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

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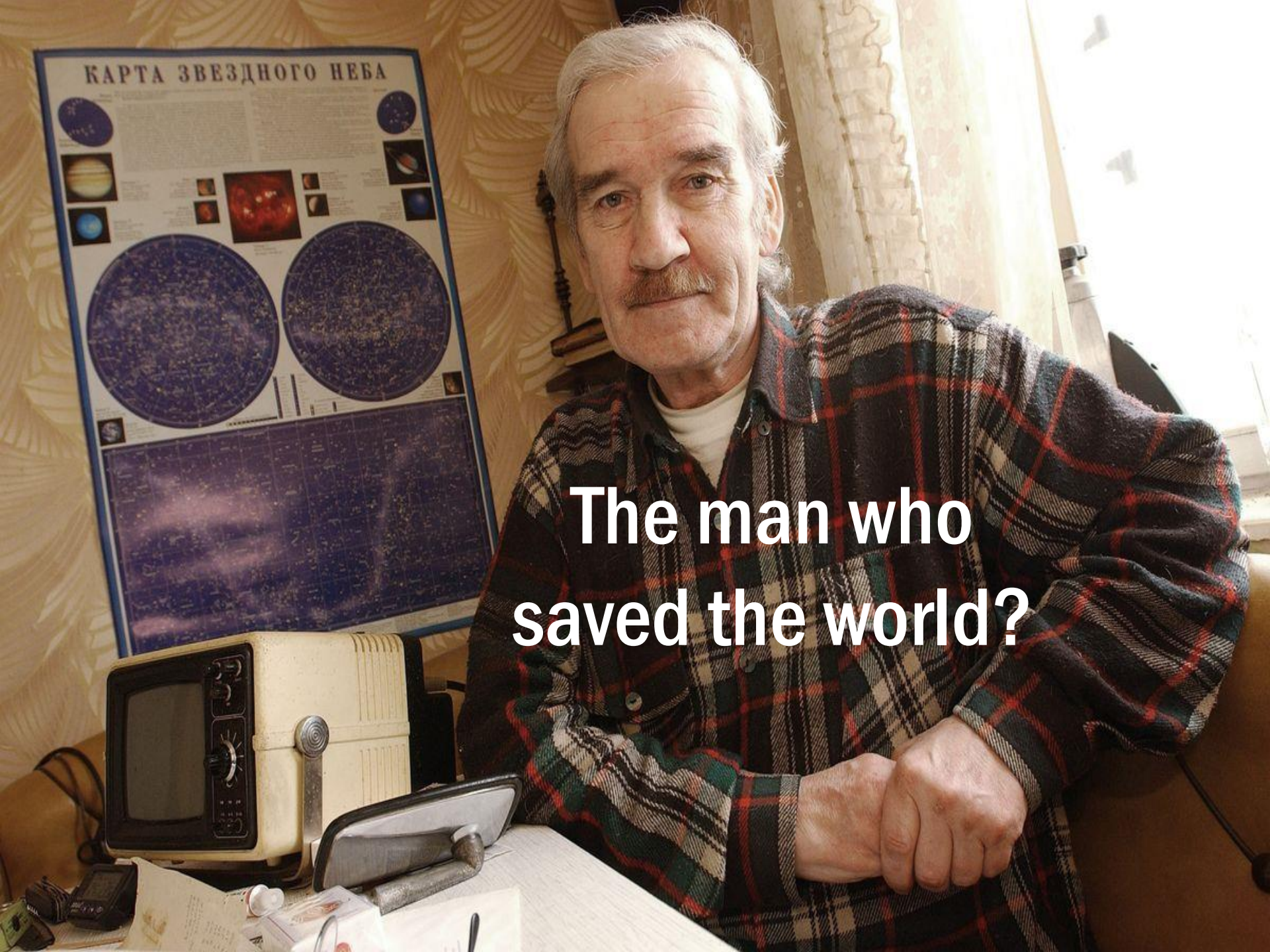
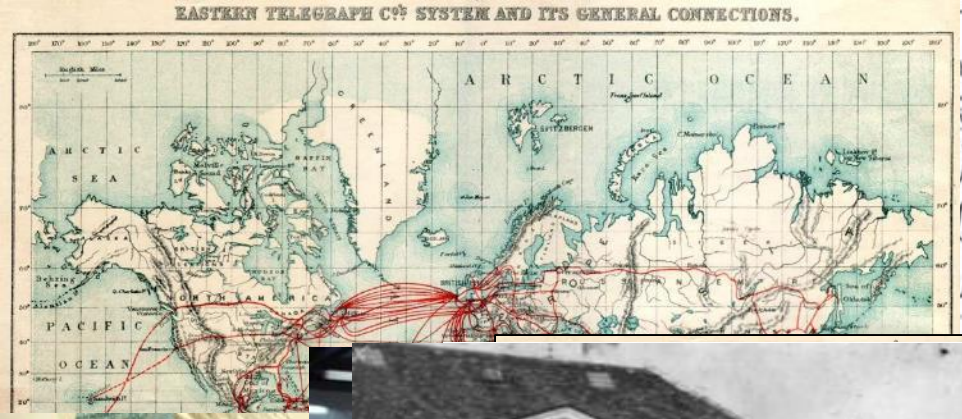
USSTRATCOM Academic Alliance


