

Science, Technology, and Innovation in Combating Terrorism

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The Role of Innovation in Combating Terrorism



Innovation Needed to Combat Terrorism

- **State power (DIME) not designed for use against terrorists.**
- **Terrorists organizations can adapt rapidly.**
- **State organizations have difficulty adapting.**
- **Overcome Clausewitzian friction in other ways.**

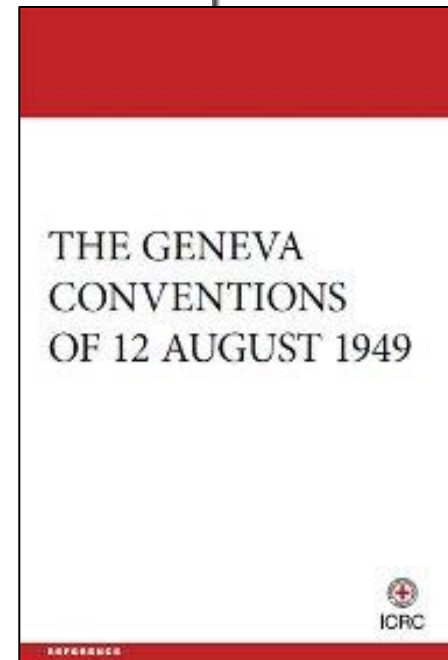
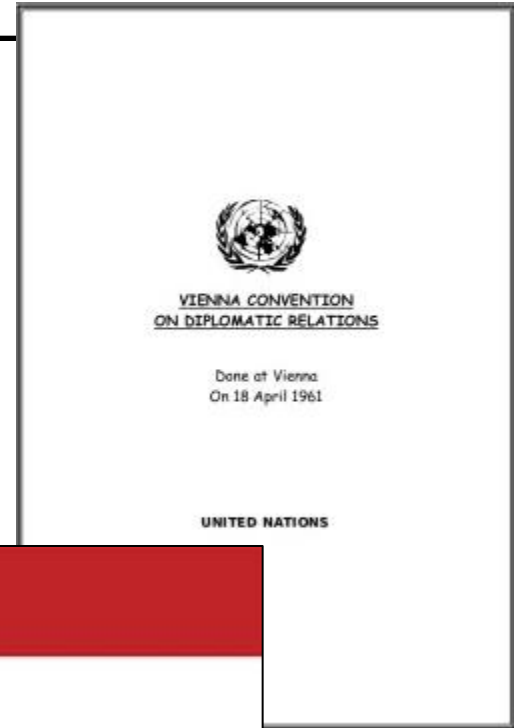
What is Terrorism?

- “...premeditated, politically motivated violence perpetrated against non-combatant targets by subnational groups or clandestine agents” (Section 2656f(d) of Title 22 of the United States Code)
- Attempt to change the behavior of states internally or internationally.



Why Terrorism?

- States have developed ways to settle international political disputes, including diplomacy and war, over hundreds of years.
- Internal laws and traditions are the means to accomplish national political goals.
- Terrorists do not believe they can achieve their goals using “normal” methods. Believe they can accomplish their goals by pressuring states with violence.





Why are Terrorists a Different Kind of Enemy?

- **Terrorist networks or organizations aren't states in the international system, or legitimate political parties.**
- **Not restricted by international conventions or agreements, or by the rule of law.**
- **Not subject to persuasion, coercion, or deterrence by usual interactions between states or by the legal political process.**
- **Do not utilize the resources of states for power.**
 - **Diplomatic**
 - **Informational**
 - **Military**
 - **Economic**



Traditional Sources of National Power

- **Diplomatic Power**
 - Relationships with other states, negotiate agreements, membership in international bodies, issue passports, maintain embassies, formal communication with governments, diplomatic immunity...
- **Informational Power**
 - Technical Intelligence, issue reports, collect statistics, census, fund research, press releases, control internet portals, censorship...
- **Military Power**
 - Legitimate use of force, (law enforcement), enforcement of economic blockades, threats, deterrence...
- **Economic Power**
 - Issue currency, regulate banking, tax, let contracts, lend and borrow money, impose tariffs, regulate trade, counterfeit foreign currency, intervene in markets...



