Evolutionary Epistemology*

A Personal View of John Boyd’s “Destruction and Creation” ... and its centrality to the ... OODA Loop

Franklin C. Spinney

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* Although I came up with this title on my own, it turns out that I am not the first to use this term, as I explain at this link: http://slightlyeastofnew.com/tag/chuck-spinney/.
Disclaimer:

This Presentation Represents My Interpretation of John Boyd’s September 1976 Paper.

(It was prepared after Colonel Boyd’s Death and has been Updated by some of His Subsequent Work as well as those of Chet Richards and Myself)

While I Worked Closely With Col. Boyd and Helped Him to Produce this Paper,

It is His Creation and My Role Was that of an Understudy.

Consequently,

Any Misrepresentation of Boyd’s or Richard’s Inputs are Mine Alone and

This Briefing Should Not Be Considered a Definitive Description of Boyd Work.
“Machines don’t fight wars, people do and they use their minds”

Colonel John R. Boyd (USAF Ret.)

As far as I can recall, I never heard Col. Boyd say this before he wrote the D&C paper ... and D&C is about ... 

The Mind.
Vector of Boyd’s Work: 1976 - 1996

Modified from Chet Richards’ original, see http://fasttransients.files.wordpress.com/2010/03/originsofjohnboydsdiscoursefigure1.pdf
Aim:

To Understand How the MIND Evolves an **Interior** Mental Orientation
(or Changing **Constructs of Meaning** or what Thomas Kuhn called “Paradigms”)

... that Permit ...

Individuals and Groups to Cope With Changing **External** Conditions

(i.e., with a Changing Environment)
Point of Departure: Why Do We Make Decisions?

**Biological Imperative Creates Purposive Behavior (i.e., GOAL Striving):**

- To **Survive** on our Own Terms ... or put another way,
- To **Increase** Our Capacity for Independent Action.

**Environment (Limited Resources and Skills)**

- Real World Constraints Limit Capacity for Independent Action and Threaten Survival.

**Implication:**

Combination of **Goal Striving** & **Scarcity** Sets the Stage for **COMPETITION** Among Individuals and Groups as they Struggle to OVERCOME Environmental Constraints.

**Consequence:**

To Survive and Grow Relatively Free of Debilitating Constraints, Individuals and Groups **MUST** MAKE DECISIONS and TAKE ACTIONS To Overcome Physical Obstacles and Social Competitors.
Focus:

How Do We Generate the Mental Concepts Needed to Support this Decision-Making Activity?

... Put Another Way ...

How Do We Evolve Mental Concepts to ...

- Identify WHAT Decisions and Actions are Necessary or Appropriate?
- MONITOR the Effect of Actions to Support Subsequent Decision-Making Activities?
Simplistic Answer

We Use a Sensor System to *Observe* Events in the External Environment.
We *Orient* Ourselves to the Meaning of those Observations.
We *Decide* and We *Act*
… and then We *Observe* the Effects of that Action ….. and Recycle

But there is a Problem With this Simple Portrayal

Any Ideas?
All Observations of the External World are Filtered Through the Cognitive Apparatus of the Observer ... and therefore ... Observations Cannot be Separated From the Various Interior Mental Processes of Each Observer

Implication
Any Description of a Complex Reality Can Be Viewed Through a Variety of Mental Concepts that Individuals & Groups Use to Represent Observed Reality (i.e., the Multitude of Different Perspectives Which Make Up One’s Mental Orientation.)

Question:
How Does One Evolve a Relevant Orientation for Apprehending the Complexity of Observations in the Real World?
There are Two Ways for Evolving and Manipulating Mental Concepts to Represent Observations

**Analysis**
Breaking Down a Comprehensive Whole into its Constituents and the Relations Among those Constituents.
(Deduction, Differentiation, Destruction)

**Synthesis**
Starting With Parts and Building Toward a Comprehensive Whole.
(Induction, Integration, Construction)
Analyses & Synthesis

Interplay of Observations & Orientation
An Introduction to the Dialectic Nature
Understanding and Creativity:

Understanding -- Analysis of a Pre-Existing Domain:
• Pyramids and the Question of Multiple Perspectives

Creativity -- Analyses & Synthesis:
• Boyd’s Thought Experiment: Example of a Destructive Deduction and the Creation of New Domains

Historical Example
• The Evolution of Cosmology
ANALYSIS
Understanding in the Context of a Single Domain

Focus of Effort
We Gather *Variety of Observations* About a Single Domain,
*Break Down & Correlate* these Observations from a *Variety of Perspectives*
... and ...
*Combine* these Correlated Perspectives into a Comprehensive *Description* of that Domain.
What is a Pyramid?

