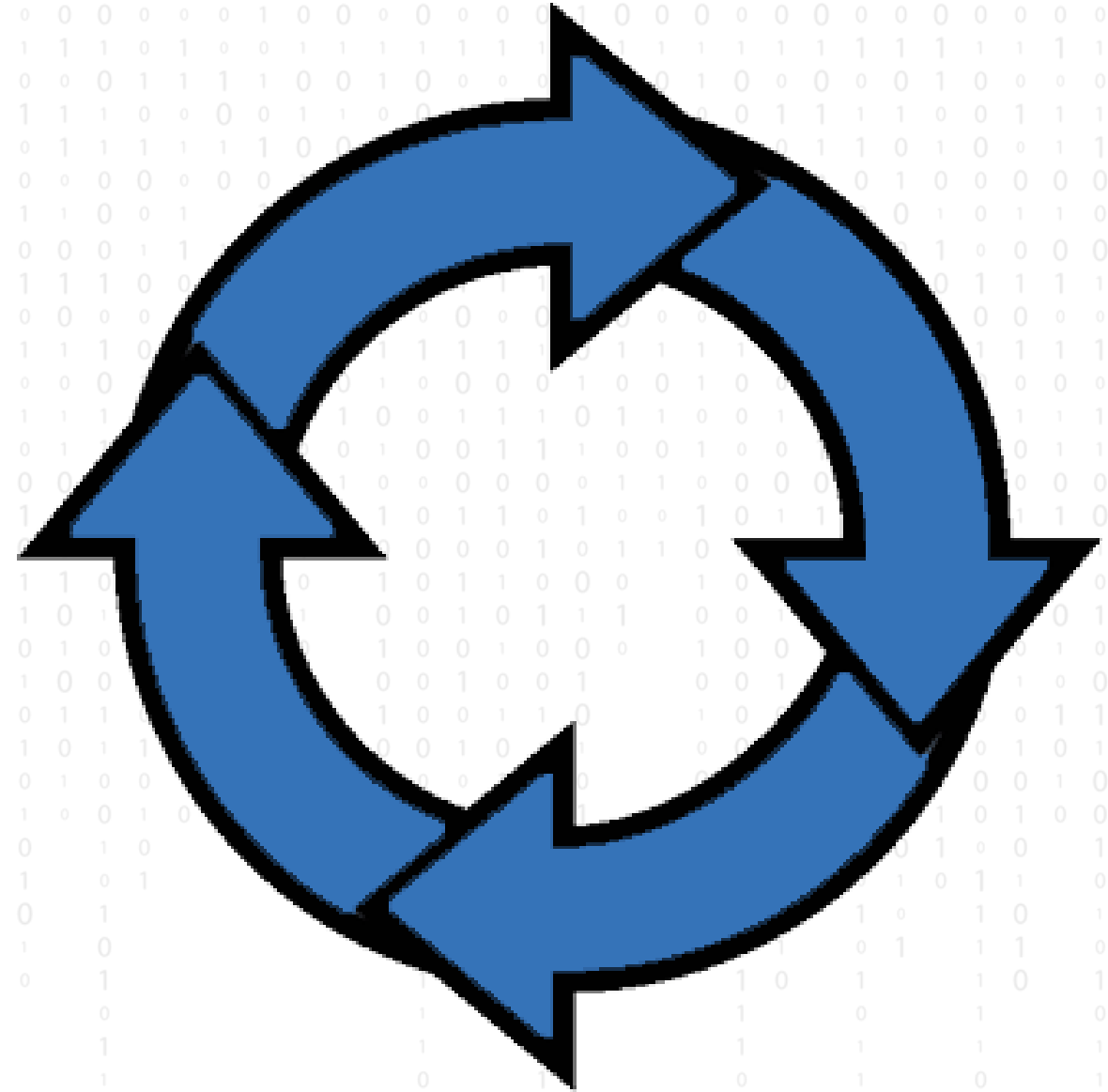


Decision-making Under Uncertainty

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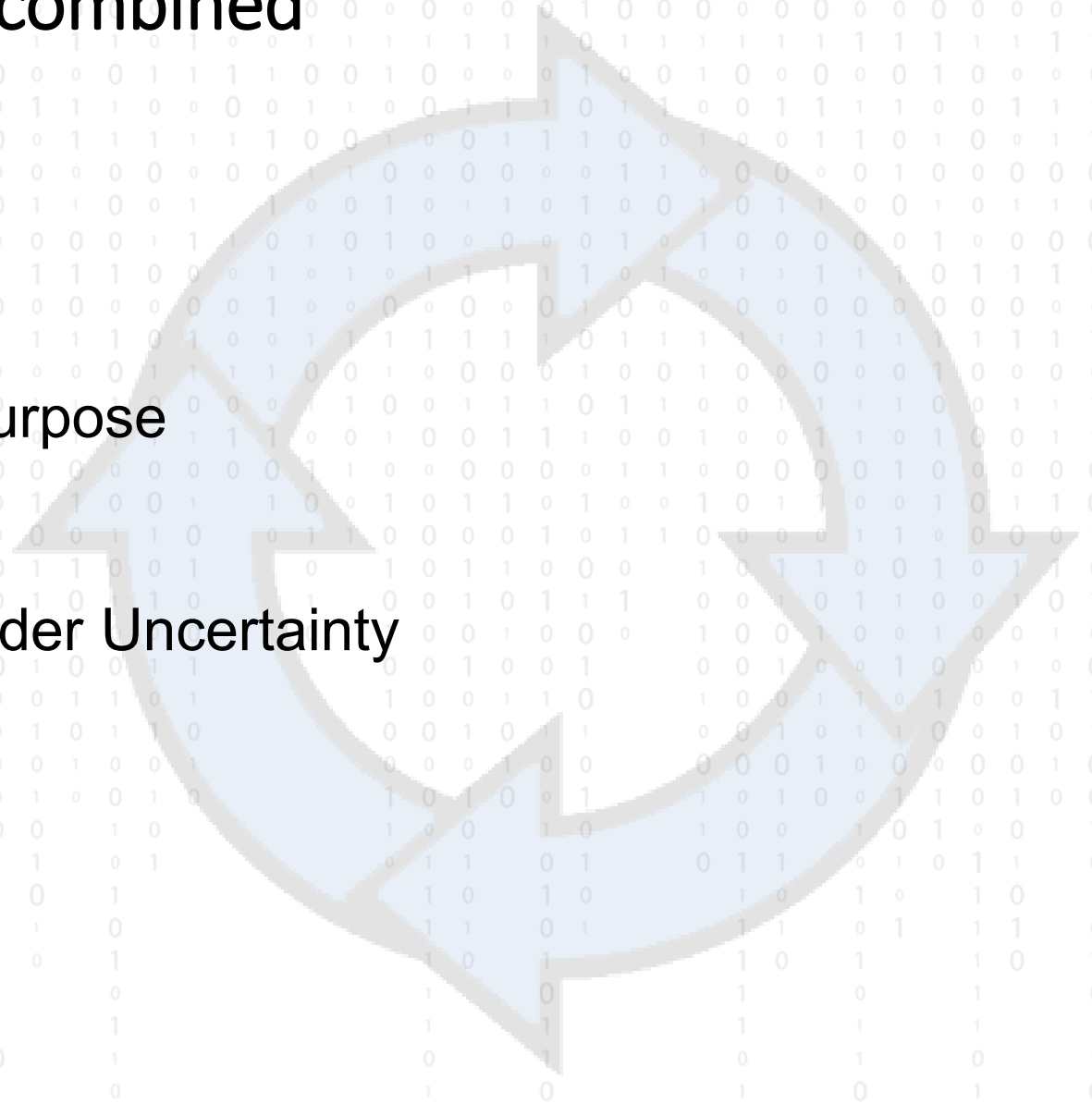
16 July 2026

Enabling Intelligent Action™



Lessons from research and practice combined

- Heuer and the mind's wiring
- An overload story
- Klein and Boyd, building instinct on purpose
- Adding rigor without losing speed
- The Ten Laws of Decision-Making Under Uncertainty



Heuer and the mind's wiring

- Heuer applied Kahneman and Tversky's research on cognitive bias to real analytic work in the Intelligence Community
- We tend to perceive what we expect to perceive, especially when it's what we want to believe.
- Mindsets form fast and resist change, even in the face of new evidence.
- Awareness of a bias doesn't remove it. The fix must be structural, not just personal.
- Formal methods can be taught (example, Analysis of Competing Hypotheses).