Some Things Terrorists Need

- **Diplomatic**
 - Legitimize political goals
 - Move/exist
 - Cross international borders
- **Informational**
 - Communicate political goals (access to leadership, credibility)
 - Communication tools
 - Information about potential targets
- **Military**
 - Survivability
 - Firepower/weapons
 - Platforms/vehicles
 - Numbers of combatants
- **Economic**
 - Raise funds
 - Move funds internationally
 - Obtain military supplies



Organizational Types

Bureaucracy

Social Network



Rule-based

Relationship-based

Dr. Jessica Glicken Turnley, *Implications for
Network-Centric Warfare*, JSOU06-3

- **No organization is wholly one type or another!**
- **States tend to be rule-based: source of DIME.**
- **Terrorists tend to be relationship-based.**
- **Terrorists must use their organization to get what they need.**



Advantages

Rule-based

- Stability
- Certainty of command
- Efficient execution of repetitive tasks
- Executing functionally complicated tasks requiring deep knowledge
- Maintaining centralized control
- Ensuring transparency, accountability

Relationship-based

- Growth
- Creating trust, loyalty
- Responding to local conditions, change
- Fostering investment in a cause or purpose
- Managing dispersion
- Focusing on task completion

Dr. Jessica Glicken Turnley, *Implications for Network-Centric Warfare*, JSOU06-3



Terrorist Capabilities

- **Terrorists must keep creating new methods for all their needs.**
- **In response to their changing environment**
 - Efforts of governments to counter them
 - Changing political goals
 - New opportunities to attack
- **However, the advantages of rule-based organizations (DIME) lead some terrorist groups to a more bureaucratic structure**
 - Early al-Qaeda
 - ISIS
 - FARC

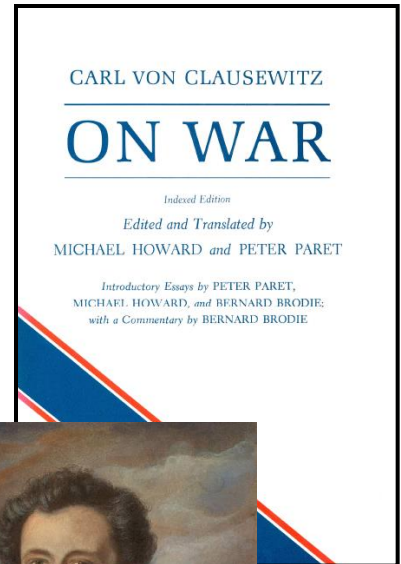


Restrictions on CT

- **Counterterrorism *could* use the full capabilities of states, including S&T.**
- **Terrorism usually isn't an existential threat, so governments can't devote large resources**
 - **DIME are mostly sources of power against other states, not terrorists.**
- **Governments have a hard time keeping up**
 - **Terrorists can respond rapidly to changing conditions.**
 - **Government, military forces, and law enforcement are rule-based organizations: stable, centralized, slow to change.**
- **Fanaticism, uncertainty, and unpredictability create Clausewitzian friction.**

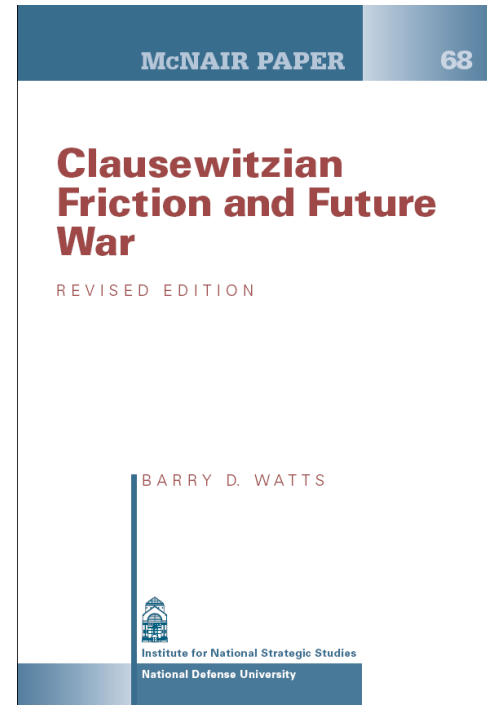
All War Has Friction

- “Everything in war is very simple, but the simplest thing is difficult.”
- “Action in war is like movement in a resistive element.”
- Friction is the “effect of reality on ideas and intentions in war” – the difference between plans and reality.
- True for counterterrorism.



Ultimate Sources of Friction

- 1. War is hell:** “Constraints imposed by human physical and cognitive limits.”
- 2. We can't know what's out there:** “Informational uncertainties and unforeseeable differences between perceived and actual reality.”
- 3. We can't predict what's going to happen:** “The structural nonlinearity of combat processes which can give rise to the long-term unpredictability of results and emergent phenomena.”