To Understand a Pyramid, the Observer Analyzes it From **Multiple** Perspectives and Correlates & Combines the Relationships Among Those Perspectives.

**Point:**

Dissection & Re-Assembly Can Produce A Richer Understanding, But the “Constrained Integration” Always Takes Us Back to the **Same** Pyramid.
CREATIVITY

Boyd’s Thought Experiment:
Replacing an Existing Order With a New Order

Imagine Four Separate Images (or Domains):
Each Image is a Pre-Existing Whole With a Unique Identity
(i.e., There are NO Relations Among the Domains)
Let's Shatter the Correspondence Between the Parts and the Domains

Analysis (Deduction):
Each Image is a Domain that Can Be Understood in Terms of Its Parts and the Relations Among the Parts (e.g. like the Pyramid!)
Analysis (Cont.)

Let’s **Shatter** the Correspondence Between the Parts and their Domains

But Something is Not Quite Right with this Picture

Any Ideas?
We may be Thinking of the “Parts” Outside their “Boxes” ... But...
the Legacy of those “Boxes” are Still Influencing What We See

More Abstractly:
The Pre-Existing Domains are Still Constraining Our Orientation and Imagination

Let’s Shatter the Correspondence Among the Parts and the Legacy of their Domains
Result: A Destructive Deduction

Uncertainty & Disorder in the Place of Meaning & Order

How Do We Construct Order and Meaning Out of this Mess? Which Brings Us to Step 3 -- i.e. Synthesis
We Can Synthesize a New Domain .... If We Can Find

*Common Qualities & Connecting Threads, Attributes, or Operations*

Among Some of the Constituents Swimming in the Sea of Anarchy.
Let’s Try Again,
Does Anyone See Any
*Common Qualities & Connecting Threads, Attributes, or Operations* in this Sea of Anarchy?
A New Domain or Concept Description
Created by Linking Previously Unrelated Constituents
!! ... Caution ... !!
Not Every “Snowmobile” is a Brilliantly Successful Innovation

A New Domain or Concept Description
Created by Linking Previously Unrelated Constituents

It never hurts to remind ourselves that,
Most “New Concept Descriptions” or “New Startups”
Do Not Work So Well in the Real World.
To be Viable and Remain Relevant, 
The New Description of Reality Must be **Continuously Refined** 
by **Checking & Verifying** Its –

- Internal Consistency and Reversibility
- Match-Up With External Reality

… But …

As the Focus of Effort **Turns Inward** to Refine the 
Precision or Subtlety of Both Observations and the Concept Description,
The Newer Level of Precision/Description Will Eventually Exceed the Original Precision

… and when this occurs …

We Should Expect to See **Mismatches** and **Inconsistencies** Between the 
Newer, More Precise Observations and the Concept Description of those Observations.
Why Will Mismatches Emerge?

If We Assumed Otherwise, It Would be the Same as Saying
Newer, More Precise or Different Observations and Interactions.
Would *Always* Combine
to Produce the *Same Synthesis* as the
The Older, More Primitive Observations and Interactions.

Perhaps a Real-World Example Will Help to Clarify this Crucial Point.

*Caveat:* The following example was constructed after Col. Boyd’s death. Any errors are Chuck Spinney’s alone.
Evolution of Our Mental Orientation to Celestial Observations  
(140 AD to 1905 AD)

Music of the Spheres  ➔  Celestial Clockwork  ➔  Space-Time-Mind

Claudius Ptolemy (circa 140 AD) and the Music of the Spheres

• Earth is Center of a Universe Made Up of 8 Spheres Which Rotate Around the Earth.
  ✓ Outer Sphere Holds the Stars, Which Rotate in Perfect Circles Around the Earth
  ✓ Each of the 7 Inner Spheres Holds a “Planet” (i.e., the Moon, Sun, Mercury, Venus, Mars, Jupiter, and Saturn) Which Moves Rotate Smoothly Around the Earth But Along a Complex Path traced by one or more Epicycles [along a path traced by rolling a smaller circle on the circumference of the sphere to produce a smooth but complex curvilinear motion]

• Problem: Although the System of Ptolemy Gave Reasonable Agreement With the Timetable of the Planets, More Precise Observations Called For Changes In or More Epicycles to Maintain the Matchup of the Concept Description with Observed Reality.

