# A Stable Nuclear Future? The Impact of Autonomous Systems and Artificial Intelligence

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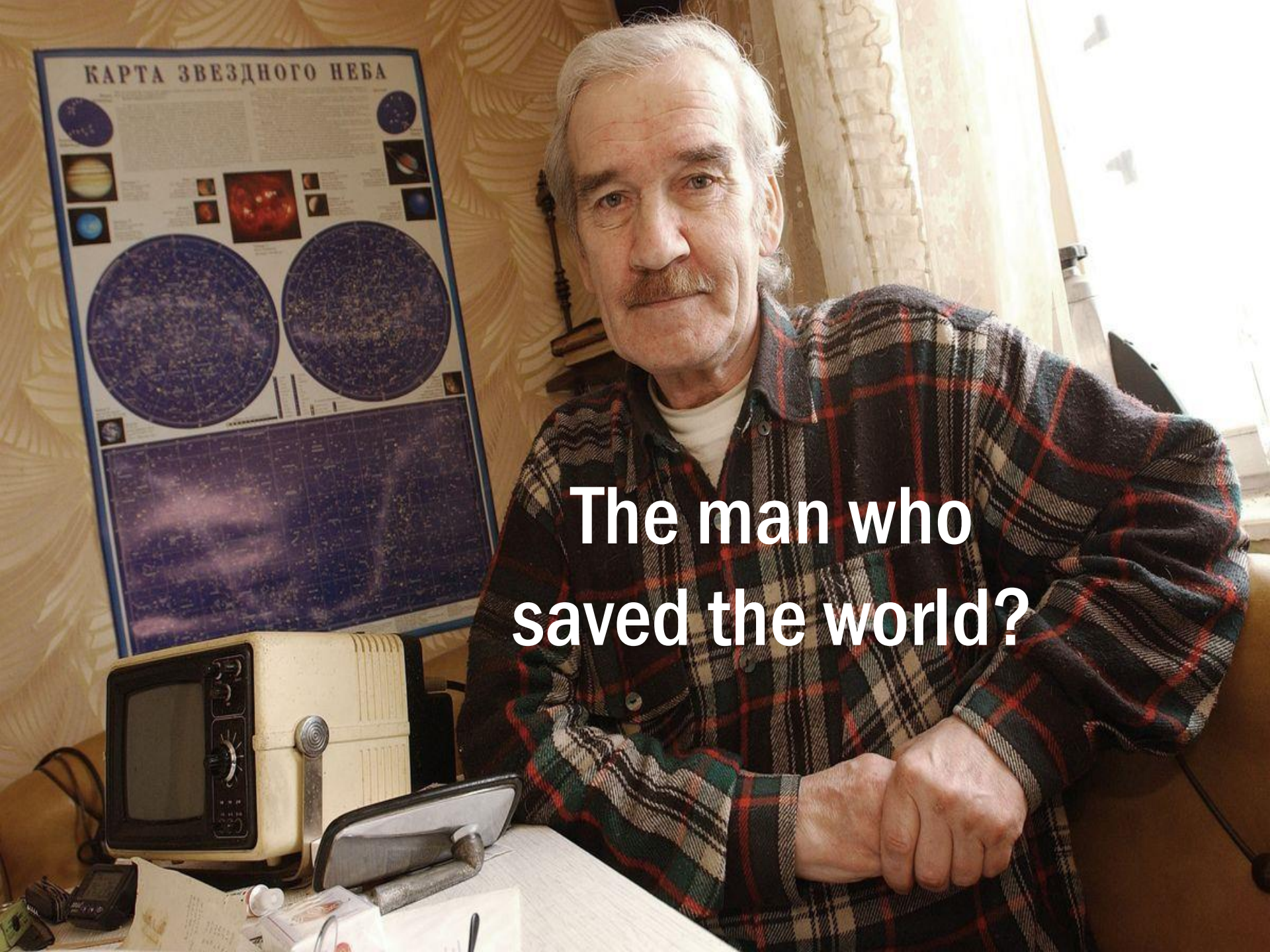
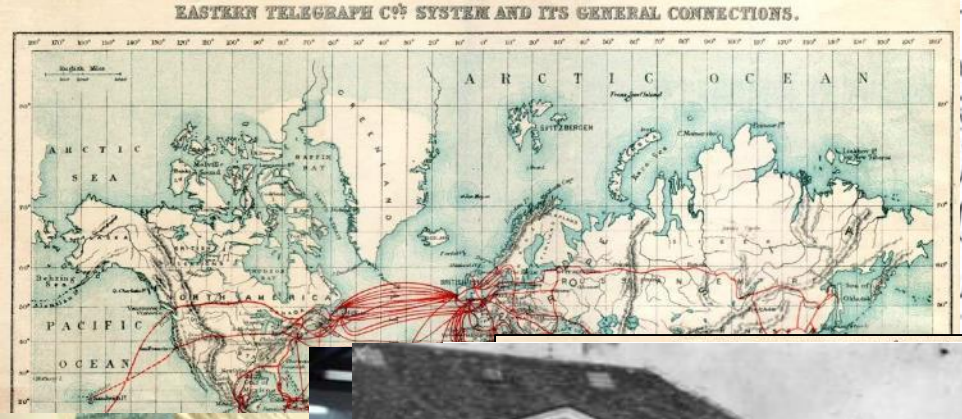
March 18, 2020

