Epic Incidents of History: The 1979 NORAD Nuclear Near Miss

What happened?

Nov 9, 1979 - Colorado Springs, CO, USA

A NORAD officer input simulation data into an ICBM early-warning detection system

Military officials almost “retaliated” against this non-existent Soviet attack

Multiple Systemic Contributors versus Root Cause: Learning from a NASA Near Miss

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In 2013 NASA nearly drowned (asphyxiated) an astronaut during an Extravehicular Activity (EVA 23) on the International Space Station due to spacesuit leakage. Indicators of trouble on the preceding EVA (22) were discounted. NASA carried out an investigation of the near miss event that is a sample of how root cause analysis is carried out in actual organizations. This paper contrasts the root cause analysis with a new analysis the authors carried out that captures how multiple systemic contributors combined to create the conditions that lead up to the near miss. The new analysis illustrates the original finding from the late 1980s that accidents arise from multiple factors each necessary but only jointly sufficient. Many of these contributors are system factors that have been present (latent) in the organization for some time prior to the specific sequence of events. In contrast, the traditional root cause analysis focuses on the human roles closest to the adverse event and only raises systemic issues in terms of vague generalities that are difficult to address in systemic improvements. The paper provides this contrast for two purposes. The first goal of this paper is to provide a concrete technique and diagram for identifying systemic contributors to adverse events (Systemic Contributors Analysis and Diagram or SCAD). The second goal is to highlight how the current practice of root cause analysis is unable to come to grips with systemic issues, misses the interactions between contributors, and misses emergent system properties. Using this systemic technique reveals that adverse events are very often due to production pressure at the blunt end, not human error at the sharp end of systems.

How could this have happened?

1. Distant Developments

2. Proximal Events

3. Review & Some Takeaways

Distant Developments

World War II - Computers (primarily humans, then machines) calculated trajectory tables for anti-aircraft artillery

- **Used then-far-superior analog technology**

Vannevar Bush & the Institutionalization of Big Science (& Engineering)

- **Creation of the “Iron Triangle”: Military-Industrial-Academic Apparatus**

Distant Developments

Together, these forces set the stage for developing digital computers for military command-and-control purposes

Distant Developments

Office of Naval Research initially funded Jay Forrester's Project Whirlwind

- **Flight simulator -> General-purpose device**
- **Why Analog -> Digital?**
  - **Speed**
  - **Accuracy (Measure v. Count)**
  - **Military-Academic "Mutual Orientation"**

The Air Force stepped in to save the project, advocating radar early warning over point-defense

But triangulating on incoming planes would require many radar stations in various locations

Distant Developments

“For the long term, the Air Force turned to scientists for new ideas. Happening almost by chance upon Forrester's crisis-torn computer project, the architects of the long-term solution found a technology neatly packaged together with a ready-made, highly articulated vision of central command and control using digital techniques. They resurrected it from near oblivion and transformed it into the core of the SAGE continental air defense system. Whirlwind, injected with almost unlimited funding and imbued with the intense urgency of nuclear fear, suddenly became a central pillar in the architecture of the closed world's defensive dome.”

Distant Developments

“SAGE was the first large-scale, computerized command, control, and communications system. Although it was obsolete before it was completed, it unleashed a cascading wave of command-control projects from the late 1950s onwards, tied largely to nuclear early warning systems. These systems eventually formed the core of a worldwide satellite, sensor, and communications web that would allow global oversight and instantaneous military response. Enframing the globe, this web formed the technological infrastructure of closed-world politics.”

Distant Developments

SAGE Produced:

- **Core memory**
- **Visual displays**
- **Analog <-> Digital Conversion Methods**
- **Parallel / Multiprocessing**
- **Networking**

First near-real-time, networked digital computer system operating 24/7

Distant Developments

Intercontinental Ballistic Missiles

- **Land-launched rockets: ~30-35 min**
- **Submarine-launched rockets: ~10-15 min**