Result:  
An Ever-Increasing Inward-Focus of Effort  
As Astronomers & Mathematicians Struggled to Update Ptolemy’s World View  
… and consequently …  
By the 1400s, the Increasing Internal Complexity of the Ptolemy’s System Had Fatally Weakened its Intellectual Coherence and Set the Stage for a New Synthesis.
The Destruction of the Ptolemaic Orientation - Key Precursors

Copernicus (1473-1543) - Simplification via Paradigm Shift

- **Contribution:** Greatly *Simplified* the Mathematical Description of the Universe by Assuming the Sun to be the Center of Rotation.  **Problem:** Assumed (Erroneously) that Orbits of Planets Were Perfect Circles.  His Predictions Did Not Match All Detailed Observations, so He Could Not Get Rid of All Epicycles.

Tycho Brahe (1546-1601) - Increased Precision of Observations

- **Contribution:** Extraordinary Astronomer -- *Assembled Vast Data Base* of Very Precise Observations (W/O Telescope & Did Not Accept Copernicus’ Theory).

Johann Kepler (1571-1630) - Matchup via Precise Mathematical Description

- **Contribution:** Used Brahe’s Data & Own Observations to Convert Copernican System in to an *Precise Mathematical Map* of Planetary Motion based on **Three Laws of Motion**, (orbits = ellipses, equal area sweeping/time, and \((\text{year})^2 = K(\text{distance from sun})^3\)).

Galileo (1564-1642) - Mathematical Precision, Experimental Method, Basis in Physics.

- **Contribution:** Experiments Established the Modern Foundation for the *Mechanics of Motion*
  - ✔️ Invented Use of Pendulum as Precise Instrument to Measure *Time*.
  - ✔️ Proved Falling Objects Accelerate at a Uniform Rate, Regardless of Mass (\(d=1/2at^2\)).
  - ✔️ Used Telescope to Postulate “Divine Clockwork” (Rotation) of Jupiter’s Moons.
Newton’s Grand Synthesis (Snowmobile)

Orbital Dynamics (Kepler’s 3 Laws)

Mechanics: Newton’s 3 Laws of Motion

Universal Law of Gravitation
\[ F = G \frac{m_1 m_2}{R^2} \]
[1687]

More Precise Observations

Infinitesimal Calculus Invented by Newton

1. Inertia
2. \( F = ma \)
3. Action & Reaction

Result:
An Elegantly Simple, Mechanical Orientation that Predicted The Motion of Planets with Stunning Accuracy.
Newton’s ORIENTATION *Shaped* Observations & Experiments for 200 Years
As Scientists *Turned Inward* to Flesh Out Newton’s Paradigm


**Experimental Evolution:**

*Inward Focus* & *More Subtle Observations* Set the Stage for Eventual Mismatches Between Newton’s Predictions & Experimental Observations

Perhaps the Most Spectacular Example is the *Michelson-Morley Experiment*
The Michelson-Morley Experiment & the Search for More \textit{Precise} Measurements (1881-1887)

\textbf{Aim of Experiment:}

Use \textit{Interferometer} to Measure Speed of Earth through the “Ether” by Comparing The Difference between Speed of Light in Direction of Motion to Speed of Light Perpendicular to Motion
The Newtonian Orientation Depended on at Least Two Universal Constants:

1. **Gravitation** -- *Explicit*


**Michelson’s & Morley’s Assumptions AND Predicted Observations were Shaped by the Newtonian Orientation):**

- Ether is the **inertial medium** in space that carried both lights waves & earth
- **Galilean Transformation** =>
  - Speed of Light in Direction of Earth’s Motion = speed of light + earth’s speed
  - Speed of Light Perpendicular to Earth’s Motion = speed of light

**Experimental Results:**

**Actual Observations** Incompatible With the **Predicted Observations** of the Newtonian Orientation!

1. **No Interference fringes Appeared**, Which Implied (Incorrectly) the Earth was not Moving (Relative to the Ether or the Inertial Frame of Reference).