USSTRATCOM Academic Alliance


КАРТА ЗВЕЗДНОГО НЕБА
The man who
saved the world?

# Presentation Overview

- Current Research Agenda
- Theory: Bias, Capabilities, and Interest in AI
- Early Warning/Command and Control
- Uninhabited Nuclear Platforms
- Conventional Military AI: Impact on Nuclear Stability
- Conclusion


EASTERN TELEGRAPH Co.ˢ SYSTEM AND ITS GENERAL CONNECTIONS.
ARCTIC OCEAN
ARCTIC SEA
PACIFIC OCEAN


"All the News hat's Fit to Print"
The New York Times.
LATE CITY EDITION
NEW YORK, TUESDAY, OCTOBER 23, 1962
FIVE CENTS
U.S. IMPOSES ARMS BLOCKADE ON CUBA
ON FINDING OFFENSIVE-MISSILE SITES;
KENNEDY READY FOR SOVIET SHOWDOWN
PRESIDENT GRAV
Asserts Russians Lie
and Put Hemisphere
in Great Danger


RAUDI
J. M. Rehse
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Foto: o.Ang. | 1919

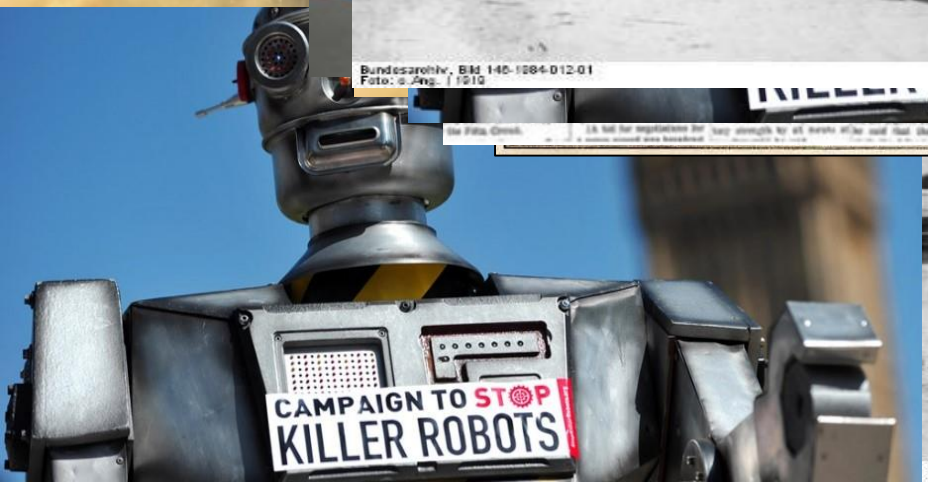
CAMPAIGN TO STOP
KILLER ROBOTS


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Foto: o.Ang. | 1919

# Key Role of Minerva Research Initiative

- Funding to conduct this research
- Access to key stakeholders
- Relevance for US military power

