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# ARROWS IN THE QUIVER

The Ohio State University Hacking for Defense 2019

# Meet the Arrows Team



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Minor: Business



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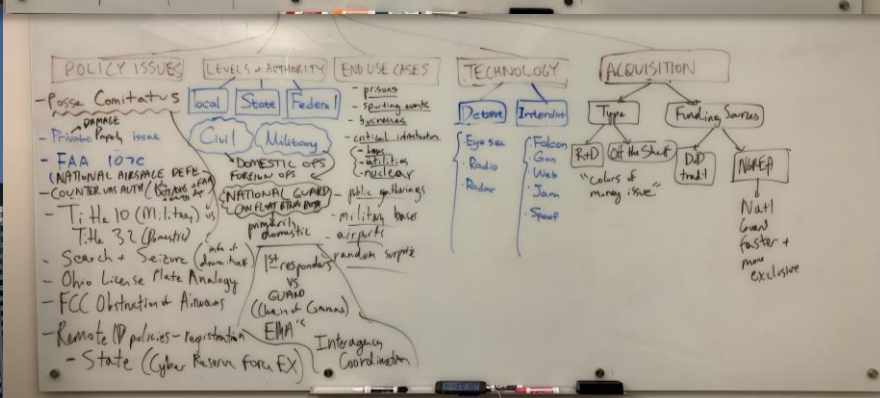
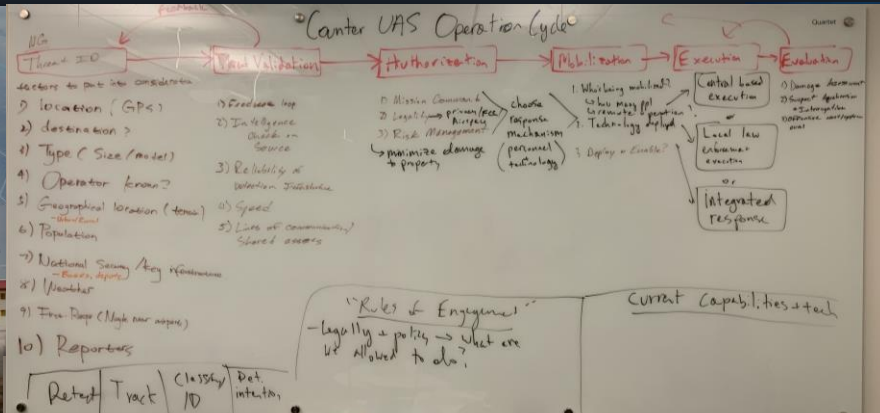
# Problem Statement:

The National Guard has no defined domestic strategy, technological capabilities, or policy to detect and verify threats, and initiate an effective response to counter hostile UAS threats against Installations or while deployed during Emergency Response Missions.

The UAS threat is ever-increasing given the rapid development of UAS technology and maturation of the commercial UAS market

This gap in the National Guard's defenses leaves National Guard personnel, assets, and cooperative partners vulnerable.

## Team attempts solving systematic c-UAS problem





# Team attempts solving systematic c-UAS problem

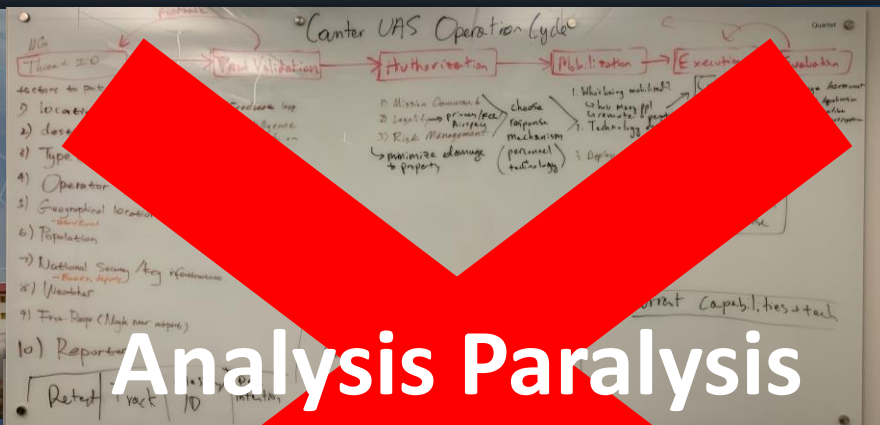
Prisons



Stadiums



Analysis Paralysis



Cities



Airports



*The team lacked focus on understanding specific pain points of the Guard with UAS*