2. **Speed of Light + Any Other Velocity = the Speed of Light** (Inconsistent with Inertial Frame of Reference and Galilean Transformation)
Einstein’s Synthesis: The Special Theory of Relativity

Einstein Resolved the Anomaly by Changing the Universal Constants in the Newtonian Orientation

Two Universal Constants:

- Gravity (Like Newton)
- Speed of Light (In Place of Time)

Result - A New Orientation!
... i.e., a New Snowmobile ...

- **Galilean Transformation Replaced by Lorentz Transformation** -- a Moving Object Will Appear to Diminish in Length in the Direction of Travel as its Velocity Approaches the Speed of Light or Moving Clock Will Appear to be Running more Slowly

- **Equivalence of mass and energy** ($e=mc^2$ and Phenomenon of Mass Increasing as its Speed Approaches the Speed of Light).

- **Universe Must be Thought of (Mind) as a Continuum of Spatial and Temporal Distance.** (The Measure of Separation Involves Spatial and Temporal Terms.)
Generalization

Each New Synthesis *Shapes* the Nature of Future Observations as well as the Research Program for Developing the Concept Description.

-- On the Other Hand --

The Evolution of Cosmology from Ptolemy to Einstein Shows How the *Interplay* of Observations and Orientation Produces a Never Ending *Cycle* of Increasing Mismatches, Destruction, and Creation.

Yet over time, our Orientation to the world changes in a *non-cyclical* way.
While Historians (esp. Kuhn) Have Recognized this Pattern, Boyd Went Further by Arguing that there are **Theoretical** Reasons Why the “D&C” Cycle is an **Inevitable** Fact of Life.
Godel’s Proof

- Any Consistent System of Axioms is Incomplete—i.e., It Contains True Statements that Can Not Be Deduced from the Postulates that Make Up the System.
- **Generalization:** Even Though a System May be Consistent, Its Consistency Can Not be Demonstrated Within the System (Must Appeal to Systems Outside It).

Heisenberg

- Can Not Simultaneously Determine Position and Velocity of a Particle.
- **Generalization:** When the Precision of the Observer Approaches the Precision of the Observed, the Observer Perceives Uncertain or Erratic Behavior.

2nd Law of Thermodynamics

- All Natural Processes Create Entropy.
- **Generalization:** Entropy Must Increase in a System that Can Not Communicate in an Ordered Fashion with Other Systems External to Itself.

Theoretical Reasons for Eventual Mismatches
Boyd’s Snowmobile

CS Note: We will see that this statement lies at the center of Boyd’s Theory of how the Mind works in Competition & Conflict i.e., the OODA Loop

Godel

Heisenberg

“One Can Not Determine the Character or Nature of a System Within Itself Moreover, Attempts to Do So Lead to Confusion and Disorder.”

2nd Law
The Never Ending Cycle of

*Increasing Mismatches, Destruction, and Creation.*

Is a Natural Manifestation of a

**Dialectic Engine**

-- an Analytic/Synthetic Process --

- **Powered by** the Continuous Effort to Survive and Improve One’s Capacity for Independent Action

  …and …

- **Regulated by** Alternating Cycles of *Entropy Increase* toward More Disorder and *Entropy Decrease* Toward Less Disorder.
Let Us Now Probe More Deeply into the Nature of Observations

... and ...

The Relationship Between the Observer and the Observed

... and the way we ...

Synthesize these Observations into a Useful Picture of Reality.

Caveat: We are now leaving the confines of Boyd’s 1976 paper, what follows is a amalgam of ideas evolved jointly by Col Boyd, Chet Richards, and Chuck Spinney, any errors, however, are Spinney’s alone.
Basic Assumptions of Different Orientations:

Classical Physics (Newton & Laplace):

- The universe is a system *Reversible Deterministic Events* that exists as an objective reality *Independent* of the Observer. Observations are *events in themselves*, and a complete description of these events is theoretically possible. Uncertainty about the description is, therefore, the result of ignorance. [Bronowski 2: 63-4]

Relativity (Einstein):

- The universe is a system *Reversible Deterministic Events* that exists as an objective reality, but one's description of that reality is *dependent* upon the position of the Observer in the system. Between each Event and the Observer, there must pass a *Signal*, e.g., a ray of light, which can not be taken out of the observation. The fundamental unit of observation is the *Relation* between the event, the signal, and the observer. Uncertainties about the *system as it is* are the result of ignorance (God does not play dice.), but some events are *unknowable* to man because of the nature of the signal -- e.g., the constant speed of light makes it impossible to apprehend simultaneous events at a great distance. [Bronowski 2: 102-3]