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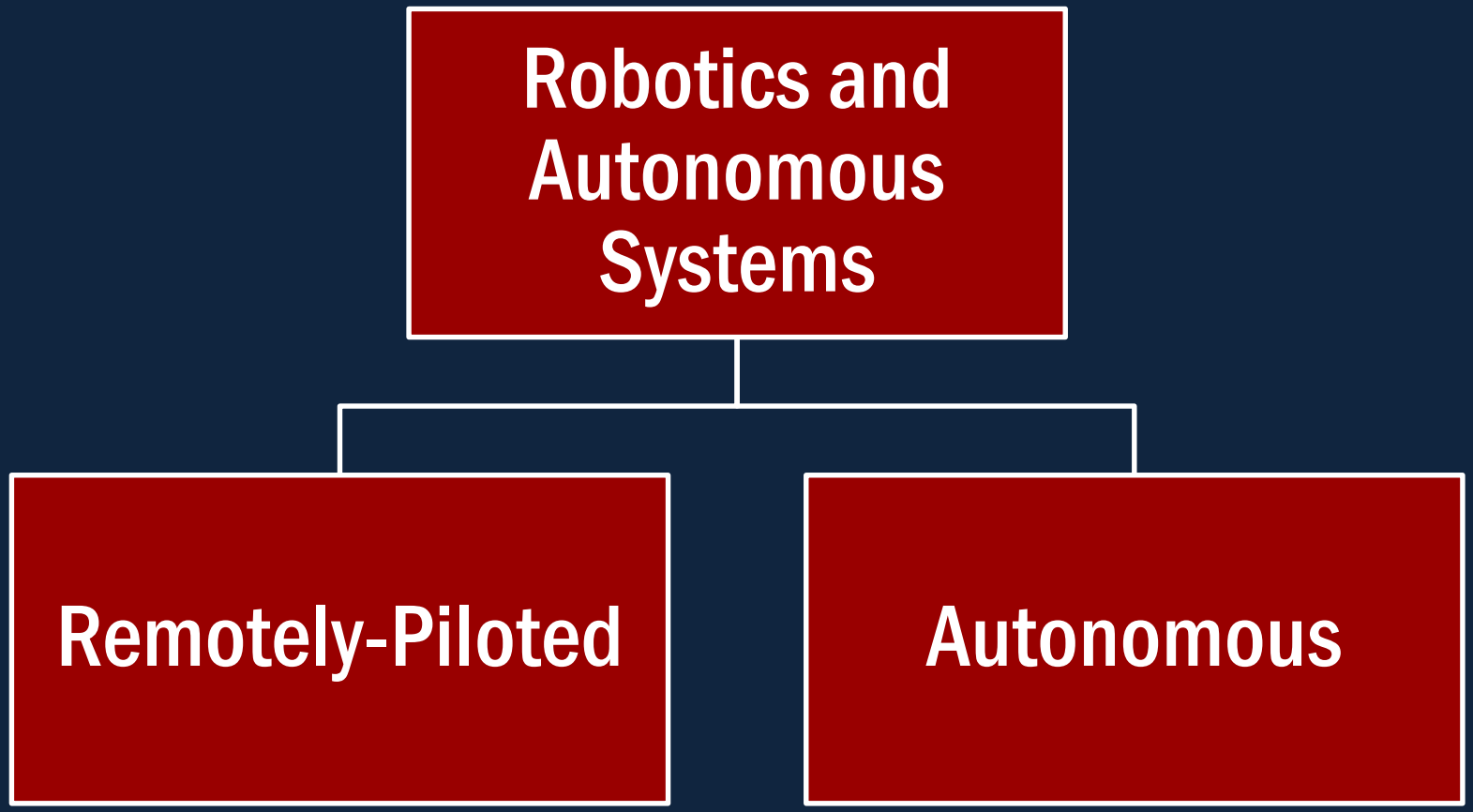
# Automation, Autonomy, and Artificial Intelligence




WHAT IS
A.I.?