A Story of Overload

- Intelligence Center, Seventh Fleet, Kamiseya, Japan. Seeking insights using every source available: undersea sensors, imagery satellites, SIGINT, HUMINT, and fleet reporting, arriving constantly and often contradicting each other.
- Heuer's teachings were of limited help here.
- Dynamic environment of ceaseless flux.
- Every watchstander, 24/7, was overwhelmed with data that's uncertain, ambiguous, contradictory and sometimes intentionally deceptive.
- The real teacher in that environment is the experienced watchstander who has lived in the domain for years. Formal methods of analysis were important but secondary to intuitive action.
- Takes years to grow a highly performing expert in this discipline.

Two systems of thinking

Stanovich and West's two modes of reasoning (2000), and why crisis response needs both.

System 1: fast

- Stanovich and West's definition: automatic, outside conscious awareness
- Doesn't draw much on computational capacity
- Fast and associative, built on experience rather than rules
- What watchstanders relied on under real-time pressure

System 2: slow

- Stanovich and West's definition: deliberate, consciously controlled
- Draws heavily on computational capacity and working memory
- Tied to individual differences in general reasoning ability
- What structured techniques like ACH are built for

Four ways to build expertise

Klein: what matters is structuring experience, not just accumulating it.

Personal experience

Straightforward, but inefficient. Growth tracks the range and difficulty of cases faced, not hours logged.

Directed experience

One-on-one tutoring: observing, assessing, modeling, correcting. Most tutors never learn how to do it well.

Manufactured experience

Simulations built to produce rare or extreme cases on demand, instead of waiting years to meet them naturally.

Vicarious experience

Learning through other people's hard cases, captured as structured stories rather than lived firsthand.

No model survives a changing reality

Boyd informed operational decision-making with math and science

Gödel's incompleteness theorem

A system powerful enough to describe itself contains truths it can't prove with its own rules.

Heisenberg's uncertainty principle

Pin down one property precisely, and another slips out of reach. Observation has limits.

Second law of thermodynamics

Left alone, closed systems drift toward disorder. Order has to be maintained.

**No system can know itself from within itself.
No model of reality can endure in a reality that is changing.**

Our frontal lobe exists to model the world. Don't let it get lazy.

Klein and Boyd, building instinct on purpose

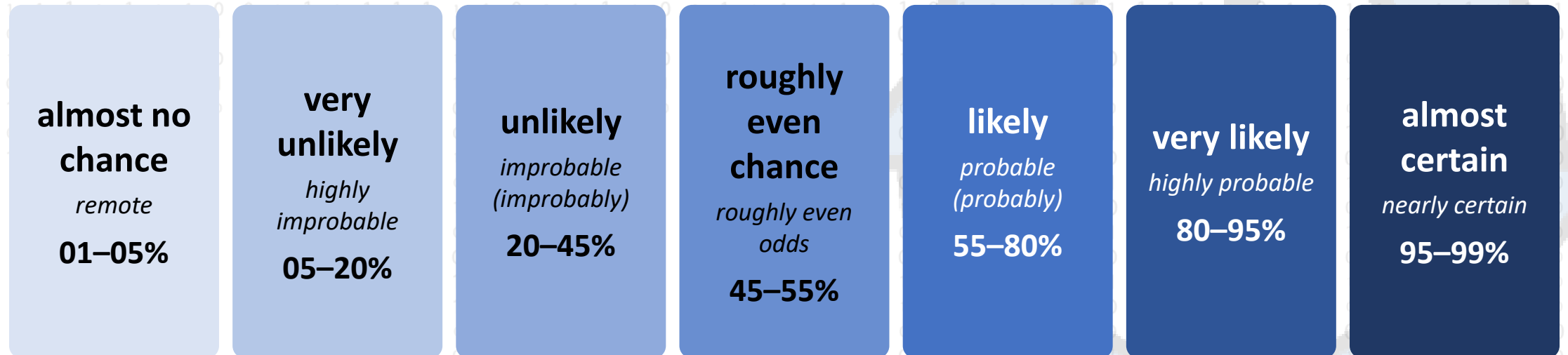
- Klein's "Seeing the Invisible": intuition builds through on-the-job experience, training, simulation, and story, not analysis alone.
- Klein's real claim: the path from apprentice to master in intuitive decision making can be deliberately accelerated, not just waited out.
- Boyd's core insight: no model of reality survives a reality that keeps changing.
- Boyd's discipline: know when a model is failing, and know how to destroy it and build the next one.