Instructors call “time-out” to regroup our team



*Frustrating 30 hour work weeks with little progress led to a break and intervention*

# Team commit to staying together for rest of project



PERSEVERANCE

*What the mind can conceive and believe, it can achieve.*

*On the verge of dropping the course, team decided to stay and trust the methodology*

# Refocus on understanding the National Guard

Title 32  
Vs.  
Title 10

Former  
Adjutant  
General



Guard Role

Civil Support  
Team

*Team learned from former TAG Maj. Gen. Mark Bartman about Guard organization and role*



# Beneficiary Identification within the Ohio Guard



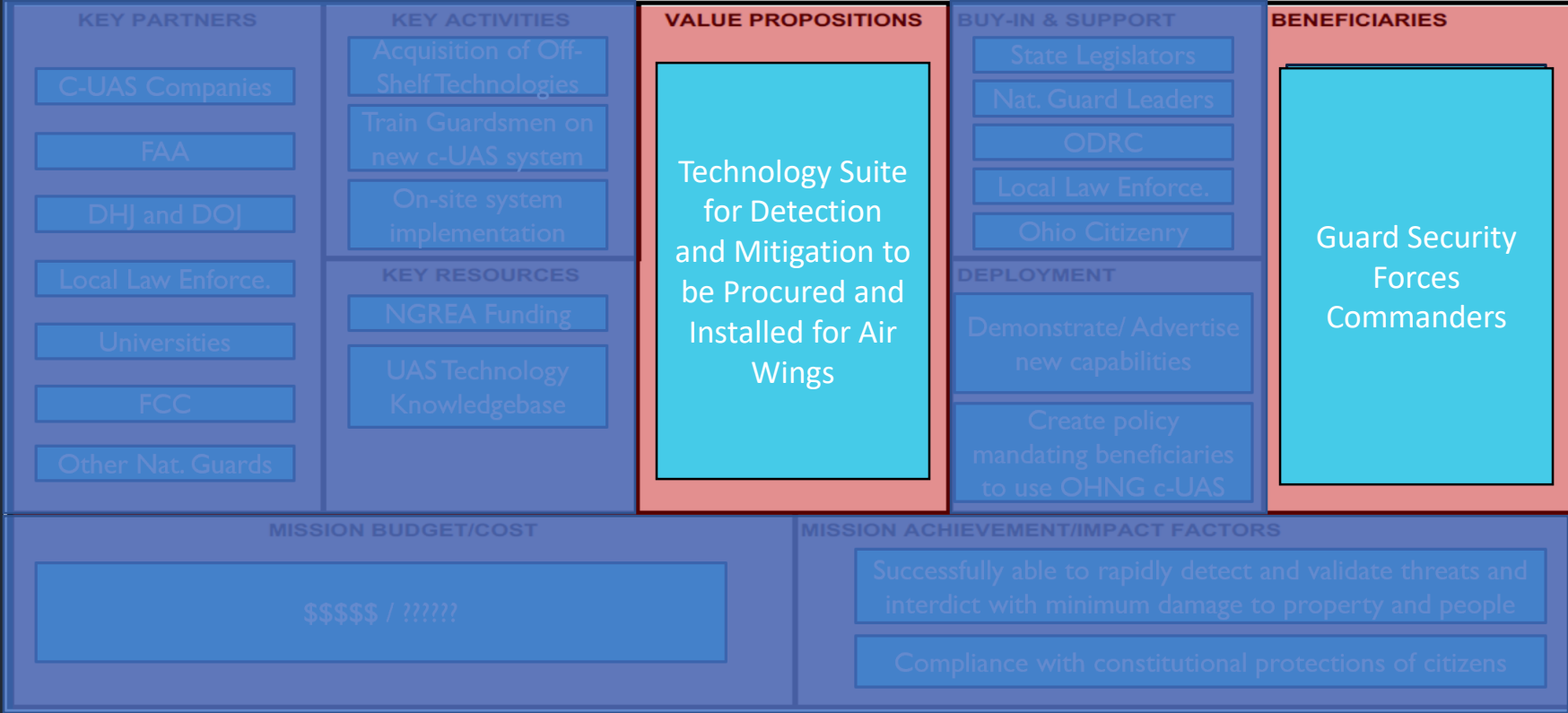
**1<sup>st</sup> Pivot**

	<p>Captain at Rickenacker</p> <ul style="list-style-type: none"><li>• Air Wing Full-Time Security Force Officer</li><li>• 30-35 Years Old</li><li>• Graduated University with B.S. in Political Science</li><li>• Has his own office on base</li><li>• Oversees 10-20 Airmen of Security Force Team</li><li>• Wife, 2 young children</li><li>• Enjoys hunting and fishing with friends</li></ul>
<p><b>BENEFICIARY ARCHETYPE – INSTALLATION SECURITY OFFICER</b></p>	

**Security Force**

*The team worked to answer the key question “Whose job in Guard does UAS interfere with?”*