Defense & Intelligence Satellites

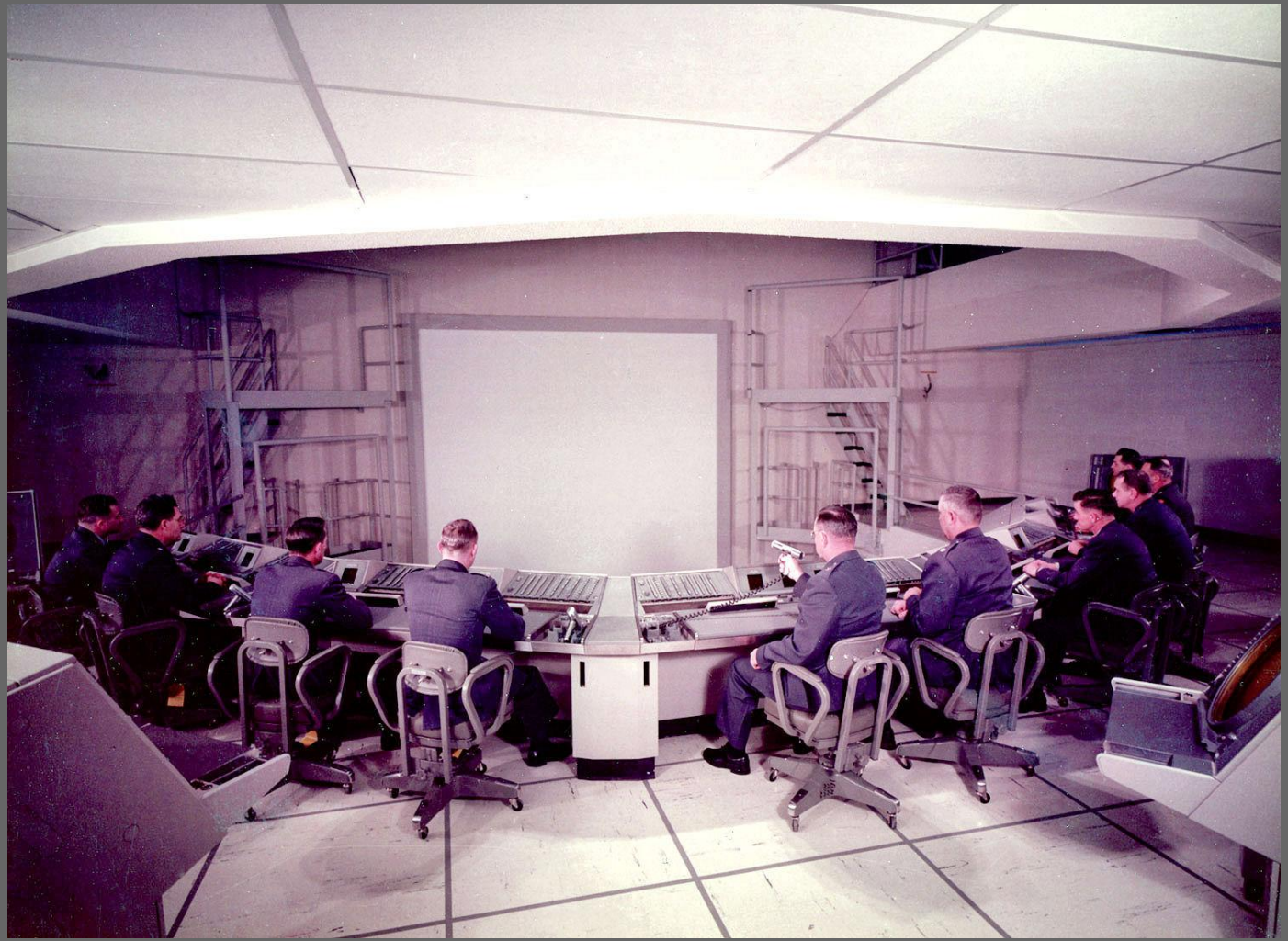
- **Civilian “Space Race” served as cover for Cold War maneuvering**
- **Optical & Infrared sensing capabilities**

Distant Developments

RAND think tank used war games to develop nuclear strategy for Air Force

Secretary McNamara brought Operations Research and technocratic style to DoD

- **Intense focus on numerical analysis and reporting good numbers to demonstrate progress, often totally disconnected from ‘ground truth’**



United States Air Force - A Handbook of Aerospace Defense Organization 1946 - 1980, by Lloyd H. Cornett and Mildred W. Johnson, Office of History, Aerospace Defense Center, Peterson Air Force Base, Colorado, Public Domain, https://commons.wikimedia.org/w/index.php?curid=12885469

Distant Developments

“As the complexity of the computer-centered BMEWS system grew, so did the numbers and types of errors. While an isolated computer problem usually posed little threat, combinations of problems stemming from human as well as electronic sources could produce extremely subtle failures (as demonstrated by experience with other complex technological systems such as nuclear power plants). Detecting and resolving these errors became increasingly difficult. As the difficulty of error detection increased, so did the level of uncertainty about the correct interpretation of any alert.”

