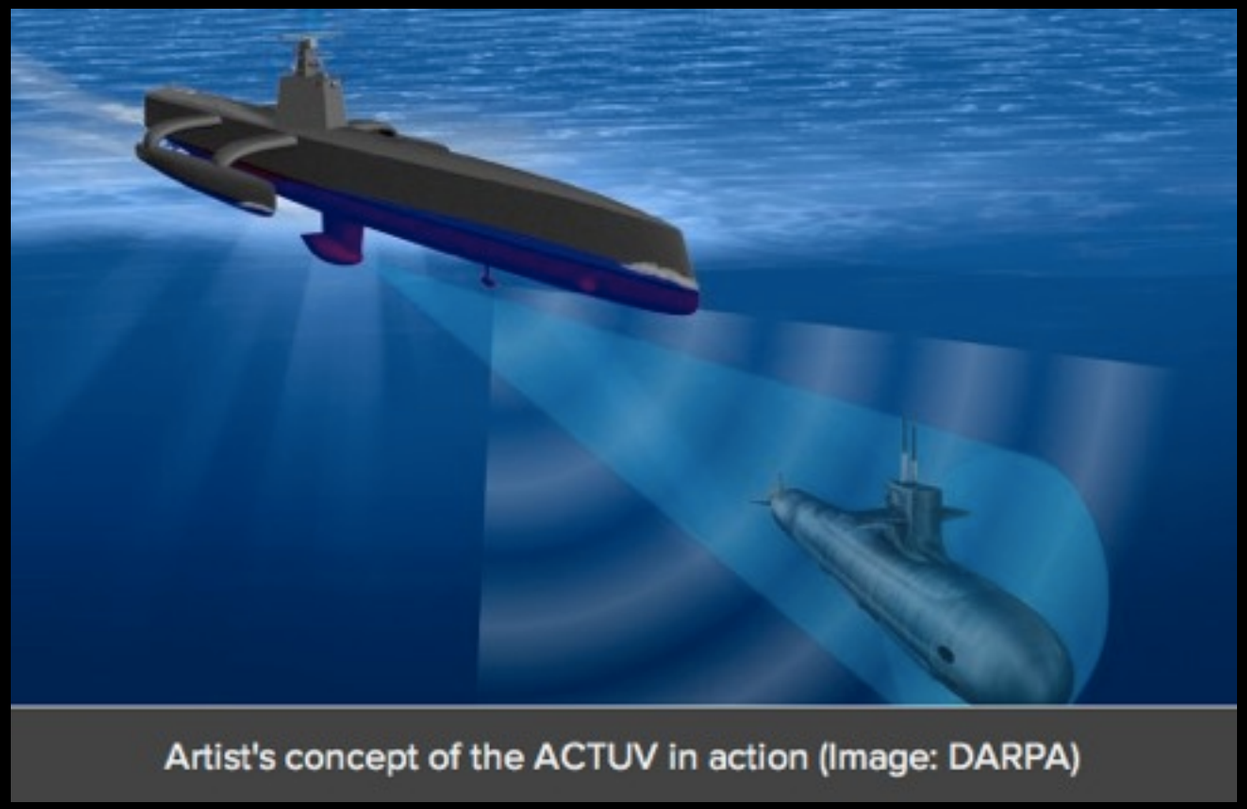
Autonomous warfighting robots are high on the agenda of all US forces

Think of TACs as moveable ordinance, mobile mines – they can draw fire and perform kamikaze missions

Gordon Johnson
Joint Forces Command at the Pentagon
New York Times 2005


THINK SAFETY FIRST
EVERYONE'S RESPONSIBILITY
MANTIS
BAE SYSTEMS
NO HUMAN OCCUPANT


sky NEWS



Artist's concept of the ACTUV in action (Image: DARPA)

DARPA

Science Applications International Corporation (SAIC), McLean, Virginia

Phase 1 completed - Phase 2 underway

ANTI-SUBMARINE WARFARE CONTINUOUS TRAIL UNMANNED VESSEL

CAN YOU COME UP WITH A WAY TO KEEP TRACK OF ELUSIVE SUBMARINES THAT HAS NEVER BEEN THOUGHT OF BEFORE?