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



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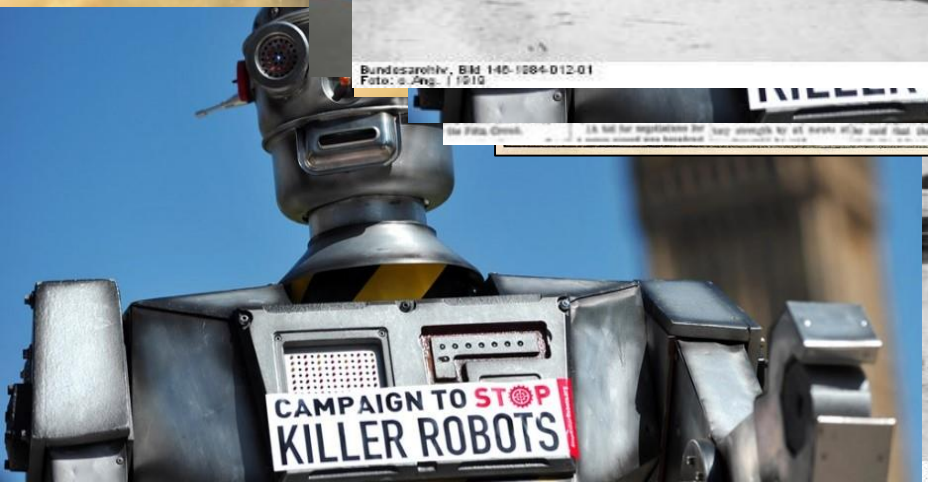

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Key Role of Minerva Research Initiative