Distant Developments

SAGE (416L) produced numerous spin-off projects, and eventually the World-Wide Military Command and Control System (WWMCCS)

Cold War relations appeared to thaw in 1970s:

- **Nixon in China**
- **Kissinger's "linkage" through mutual action in treaties, proxy fights**
- **Decline in DoD investment in technology research & staffing, accelerating reliance on automation and computerized weapons**

Distant Developments

NORAD's 427M system consisted of 3 primary components:

1. **Communication System Segment (CSS)**
2. **NORAD Computer System (NCS)**
3. **Space Computational Center (SCC)**

Purchasing was a spatially and temporally disjointed acquisition process

All mandated to use WWMCCS standard hardware (Honeywell 6080s) & software

Distant Developments

Upgrade to the system had been in progress since 1966 (427M replacing 425L & 496L)

NORAD Command request for a 4th component to develop custom software, meant to address WWMCCS inadequacies for NORAD mission in 1974

- **Denied due to budget constraints, so it happened in a partitioned section of the 427M network**

Distant Developments

DoD digital-image satellites first launched in 1976

- **Images could be processed and disseminated much faster than earlier, film-based models**

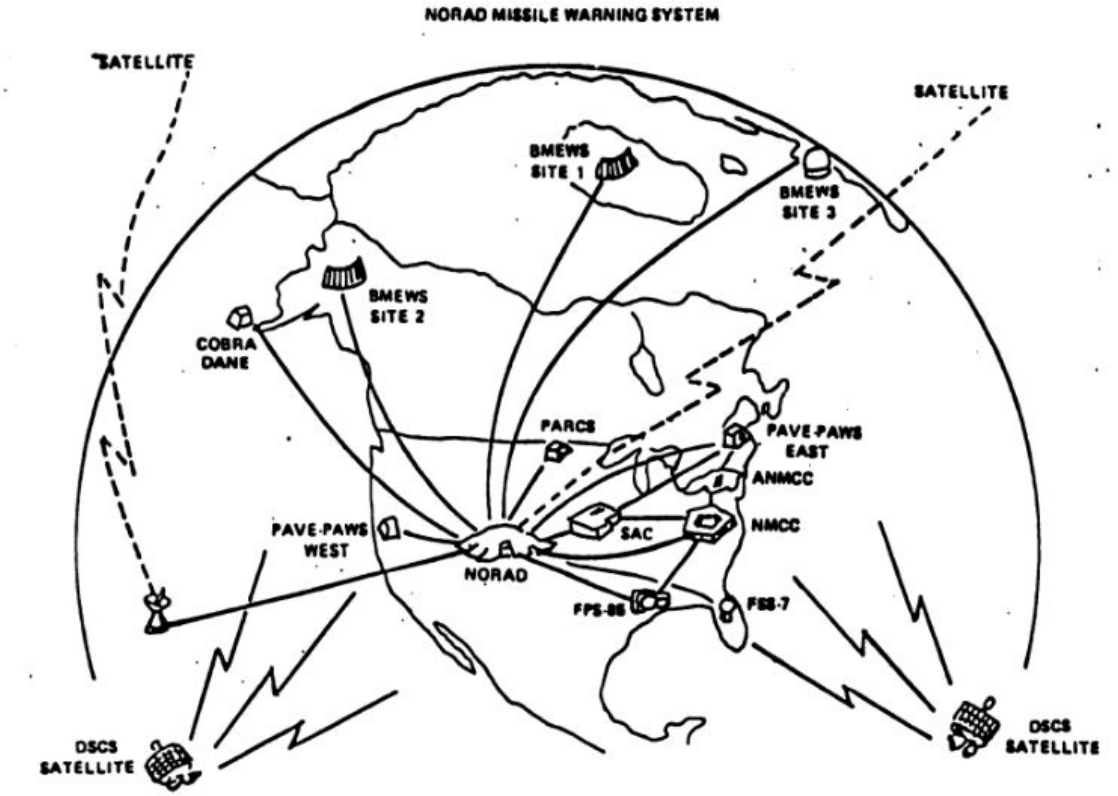
Phased-array radars (PAVE PAWS) built on East & West Coast by 1979