# What Is AI?

- Definition: the use of computers to simulate human behavior that requires intelligence
- Methods of AI
  - Symbolic v. Connectionist
  - Machine learning
  - Neural Networks
- Types of AI
  - Narrow
  - General Intelligence
  - Superintelligence

# AI is an Enabler, not a Weapon

- Things AI can do. . . .
  - Direct physical objects
  - Process data
  - Overall information management (decision-making)
- Things AI is not
  - A gun
  - A plane
- Implication: AI is much broader than particular military technologies

# Key Properties

## Broad

## Dual Use

## Low barrier to entry

# Why Pursue Autonomy or Artificial Intelligence?

Speed

Precision

Bandwidth/Hacking


Decision-Making

# Brittleness of Autonomous Systems

- Narrow AI systems trained to do one thing
- Example: Alpha Go
- Challenges:
  - How do you train them (with what data)?
  - Limited potential area of operation

# Trust, Confidence, and AI (1)

**Trust Gap**

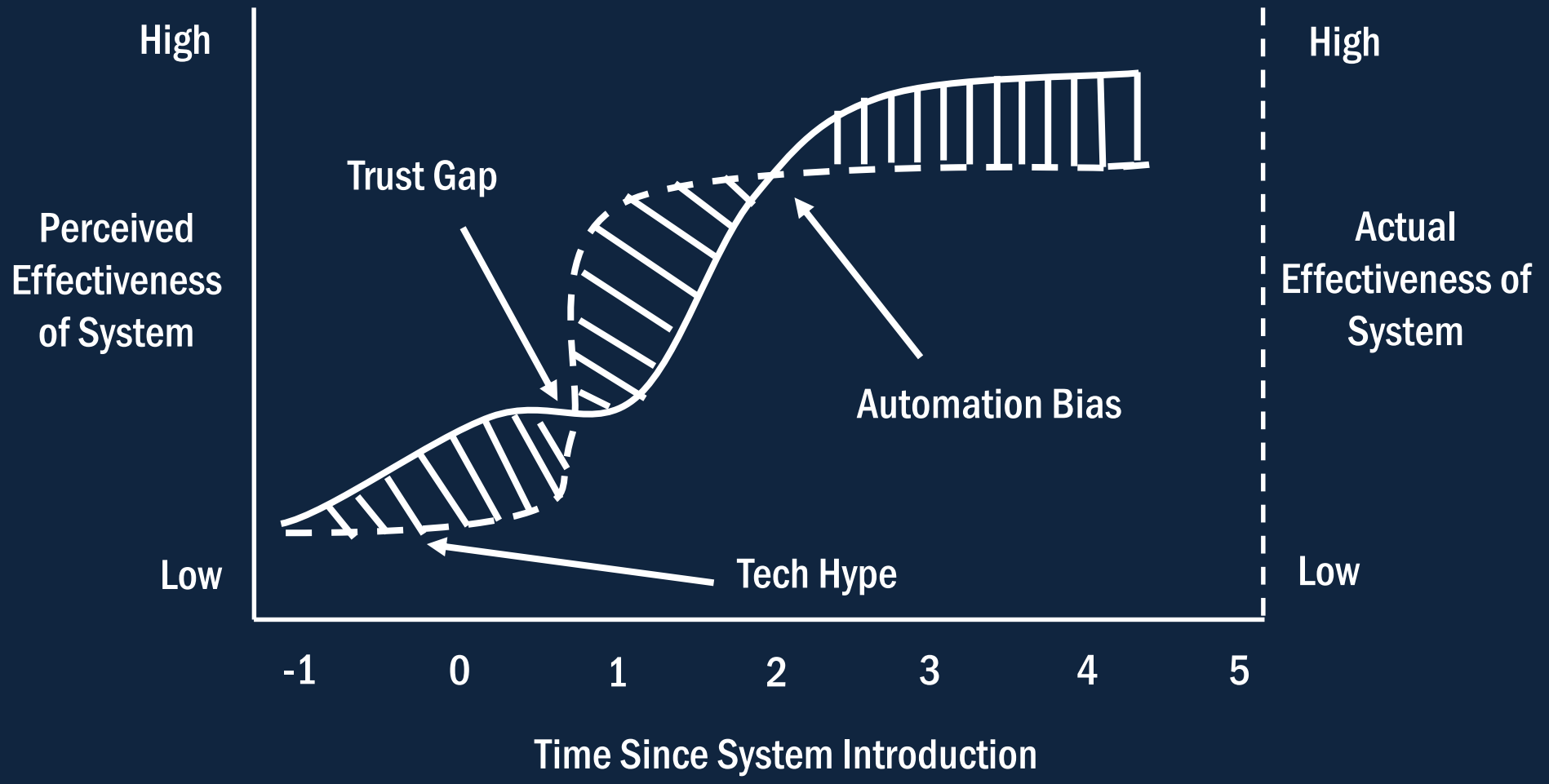
- Inability to trust machines to do work of people
- Unwillingness to deploy or properly use systems
- Example: Ground Tactical Air Controllers (MacDonald and Schneider)