Quantum Mech. & the Principle of Complementarity (Bohr's interpretation of Heisenberg's Uncertainty Relation):

- Events at the atomic level can only be described in terms of *Alternative Possibilities and Relative Probabilities of Occurrence*: Heisenberg showed why it is impossible to make precise, simultaneous measurements of the position and momentum of an electron. Bohr interpreted this result to mean that (1) the *Interaction* between the object of observation (the quantum system) and the observing mechanism is *Non-decomposable*; (2) no single observation or observing mechanism can completely describe the system; and (3), while various observations may describe complimentary portions of the same reality, it is impossible to combine them into a single, complete description of the whole of reality. [Prigogine: 222-9; Britannica: V15, 159 & V23, 876]

Natural Science: Evolutionary Biology, Culture, & Epistemology (Darwin, Lorenz, Campbell, Hall, Boyd, etc):

- Events in the external world are perceived through an *Evolutionary Cognitive Apparatus* -- a neurosensory system that acquired its present form through interaction with and adaptation to the *Subset* of events in the outer world which affects *Survival*. Since these sensing mechanisms superimpose *Partial Images* of the outer world on the fluctuating mental states of the *Internal Neurosensory Organization*, it is necessary to *Compensate* for the physiological and psychological mechanisms present in the observer to construct a viable image of reality. [Lorenz 1:1-19, Campbell: 47-89]
Newton & Laplace (and most Defense “Analysts,” Social “Scientists”, & Economists)
★ **No Interaction**: Unit of Observation = [Object of Observation]
★ Sterile Theory of “Objective” or “Absolutist” Observer in Social Science.

Einstein
★ **No Interaction**: Unit of Observation = [Object-Signal-Observer]
★ Sterile Theory that Everything is Relative in Social Science.

Heisenberg & Bohr
★ **One-Way Interaction**: Process of Observation *Shapes* the Object of Observation
★ Units of Observation = [Alternative Possibilities & Relative Probabilities]

Darwin ---* Lorenz ---* Boyd (inter alia)
★ **Two-Way Interaction**: Observing Apparatus *Shapes and is Shaped By* the Object of Observation and the Interaction of Environmental Pressure (Co-Evolution)
★ Units of Observation = [Subset of External Events Which Affect the Observer’s Survival]
Let’s Bring these Ideas Together

to understand what Boyd was getting at, when he said,

“Machines don’t fight wars, people do and they use their minds”

... and ...

One Can Not Determine the Character or Nature of a System Within Itself ...

Moreover ...

Attempts to Do So Lead to Confusion and Disorder.
The Simple Mechanistic Interpretation of the OODA Loop Misrepresents Boyd’s Ideas

Because
Our Discussion of the Relationships Among Analyses & Synthesis and Observation & Orientation Shows that ORIENTATION is Crucial to the OODA Loop.

... and ...

This Mechanical Cycle says Nothing About the Importance of Orientation
Orientation Shapes

“How” we see ... as well as ... “What” we see

... and ...

“How” we see “Evolves” over time.

Which Brings Us To
Let’s Examine Some Implications of his Idea:
(Remember - This Diagram is merely an illustrative Abstraction!)

* Note: This is a cleaned up version of a sketch jointly drawn in the late 1980s by John Boyd, Chet Richards, and Chuck Spinney. It is Boyd’s depiction of an OODA loop.
The following charts describe parts of the OODA Loop model and how it interacts with the external environment. They have been jointly evolved by Chet Richards and Chuck Spinney from time to time after Colonel Boyd’s death.

Readers interested in taking these ideas further should read “Boyd’s Real OODA Loop” by Chet Richards which can be downloaded at this link: https://fasttransients.files.wordpress.com/2012/03/boydsrealooda_loop.pdf

The Model is a very limited Pedagogical device, useful in understanding Boyd’s idea of Orientation as opposed to being a tool for use in any kind of operational sense.

We believe the following charts are consistent with Boyd’s ideas, but be advised -- any errors are Spinney’s alone.
Impression #1: Boyd’s OODA Loop is an **Organic** Conception of how the **Mind** Operates

The OODA Loop **should** be thought of as a complex *interplay* of ...