# Initial MVP: Technology Procurement Recommendation



*The team initially believed the Guard needed a new c-UAS technology to procure*

# Initial Beneficiary Discovery with Security Forces



Overseas: C-UAS Permitted

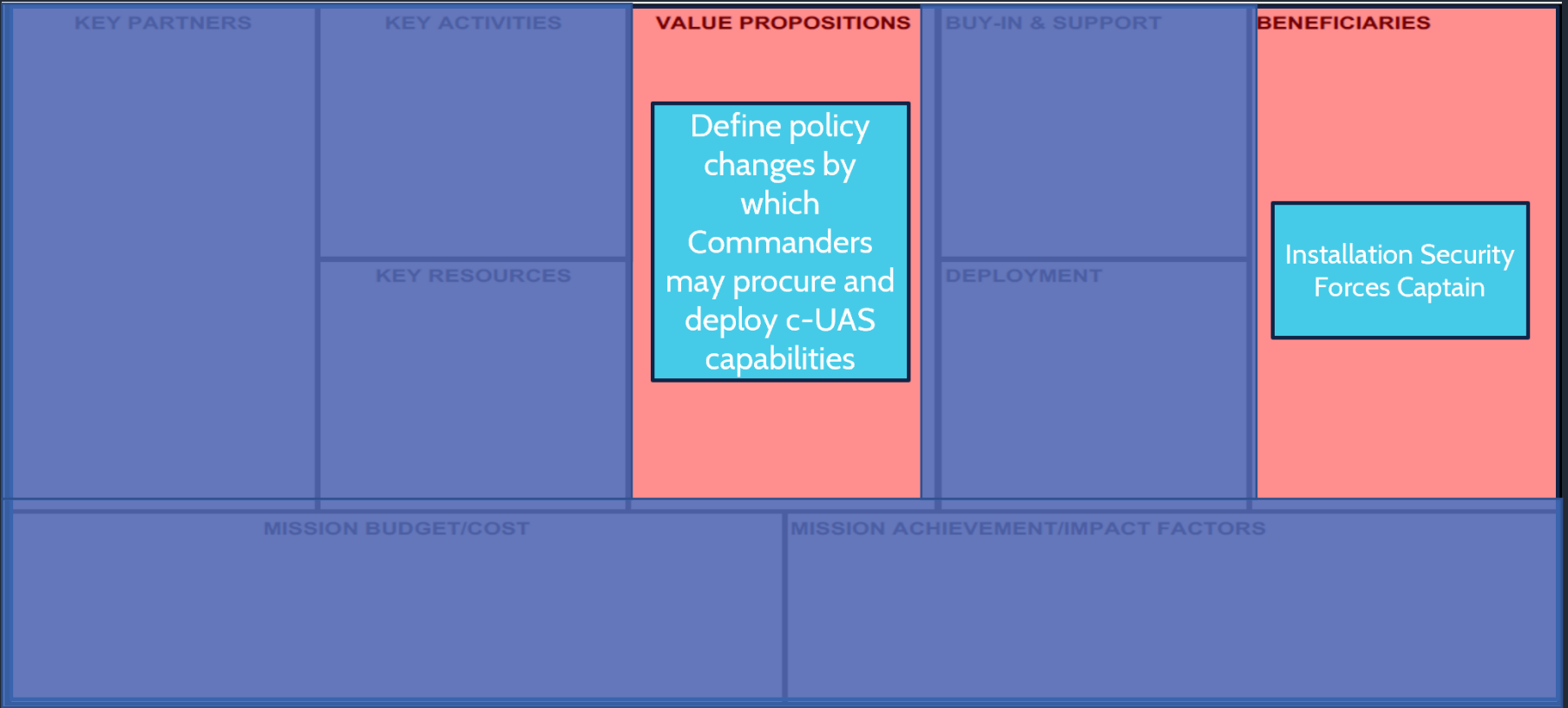


Home Installations: C-UAS Prohibited

*Learned from Security Forces that they could only “monitor and report” any UAS over facility*



# Recognition that Policy is Primary Problem



*Learned from Security Forces that they could only “monitor and report” any UAS over facility*

# Beneficiary updated to be Ohio Adjutant General

## Operational Level



- Captain at Rickenacker
- Air Wing Full-Time Security Force Officer
  - 30-35 Years Old
  - Graduated University with B.S. in Political Science
  - Has his own office on base
  - Oversees 10-20 Airmen of Security Force Team
  - Wife, 2 young children
  - Enjoys hunting and fishing with friends

BENEFICIARY ARCHETYPE – INSTALLATION SECURITY OFFICER

Secondary Beneficiary

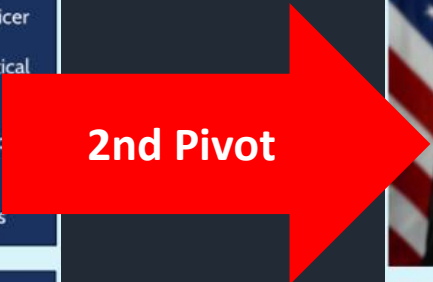
## Strategic Level



- Ohio Adjutant General
- Member of the Governor's cabinet
  - Leads the flag officer heads in the day-to-day operation and management of the readiness, fiscal, personnel, equipment, and real property resources of the agency.

BENEFICIARY ARCHETYPE - TAG

Primary Beneficiary



2nd Pivot

*Realized Ohio Adjutant General is better positioned to receive policy recommendations*