V

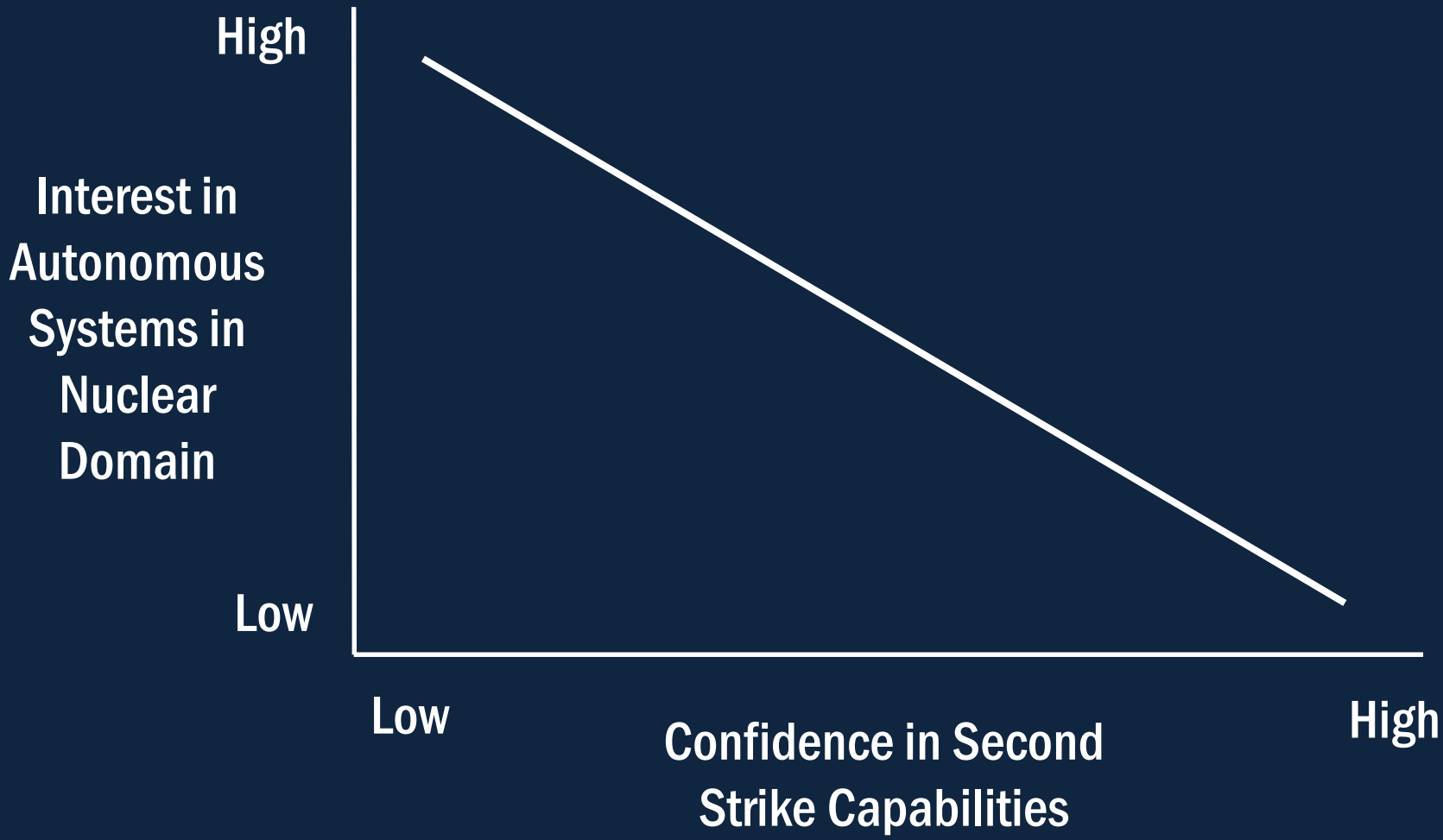
**Automation Bias**

- Delegation of cognitive judgment to machine – trusting too much
- Failure to question algorithms if they make mistakes
- Example: Air France Crash
- Example: Patriot Missile fratricide