**Homeostatic Control Loops** in a Mental Struggle to 
*Evolve a Matchup of* 
**Living Organisms*** to Their **Environments**

(* The Idea can be Applied to Individuals - Groups - Cultures)
Impression #2:

Observations & Actions are the ONLY points where the OODA Loop comes into contact with External Reality.

All of the other operations of the loop are Internal with all the Hazards that Inward Focus implies.

(Which brings us back to Boyd’s Snowmobile)
Recall Boyd’s Snowmobile

Implication For Strategy in Competition & Conflict:

If the Interior Operations of an Adversary’s OODA loop can be induced to Hijack Observations & Actions, his OODA Loop would become Isolated from the Environment and would be induced to Collapse into Confusion & Disorder

The next few slides will explore Boyd’s insight.
What Can We Say About the Internal Workings of an OODA Loop?

Any Ideas?

Hints:
1. There are Two Types of Loops.
2. One of the “Control” Loops is Very Different from All the Others
Recall the Goal:
Increase one’s capacity for independent action in a competitive environment of Limited Skills & Resources

Two Types of Loops

Feed Forward Loops
Can be thought of as the energy flow powering the Goal Seeking behaviour of the OODA forward thru Time.

Feed Back Loops
Can be thought of as Regulating the Goal Seeking Behaviour of the OODA loop forward thru Time.

Which one of these loops is very different from all the others?
Impression: #3

Positive Feedback

Disconnected from Environment Can Drive Loop Away from Goal!

Danger: Amplifies!!!
(like placing a speaker next to a microphone)

Negative Feedback

Dampens
makes corrections like a thermostat, to drive loop Toward Goal

Positive Feedback can Seduce the loop into ‘Seeing What it ‘Wants’ to See’ as Opposed to What ‘Is’

ORIENTATION can Distort Observations to Disconnect the Organism from its Environment
... thus isolating the loop ...

Making All OODA Loops Prone to Collapsing into Confusion & Disorder

VULNERABILITY:
All OODA Loops embody the Potential for “Incestuous Amplification”
Implicit - Quick & Easy - Natural (Internal - Orientation Shapes Observation)

Implicit => Quick & Easy - Natural - Almost Instinctive (Internal: Orientation Shapes Action)

Always a Danger of “Incestuous Amplification”

Using Existing Repertoires “Fingerspitzengefühl”

Observation => Orientation => Decision => Action

Observations

Implicit Guidance & Control

Feed Forward

Implicit =\> Quick & Easy - Natural - Almost Instinctive

Real World

Observation

Orientation

Decision

Feedback

Action

Real World

Creating New Repertoires Slow

Explicit => Difficult - Can Feel Unnatural & Unnerving

(Internal Regulated by External - May Require Destructive Deduction, if New Synthesis is Needed)
**Examples**

**ORIENTATION** Can *Highjack Observations*

**France 1940**
- Maginot Line Mentality
- Schlieffen Mentality

**France 1944**
- Patton Deception
- Bletchley Park

**Vietnam 1965-72**
- Body count
- Interdiction bombing

**Propaganda**
- Nazi Demonization of Jews

**Iraq 2003**
- Saddam’s wpns of mass destruction

**Michaelson-Morely Revisited**
- Counter example

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**Point:**
The OODA Loop can be a tool for exploration in case study method & doctrinal research.
The OODA “Loop”

Is an Analytic/Synthetic Interaction by Which
Our Mental Orientation Connects With the External World
In an Evolving, Open-Ended, Far-From-Equilibrium Process
Governed by Control Loops Embodying Positive as well as Negative Feedback

The entire "loop" (not just orientation) is an ongoing many-sided implicit cross-referencing process of projection, empathy, correlation, and rejection.

The OODA Loop is an Unpredictable Evolutionary Phenomenon
...that is always...
Prone to Chaos

... On the Other Hand ...

... When things go out of whack ...
We can see something new and strange; and that is when we learn something
Boyd’s “Revelation” or Bottom Line

Brings Us Back to the **Centrality** of his 1976 Paper to an Understanding of his Theory of Conflict

(Note: written after the completion of his Entire Discourse — Summarized on Slide #4)

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**Revelation**

A *loser* is someone — individual or group — who cannot build snowmobiles when facing uncertainty and unpredictable change;

Whereas,

A *winner* is someone — individual or group — who can build snowmobiles, and employ them in an appropriate fashion, when facing uncertainty and unpredictable change.