# Expanded Scope to include Mobile Deployment



Installation



Installation



Mobile

***Mobile Units also face UAS threat during lifesaving homeland response missions***



# Existing Roadblocks

## Legal Restrictions on c-UAS



Wiretap Act

Pen-Trap Act



Aircraft  
Sabotage Act

FCC Regulations



***Criminal Code Title 18 liabilities prevent domestic deployment***

# Existing Exemptions

## Legal Restrictions on c-UAS



Wiretap Act

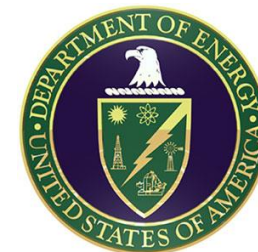
Pen-Trap Act

Aircraft  
Sabotage Act

FCC Regulations

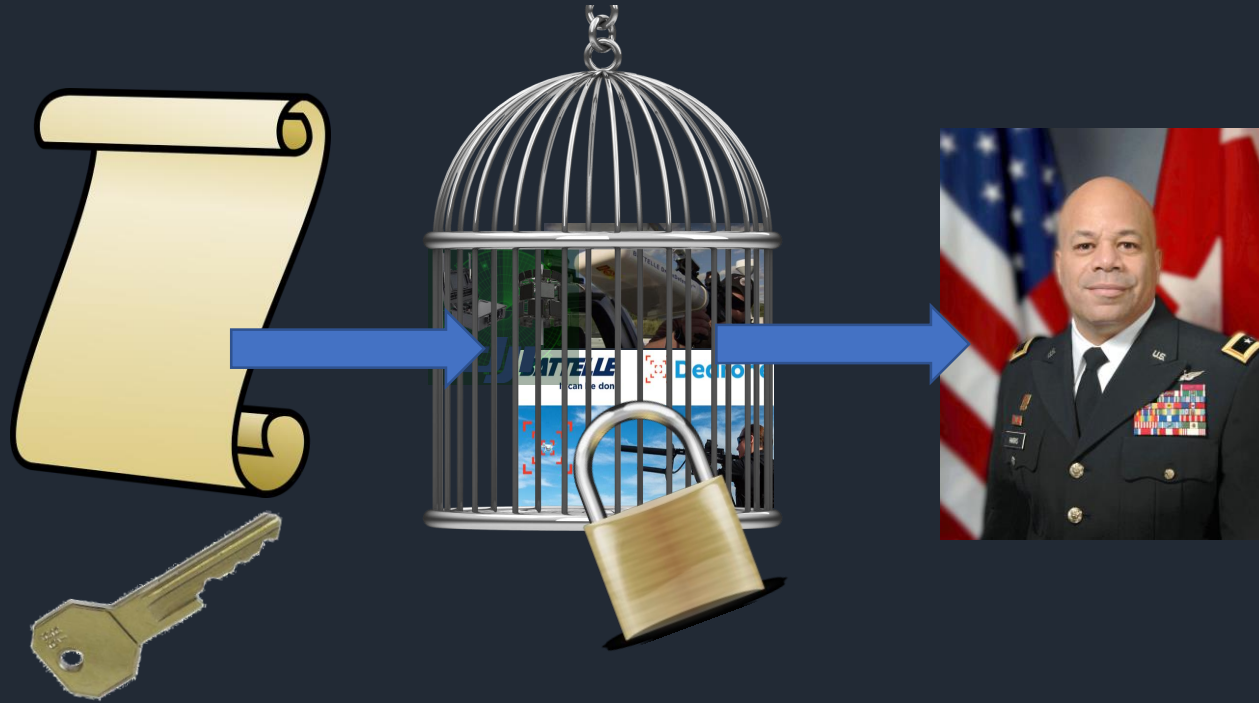


## Federal Agencies with c-UAS



*Some federal agencies gained exemptions through the NDAA & FAA Reauthorization*

# Key for Unlocking Counter-UAS is Legislation



*Guard can benefit law enforcement and existing Federal Agencies as well!*





## **Agile Development and Beneficiary Validation**

# MVP takes form: Policy Advocacy Strategy

Problems: Mobile Deployment is  
MVP: Policy Adv. Strat

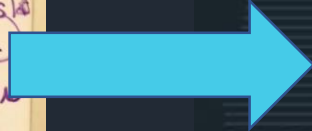
Key MSB ← + F1 → Missions scenario + Rules → legisla  
+ F2 → politically palatable (public accept.)  
+ F3 → approp. efficient comm/coord process  
+ F4 → clear, prioritized list of tech appropriate

H1: Organiz model is Embedded  
like WHP

H2: { LE unlikely to ever gain Tech Capabls  
that ONS will be able to apply.  
Public acceptance of LE  
will never happen. } ← mitigate