Adding rigor without losing speed

- JTF-CND, 1998: defending more than 7 million DoD computers and 10,000 networks, under strict legal constraints and almost no precedent.
- Applied Klien, Boyd, Heuer to our day-to-day operations.
- Built IC-wide team, ran simulations and training with extended team.
- Built new models.
- Analysis of competing hypotheses (ACH): hunt for evidence that kills each explanation, not evidence that confirms your favorite.
- Boyd's other lesson: your adversary has a tempo too, so speed is part of rigor, not opposed to it.
- ICD 203: separate how confident you are in a judgment from how certain the underlying facts are and say so in language everyone reads the same way.

A common language for likelihood

ICD 203's standard vocabulary for expressing probability judgments.



Each term maps to a working probability range, so a judgment reads the same way to everyone who hears it.

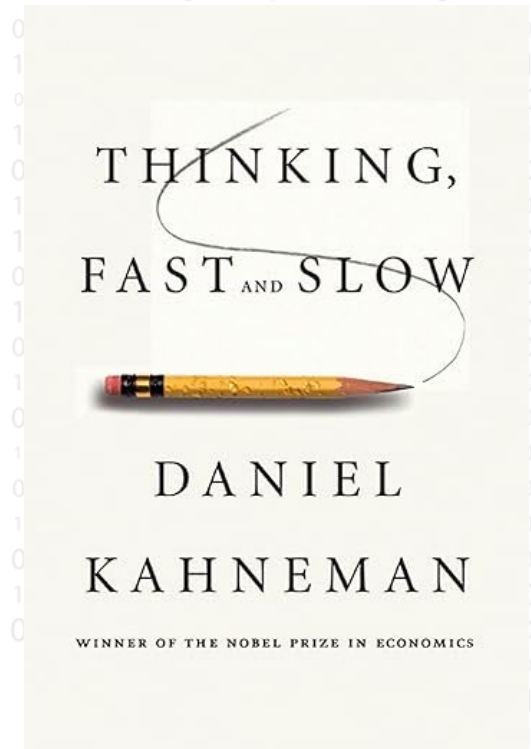
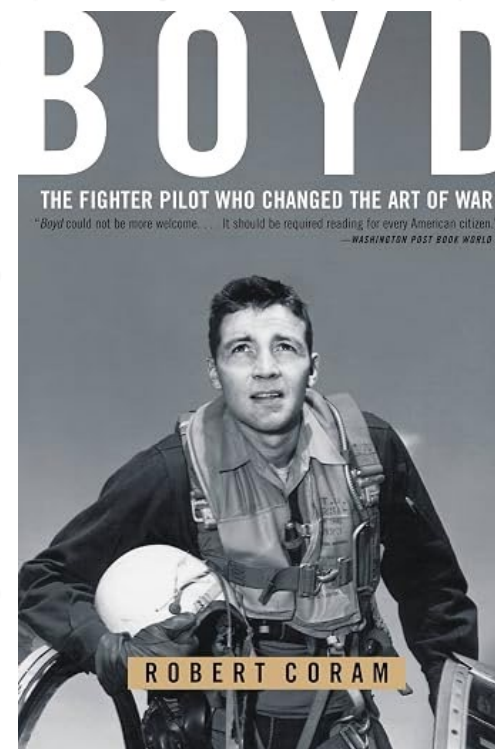
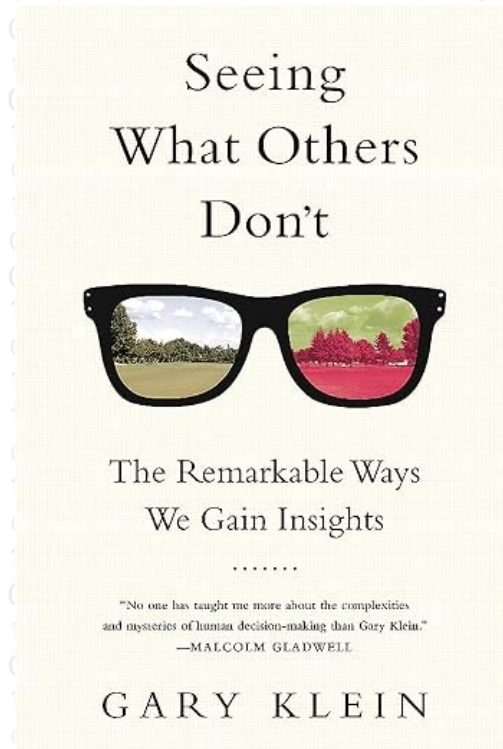
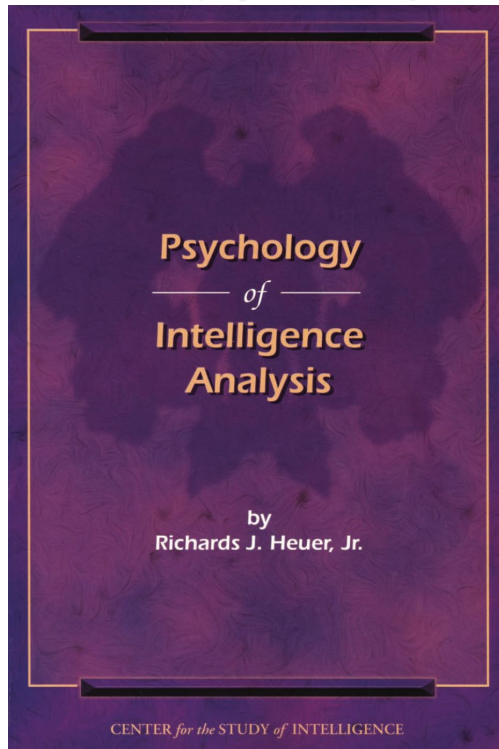
Today's Nuance: AI changes the volume, not the problem