- **Electronic steering to quickly detect submarine-launched missiles**

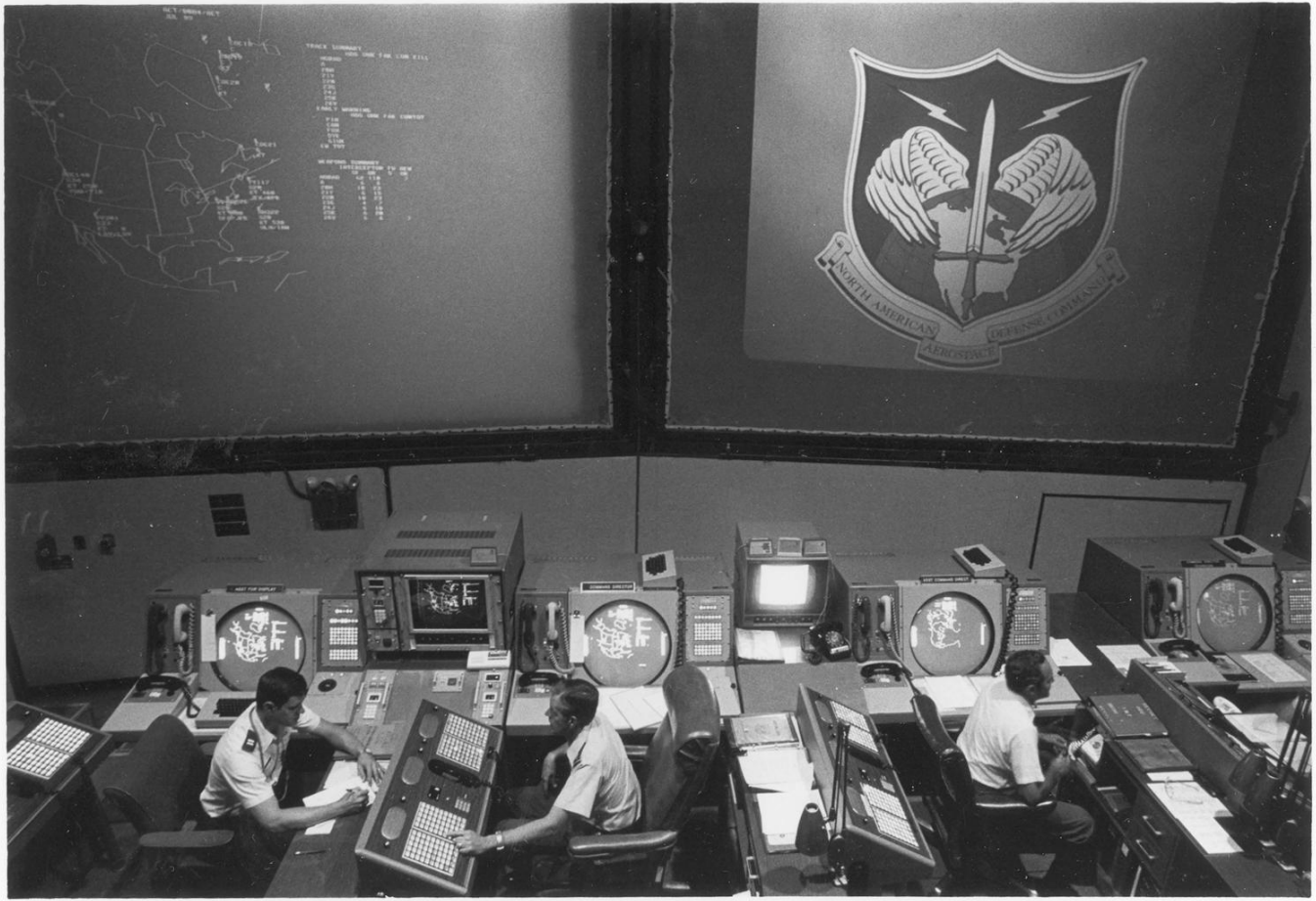
Distant Developments

“By the late 1970s, computers had been integrated into most high-technology weapons systems. Micro processors and other miniaturized components allowed drastic reductions in computer size and power requirements, while progressively more sophisticated software expand their utility. Their very ubiquity made them increasingly problematic not only when they failed, but also when they worked normally.”

Figure 1, taken from the GAO report "Review of Department of Defense's Strategic Missile Warning System", March 14, 1980, depicts the schematic arrangement of the NORAD missile warning system.



Hart, Gary, and Barry Morris Goldwater. Recent False Alerts from the Nation's Missile Attack Warning System: Report of Gary Hart and Barry Goldwater to the Committee on Armed Services, United States Senate. USGPO, 1980.