H4: Tech partition is available to ONS <sup>accomplish</sup> role  
(no further dev reqrd.)

WK1 WK2 WK3 WK4 WK5 WK6 WK7 WK8 WK9 WK10 WK11 WK12 WK13 WK14 WK15 WK16 WK17 WK18 WK19 WK20 WK21 WK22 WK23 WK24 WK25 WK26 WK27 WK28 WK29 WK30 WK31 WK32 WK33 WK34 WK35 WK36 WK37 WK38 WK39 WK40 WK41 WK42 WK43 WK44 WK45 WK46 WK47 WK48 WK49 WK50 WK51 WK52 WK53 WK54 WK55 WK56 WK57 WK58 WK59 WK60 WK61 WK62 WK63 WK64 WK65 WK66 WK67 WK68 WK69 WK70 WK71 WK72 WK73 WK74 WK75 WK76 WK77 WK78 WK79 WK80 WK81 WK82 WK83 WK84 WK85 WK86 WK87 WK88 WK89 WK90 WK91 WK92 WK93 WK94 WK95 WK96 WK97 WK98 WK99 WK100



NATIONAL DEFENSE  
AUTHORIZATION ACT

# MVP takes form: Policy Advocacy Strategy

Essential Components Required

```
graph TD; A[Essential Components Required] --> B[Organizational Model]; A --> C[Model Legislation]; A --> D[Technology Recommendation]; A --> E[Political Feasibility];
```

Organizational  
Model

Model  
Legislation

Technology  
Recommendation

Political  
Feasibility

*Validated with extensive interviews with Executive Officers close to Adjutant General*



# Policy Advocacy Strategy

## Appendices

### One Page Executive Brief

#### Executive Summary

To: Major General Harris  
From: OSU H4D c-UAS Team  
Re: ONG c-UAS Capability Gap

##### Problem Statement (~10%)

- NG has capability gap and cannot effectively respond and fulfill mission because of lacking DOMOPS c-UAS authorities

##### Background (~20%)

- .....