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

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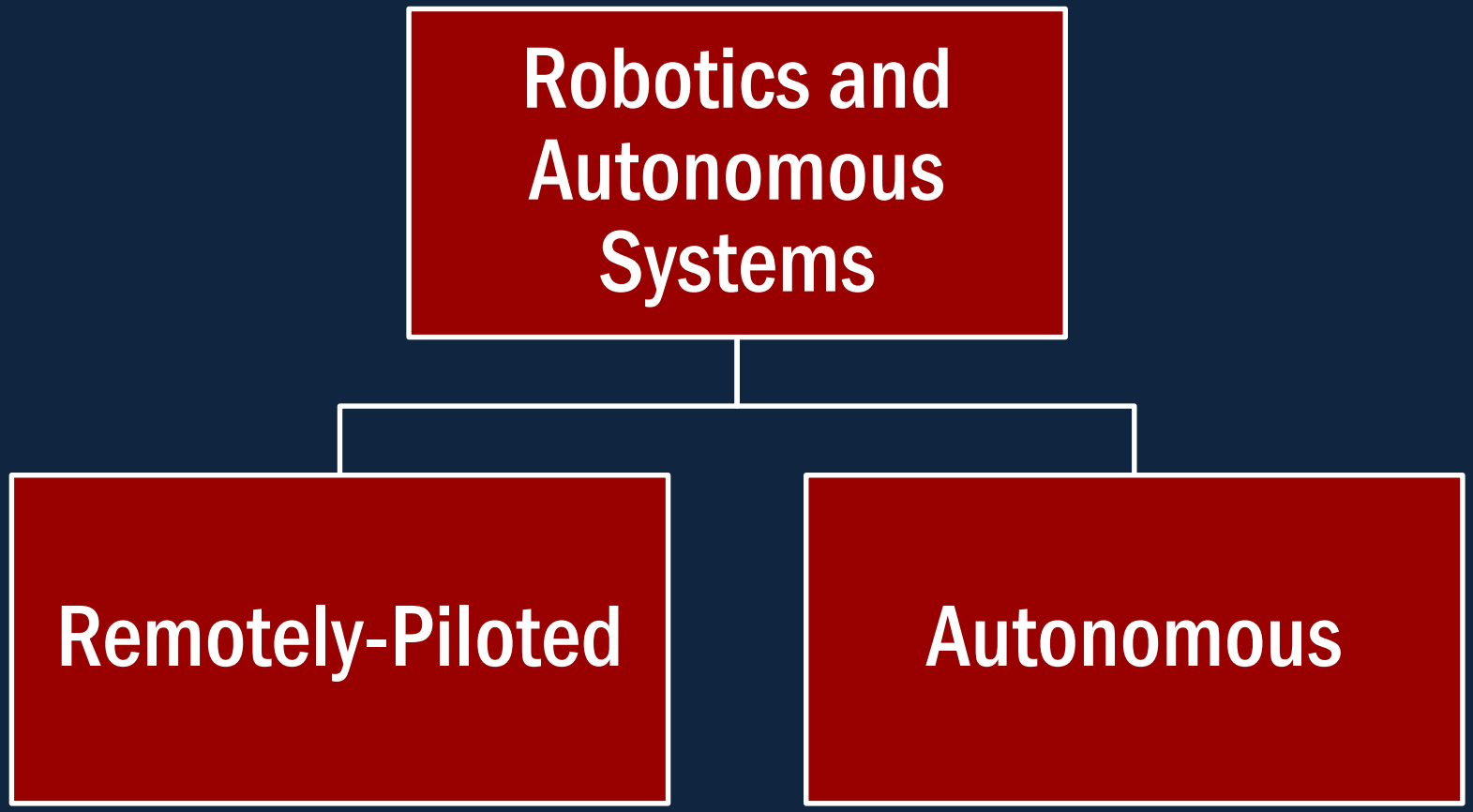
Automation, Autonomy, and Artificial Intelligence



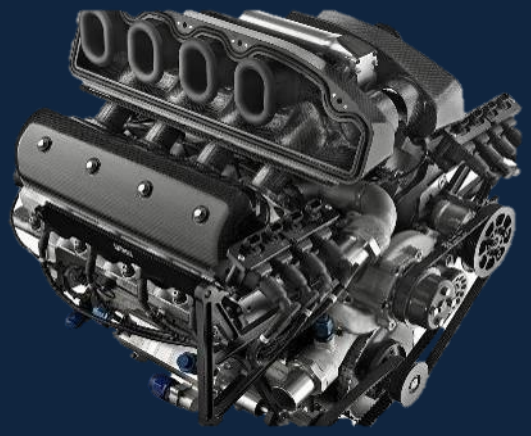

WHAT IS
A.I.?