Friction in Combating Terrorism

- 1. War is hell:** Terrorist are willing to commit heinous acts, suicide.
- 2. We can't know what's out there:** Terrorist organizations are secret, emphasize security. Different parts of the organization may not share knowledge or plans.
- 3. We can't predict what's going to happen:** Counterterror operations may (or may not) lead to increased credibility for the terrorists' cause, aid recruitment, lead to more violence.



Conventional Forces for War Against States

- **War is Hell**
 - “Force protection,” very lethal platform-based weapon systems, dispersion of forces
- **We Can’t Know What’s Out There**
 - Technology-based intelligence, deliberate planning, networking, economy of force
- **We Can’t Predict What Will Happen**
 - Large numbers, uniformity and rigidity in doctrine and training, reserves, caution
- **Principles of War: Security, Offensive, Unity of Command, Objective, Maneuver, Surprise, Mass, Economy of Force, Simplicity**



Different Qualities for a Different Enemy

- **War is hell – Elite Warriorship:**

- Distribution of personnel with greater average “attributes” that exceed the constraints of conventional forces.
- Attributes include abilities to better deal with the intense stresses, pressures, and responses of engaging terrorists.

- **We can’t know what’s out there – Flexibility:**

- Wide range of existing capabilities to apply to specific goals in the face of uncertainty.
- Capabilities to discover the “ground truth.”

- **We can’t predict what’s going to happen – Operational Innovation:**

- Avoid the level of risk that would limit conventional forces by rapidly creating new capabilities.
- Change the process by which objectives are accomplished.



Definitions

Adaptability: more quickly recognize that a plan isn't working and change to a different plan.