##### Recommendations (~60%)

- CST unit has capabilities
- Work through NG Bureau and DOD to expand current T10 exemptions to T32 and include emergency mobile deployment & more installations
- Proposed legislation (original Preventing Emerging Threats Act of 2018 language)

##### Conclusion (~10%)

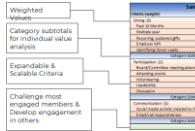
- .....

#### Tech Rec

##### Cost-Benefit-Risk Analysis



##### Criteria Alternati Matrix



##### Vendor Options List

- .....
- .....
- .....

#### Legislative Language

##### Extending Exemption

###### MEMORANDUM OF UNDERSTANDING

#### Equipped Units & ROE

##### CST Team

- Independent mobilization
- Rapid response

##### Airwing Security Forces

- Fits mission
- Full-time

##### Rules of Engagement

- On Mobile Deployment
  - .....
  - .....
- Installation Defense
  - .....
  - .....

# Hypothesized Organizational Model Invalidated

Hypotheses



Embedded Units in 88 Counties

Updated Hypothesis



Single Guard Equipped Unit

# Hypothesized Organizational Model Invalidated

Hypotheses



Single Equipped Unit

Updated Hypothesis



Multiple Equipped Units

# Technology Recommendation Finalized



## Detection



## Interdiction





# Frozen – Testing, Testing, Testing...



# Building The Bill

## A BILL

To ensure the safe and effective emergency response mission operations and installation security details of State National Guards mobilized under State Active Duty or under full time security status by protecting against errant and hostile unmanned aerial systems threats.

### SECTION 1. SHORT TITLE

This Act may be cited as "A Regulation Regarding Operational Working Standards for C-UAS Act of 2020" or the "A.R.R.O.W.S. Act of 2020".

### SEC. 2 PROTECTION OF CERTAIN ASSETS AND TROOPS FROM UNAMANNED AIRCRAFT

(a) AUTHORITY. – Notwithstanding section 46502 title 49, United States Code, or any provision of title 18, United States Code, State Governors and Adjutant Generals may authorize personnel, such as described in section (c), with assigned duties including asset and personnel protection and emergency support of civil organizations to take such actions as described in subsection (b)(1) that are necessary to mitigate a threat as defined by Governors, Adjutant Generals, and Incident Commanders that an unmanned aerial system or unmanned aircraft poses to the safety or security of a covered asset or area of emergency response operations.

(b) ACTIONS DESCRIBED. –

(1) IN GENERAL. – The actions authorized in subsection (a) are the following:

(A) Detect, identify, monitor, and track the unmanned aircraft system or unmanned aircraft, without prior consent, including by means of intercept or other access of a wire communication, an oral communication, or an electronic communication used to control the unmanned aircraft system or unmanned aircraft.

(B) Warn the operator of the unmanned aircraft system or unmanned aircraft, including by passive or active, and direct or indirect physical, electronic, radio, and electromagnetic means.

(C) Disrupt control of the unmanned aircraft system or unmanned aircraft, without prior consent, including by disabling the unmanned aircraft system or unmanned aircraft by intercepting, interfering, or causing interference with wire, oral, electronic, or radio communications used to control the unmanned aircraft system or unmanned aircraft.

(D) Seize or exercise control of the unmanned aircraft system or unmanned

ate the unmanned aircraft system or unmanned

al force to disable, damage, or destroy the  
ad aircraft.

– The Secretary of Department of Defense, acting  
hall develop the actions described in paragraph (1)  
Aviation Administration, Chairman of Federal  
eral of Department of Justice, and Secretary of

VALUATION. – The Chief of National Guard  
aluation of any equipment, including any electronic  
ity to enable any of the actions described in

ads and the units authorized to use counter  
all conduct regular training in the use and  
ed in subsection (b)(6).

of National Guard Bureau shall coordinate with the  
atration when subsection (b)(3) and (b)(4) might  
vspace operations, or aircraft airworthiness.