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

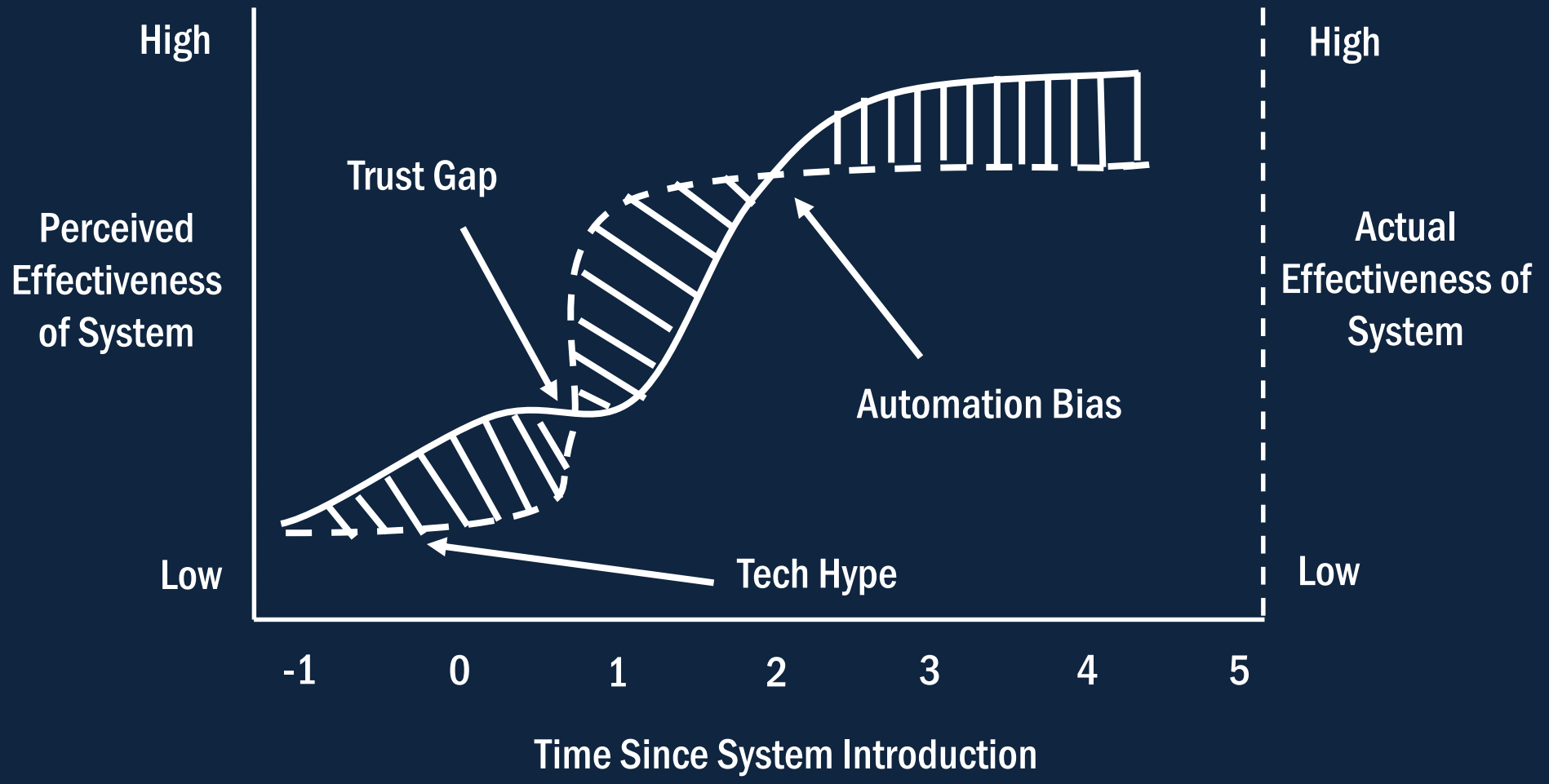
- Inability to trust machines to do work of people
- Unwillingness to deploy or properly use systems
- Example: Ground Tactical Air Controllers (MacDonald and Schneider)