CAN YOU OUTSMART AN ENEMY SUBMARINE COMMANDER AND KEEP HIM FROM ESCAPING INTO THE DEEP?

DOWNLOAD AND PLAY THE ACTUV TACTICS SIMULATOR AND SUBMIT YOUR RESULTS TO DARPA TO HELP DEVELOP THE FUTURE OF ANTI-SUBMARINE WARFARE.

DOWNLOAD NOW: DARPA ACTUV Game.zip

the crusher

weight: 7 tons

speed: 25mph

sight: 2.5 miles

fully autonomous capability

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fully autonomous capability

The laws of war jus in bello

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1. Principle of Distinction
2. Principle of Proportionality
3. Accountability

Autonomous Harpy radar killer

Made by IAI for Turkish, Korean, Chinese and Indian Armies

Autonomous Harpy radar killer

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robots cannot reason

robots cannot be proportionate

robots cannot be proportionate

easy proportionality problem

robots cannot be proportionate

easy proportionality problem

hard proportionality problem

situational awareness

Who is accountable and responsible for mishaps?

Who is accountable and responsible for mishaps?

robots cannot discriminate
robots cannot be proportionate
robots cannot reason
robots cannot be held accountable

The accelerating pace of battle

The accelerating pace of battle

The accelerating pace of battle

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HTV-2 tested at Mach 22
13,000mph (20,921.5kph)

The accelerating pace of battle

HTV-2 tested at Mach 22
13,000mph (20,921.5kph)

Who knows how all of the complex algorithms will interact?

Interaction of complex algorithms

Interaction of complex algorithms

AMAZON: The Making of a Fly $50 + $3.99 shipping

Profnath v Borderbooks

Interaction of complex algorithms

AMAZON: The Making of a Fly $50 + $3.99 shipping

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Profnath: 0.998 times highest price

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$23,698,655.93

will autonomous lethal targeting be used

ready or not?

will autonomous lethal targeting be used

ready or not?

incremental functionality

will autonomous lethal targeting be used

ready or not?

incremental functionality

it will depend on who else uses it -

military necessity

'robust' self defence

Prohibition or control?

Prohibition or control?

CCW

Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects (eg blinding laser weapons)

Article 36

The study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is **under an obligation to determine whether its employment** would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party.

re-purposing: making it hard to stop ALT

MQ-1 PREDATOR WITH HELLFIRES (USAF)

re-purposing:

re-purposing:

re-purposing:

re-purposing:

International Court of Justice
Nuclear Advisory Opinion

International Court of Justice
Nuclear Advisory Opinion

The Court ruled that, in the current state of international law and given the facts at its disposal, it was not possible to conclude definitively whether the threat or use of **nuclear weapons** would be lawful or unlawful in extreme circumstances of self-defence (circumstances in which the very survival of the defending State would be at stake)

International Court of Justice
Nuclear Advisory Opinion

The Court ruled that, in the current state of international law and given the facts at its disposal, it was not possible to conclude definitively whether the threat or use of **Autonomous Robot Weapons** would be lawful or unlawful in extreme circumstances of self-defence (circumstances in which the very survival of the defending State would be at stake)

US DoD directive 21 Nov 2012

US DoD directive 21 Nov 2012

failures "can result from a number of causes, including, but not limited to, human error, human-machine interaction failures, malfunctions, communications degradation, software coding errors, enemy cyber attacks or infiltration into the industrial supply chain, jamming, spoofing, decoys, other enemy countermeasures or actions, or unanticipated situations on the battlefield".

Human Rights Watch Report, Nov 19 2012

all states:

prohibit the development, production and use of fully autonomous weapons through an international legally binding instrument;

adopt national laws and policies to prohibit the development, production, and use of fully autonomous weapons.

in conclusion

in conclusion

automating war could lower the threshold for war

automating war could kill more civilians

robots cannot discriminate

robots cannot be proportionate

robots cannot reason

robots cannot be held accountable

automating war could create more terrorism

automating war could extend targeted killings

we have no idea how these systems will interact

www.icrac.net

thank you for listening

twitter StopTheRobotWar

Unmanned Nuclear Bomber!

Adam B. Lowther
USAF
June 17, 2009