INT SELECTION. – The National Guard Bureau  
adings outlined in subsection (a)(3)

IE OF FORCE. –

authorized in subsection (a) and described in

a duties of  
Security Forces, and;  
en, and;

tion Civil Support Teams.

The Chief of National Guard Bureau shall develop  
rules and regulations governing the deployment and use of c-UAS.

(A) The Chief of the National Guard Bureau shall submit to Congress, no later  
than 180 days after the enactment of this Act, a report summarizing the appropriate Rules  
of Use of Force.

of the Governor unless the disclosure –

(A) is necessary to investigate or prosecute a violation of law;

(B) would support Department of Justice or Department of Homeland Security, a

DNC –

authorized in subsection (a) and described in  
e during –

sions when called upon by the Governor to assist  
-made disasters, riot and crowd control, or any other  
stance with Federal and State law; and  
sions when called upon by local law enforcement  
d, fire, other natural or man-made disasters, riot and  
agency as declared in accordance with Federal and

in coordination with the Department of Justice,  
Department of Defense, State and Local Law  
ting cooperation agreements, statutes, and Federal

and defense duties of installation security forces and  
stions.

tions or guidance issued to carry out authorized

, or access to, or maintenance or use of  
aft system under this section is conducted in a  
amendments to the Constitution of the United States

unmanned aircraft system are intercepted or acquired  
ion described in subsection (b)(1);

are maintained only for as long as necessary, and in  
Governors or Adjutant Generals determine that  
investigate or prosecute a violation of law, directly  
sired under Federal law, or for the purpose of any

closed outside the Department of Defense or Office

efficiency, and use of the national airspace  
system, including potential effects on manned aircraft and unmanned aircraft systems,  
aviation safety, airport operations, infrastructure, and air navigation services related to the

enforcement activities of a regulatory agency of  
with a criminal or civil investigation of, or any  
nt action relation to an action described in

means any facility or asset that –  
and a potential target for unlawful unmanned  
nt General, or Incident Commander, in

the Federal Aviation Administration with respect  
is a risk-based assessment for purposes of this  
stions described in subsection (a)(3), such

protection of a facility or asset that is assessed to  
lawful unmanned aircraft activity);  
ee (including the territories and possessions,  
a United States); and  
ree missions authorized to be performed by State

el', 'intercept', 'oral communications', and 'wire  
sirus in section 2510 of title 18, United States

term 'personnel' means officers and employees of

unmanned aircraft system' have the meanings  
United States Code.

n 'risk-based assessment' includes an evaluation  
y or asset and, with respect to potential impacts  
sion system and the needs of law enforcement and  
identified by State Governors and Adjutant  
of the Federal Aviation Administration of each

or carrying out the actions described in subsection

any identified impacts to the national airspace system  
technology, including minimizing when possible the  
pen the transmission of radio or electronic signals, for  
in subsection (b)(1).

se of the impacts of any actions taken under subsection  
um and infrastructure if not mitigated.  
reasonable advance notice to aircraft operators  
ational airspace system and the needs of law

ties of any covered facility or asset, including whether  
near other structures, whether the facility is open to the  
used for nongovernmental functions, and any potential  
amissions or for injury or damage to persons or

timeframe, and national airspace system impacts of  
nd Special Event Assessment Rating events.

to national security, public safety, or law  
unmanned aircraft systems are not mitigated or defeated.

# Team Gets Out of The Building - Again



# Exploring a Deployment Path to NDAA





# Deployment Path Selected



Ohio



Ohio Guard  
Association



Other States



National  
Guard  
Association



U.S. Congress



# Briefing The Adjutant General



**“You guys truly understand the complexity and nuances of our organization and this issue. This is deployable and will contribute to the actual legislation.”**

**– Major General Harris**

## **Next Steps**

- **Begun conversations with other state Adjutant Generals to build buy-in**
- **The Ohio Adjutant General asked for our continued assistance**
- **Ohio National Guard Leadership will be attending national conferences and networking for this solution**



# Acknowledgements

## Instructors

- Dr. Liz Newton
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- Colonel Kevin Cullen
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- Jenny Shields – Program Manager

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- Colonel Auer

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- Major General Mark Bartman
- Brigadier General James Camp
- Command Sgt Troy Taylor
- LTC Sy Gladden
- All other interviewees