V

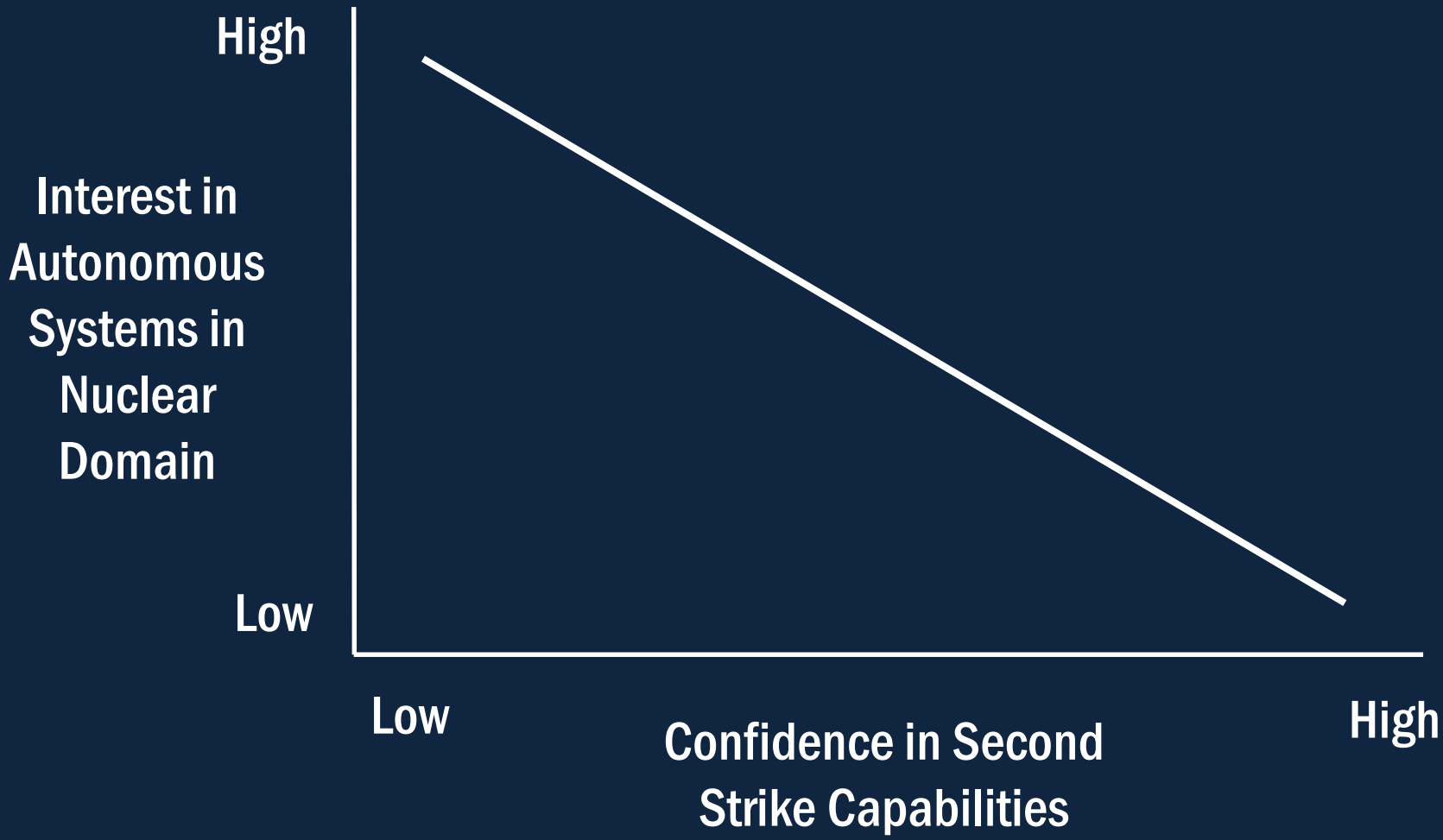
Automation Bias

- 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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