Burr, William, ed. False Warnings of Soviet Missile Attacks Put US Forces on Alert in 1979-1980; Eight Minutes After Warning Screens Showed 1,400 Soviet ICBMS Approaching North America, on 9 November 1979, NORAD Concluded "Attack Was Underway", National Security Archive, 2020.

Burr, William, ed. False Warnings of Soviet Missile Attacks Put US Forces on Alert in 1979-1980; Eight Minutes After Warning Screens Showed 1,000 Soviet ICBMs Apparently Nine North America, on 9 November 1979, NORAD Concluded "Attack Was Underway". National Security Archive. 2020.

Proximal Events

On the morning of Nov 9, officers began preparing for a test operation later in the day

They attempted to input a data reel tagged as test data through a test device (MG/R) to CSS; the Honeywell computers were in “Hot/Shadow Mode,” so both of their processors matched and used the same data

- **This was a regular procedure since 1978**

However, this time, the MG/R and the CSS failed to connect properly

Proximal Events

The officers tried another tape (the “NJ scenario”) which did not indicate that it was test data

- **Officers had used this reel before to show that untagged data which entered the system would override test-tagged data**

The MG/R and CSS behaved ambiguously but the officers did not believe it was connected

The MG/R transmitted the data, though no evidence that anyone manually initiated transmission

Proximal Events

Meanwhile, a circuit transmitting serial satellite data through Buckley AFB blipped and the MG/R was incidentally connected to a backup conduit

Finally, the last signal from Buckley had been 001 and the NJ scenario began with 002

The CSS transmitted a signal indicating that 1400 missiles were incoming!

Proximal Events

A threat assessment conference call began within about a minute

- **Counter-offensive planes were ordered to prepare to launch, but some actually did due to patchy connections**

Responders cross-checked against alternative data sources, e.g. PAVE PAWS, which did not detect any missile launches

Incongruities between the time of day and the MG/R data undercut its credibility

Proximal Events

The NORAD commander determined it was a false alarm in about 6 minutes

President Carter and DoD higher-ups were not notified or evacuated

Press and IR fallout began the next day, which the DoD downplayed

To remediate, NORAD built a separate dev-and-test facility and more

Review & Some Takeaways

“Blunt-Distant factors include pressures created by the blunt end and the priorities that are intentionally or unintentionally communicated through those pressures. Sharp-distal factors include adaptations formed to react to priorities communicated by blunt-distal pressures. These adaptations or beliefs have been used successfully in previous work. Blunt-proximal factors influence sharp-end behavior during the accident, and sharp-proximal factors are sharp end behaviors during the accident.”

Review & Some Takeaways

Where did the production pressure come from?

According to Edwards: The Truman Doctrine of “containment”

- **“The Closed World” is undergirded by and reproduced through a zero-sum, us-versus-them, totalizing model**

This fallacious totality allows for exacting calculations, identifying precise causes, and stifles learning about the tensions which produce pressure

Article

Imaginaries of omniscience: Automating intelligence in the US Department of Defense

Lucy Suchman

Abstract

The current reanimation of artificial intelligence includes a resurgence of investment in automating military intelligence on the part of the US Department of Defense. A series of programs set forth a technopolitical imaginary of fully integrated, comprehensive and real-time 'situational awareness' across US theaters of operation. Locating this imaginary within the history of 'closed world' discourse, I offer a critical reading of dominant scholarship within military circles that sets out the military's cybernetic model of situational awareness in the form of the widely referenced Observe, Orient, Decide, Act or OODA Loop. I argue that the loop's promise of dynamic homeostasis is held in place by the enduring premise of objectivist knowledge, enabled through a war apparatus that treats the contingencies and ambiguities of relations on the ground as noise from which a stable and unambiguous signal can be extracted. In contrast, recent challenges to the closed-world imaginary, based on critical scholarship and investigative journalism, suggest that the aspiration to closure is an engine for the continued destructiveness of US interventions and the associated regeneration of enmity. To challenge these technopolitics of violence we need a radically different kind of situational awareness, one that recognizes the place of ignorance in perpetuating the project of militarism. Only that kind of awareness can inform the public debate required to re-envision a future place for the US in the world, founded in alternative investments in demilitarization and commitments to our collective security.

Invited Exchange of Letters

COLLECTIVE INTELLIGENCE

An exchange of letters on the role of noise in collective intelligence

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Thank you

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