- More access to relevant expertise and prior cases than any analyst has ever had.
- Also more misinformation, disinformation, and irrelevant noise than any analyst has ever faced, often delivered with false confidence.
- Treat AI as a source to interrogate and scrutinize, not an oracle to trust.
- Learn and teach proper use of tools, and seek the best for the task at hand

The Ten Laws of Decision-Making Under Uncertainty

- Preparedness actions should include training on how we think. Heuer, Klein and Boyd provide a solid foundation.
- None of us is as smart as all of us. Strengthen your human citadels. Build deep human networks and personal relationships before the crisis.
- Ensure training for crisis response emphasizes vicarious experiences: Formalize scenario-based tabletop exercises across the community to improve System 1 thinking skills.
- Learn cognitive biases and seek to mitigate them (this requires institutional effort)
- Architect for access to all the right data before you need it. During the crisis fight for more data.
- Understand the strengths and weaknesses of every data source.
- Don't believe everything you think. Every mental model will fail you eventually. Understand the mind is like software, it should be constantly improved, debugged and upgraded.
- Expressing views on a situation should be done in ways that convey credibility of sources and express judgements and uncertainty in common ways.
- Treat AI as a source to be scrutinized, not as a sage to always be believed. To do this well, encourage mastery of the new AI tools to improve fluency on their strengths and weaknesses.
- Make judgements based on facts when possible, opinions when you must, and assumptions when you have to. Ensure you revisit all in the face of new data.

More on Decision-Making Under Uncertainty



And OODAloop.com

Every model will fail you
eventually.

The question is whether you notice in time to build a new one.