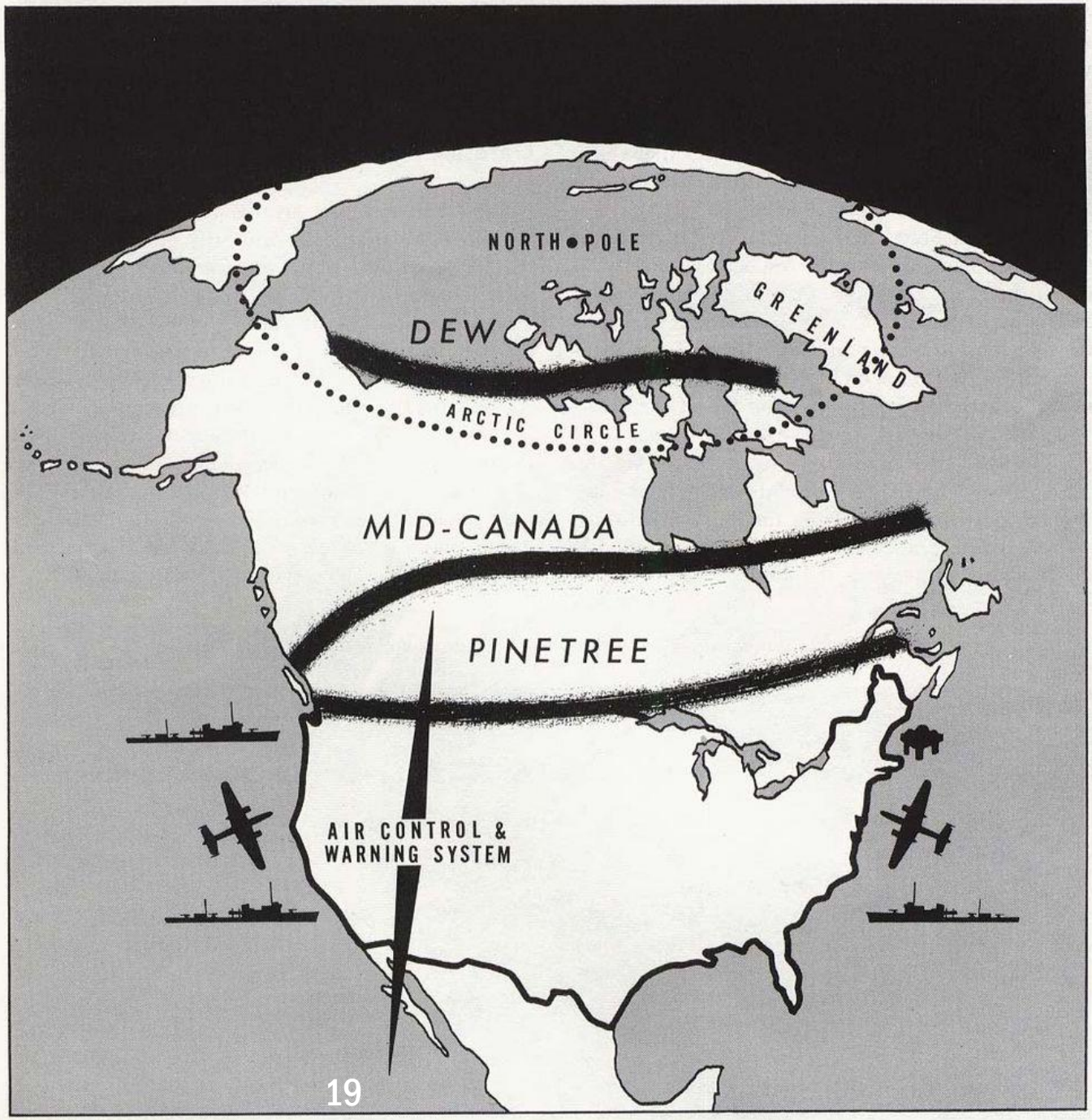
Early Warning + Command & Control



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