# Trust, Confidence, and AI (2)



# Second Strike Capabilities And Autonomy



# Key Driver: Competitive Pressure

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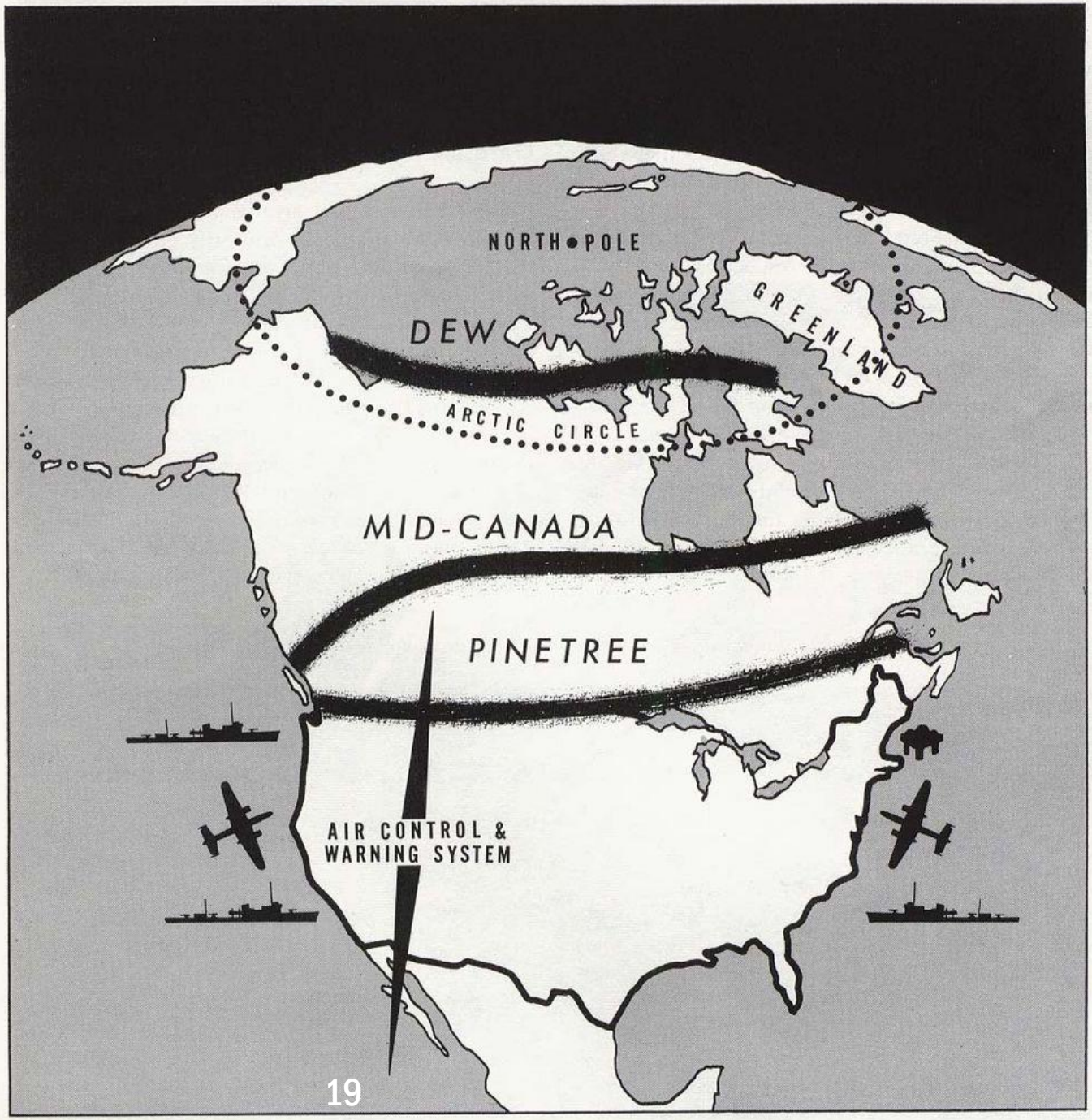
# Early Warning + Command & Control



# Existing Early Warning: Automated

- Long-range radar or satellite based alert systems
- Rapid-retargeting capability
- Communication rockets to transmit launch codes

**Example: Petrov Incident**

**Example: Soviet Perimeter System**

# Autonomous Early Warning?

- Theoretical Benefits:
  - Early detection: Buys time for decision-makers
  - Reliability
- Theoretical Downsides
  - Loss of human judgment/lack of human judgment
  - Brittleness of algorithms -> false alarms

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# Uninhabited Nuclear Platforms

- Theoretical Benefits:
  - Endurance
  - Reliability
- Theoretical Downsides
  - Cannot maintain positive human control
  - Consequences of accidents, hacking, spoofing
  - Brittleness of algorithms -> false alarms

# Example: US Military

US Air Force 2013 report, *Remotely Piloted Aircraft (RPA) Vector*: **[N]uclear strike may not be technically feasible unless safeguards are developed and even then may not be considered for [unmanned aircraft systems] operations.**

General Robin Rand, head of Air Force Global Strike Command (2016): **We're planning on [the B-21] being manned. … I like the man in the loop … very much, particularly as we do the dual capable mission with nuclear weapons.**

# Example: Russian military

- Perception of conventional + nuclear inferiority
- 2012 statement
- Ocean Multipurpose System 'Status-6

# Example: North Korean Military

- Relatively newer nuclear power
- Conventional military inferiority
- Fear of decapitation
- Repressive regime

North Korea, **in** theory, should have greater interest in autonomy of all kinds, especially uninhabited nuclear vehicles

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# Surveillance and Counterforce

# What Would Militaries Use AI For?

# Fighting At Machine Speed: Crisis Stability


- Compressed decision cycles
  - Offense
  - Defense
- Fear of losing quickly
  - First strike stability
  - Launch posture

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# Conclusion

- The less secure the second strike capabilities, the more a country is likely to consider autonomous systems within their nuclear weapons complex
- Some risk associated with greater automation in early warning
- Potentially large risk associated with impact of conventional military uses of autonomy on crisis stability