enabled by

Flexibility: a wider range of existing capabilities to apply to the problem,

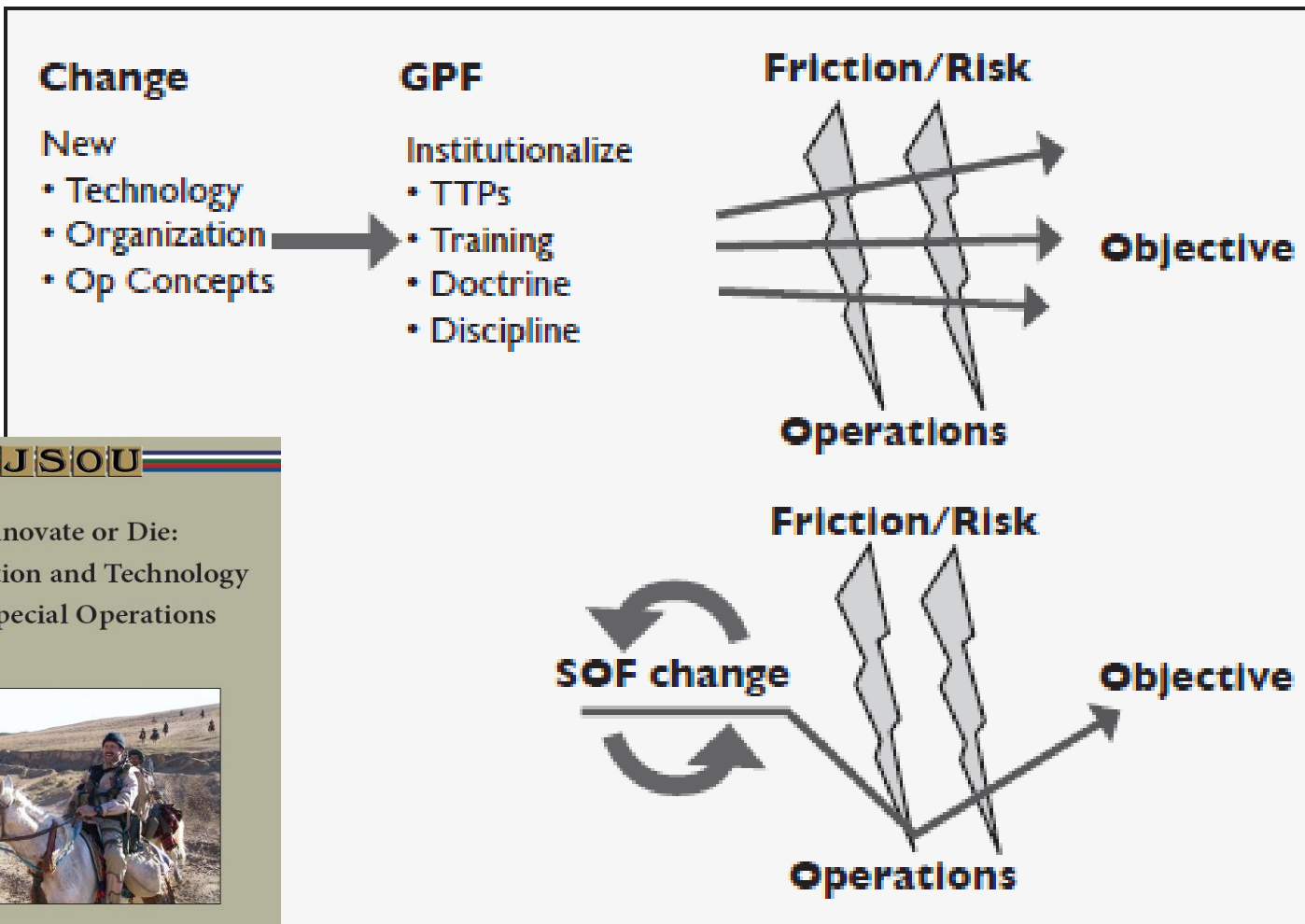
enabled by

Innovation: implementing a new capability,

enabled by

Creativity: a new and useful idea for the way to do something.

Rapid Operational Innovation



J S O U

Innovate or Die:
Innovation and Technology
for Special Operations



Robert G. Spulak, Jr.
JSOU Report 10-7
December 2010

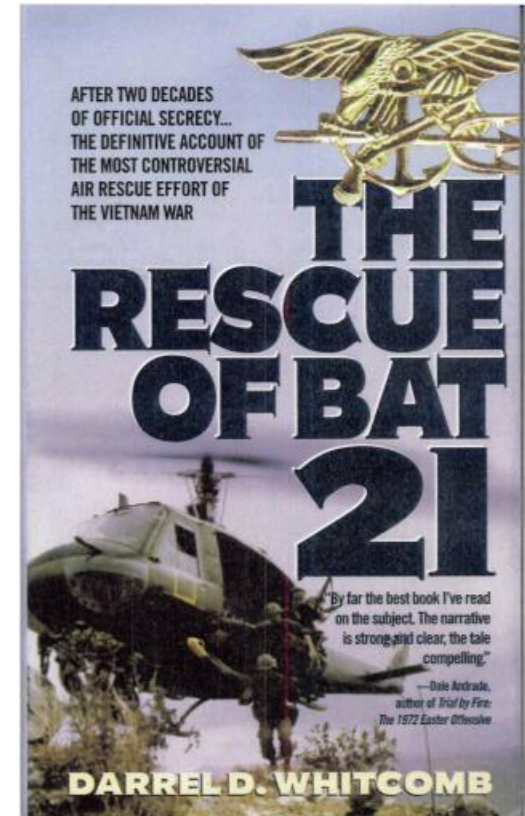
Changing the Game: Origin of the SAS

- **Situation:**
 - British WWII ground attack of remote airfields and other targets in North Africa.
- **Conventional commandos:**
 - Six hundred men attacked two landing grounds per night.
 - More than three-quarters of the force to provide security.
- **Special operations:**
 - Four or five men attacked a full target on their own.
 - Sixty men could attack fifteen or twenty targets per night.



Changing the Game: The Rescue of BAT 21

- **Situation:**
 - 2 April 1972 Lt. Col. Iceal Hambleton parachuted into largest conventional NVA attack of the war.
 - Air defenses made CSAR difficult.
- **Conventional operations:**
 - Conducted more and more air strikes and air CSAR attempts.
 - Six (6) more aircraft lost, many damaged beyond repair, eight (8) would-be rescuers killed, two captured, two (2) evading (Clark and Walker) with Hambleton.
- **Special operations:**
 - SEAL LT Tom Norris patrolled by land and operated indigenous sampan to move to position and rescue Hambleton and Clark. CMOH.





The role of Cyber

- **Terrorists use non-state means for**
 - **Diplomatic:** legitimize political goals, move and exist, cross international borders
 - **Informational:** communicate political goals, access communication tools, develop intelligence
 - **Military:** Survive attack, create effects, use platforms, create mass
 - **Economic:** raise funds, engage in international trade, obtain “military” supplies
- **Cyber allows terrorists to do many of these.**



The Problem

In war, traditional nation-states have specific attributes, such as territory, military forces, governmental structures, and economic capacity that can be the objectives of grand strategy and resulting military campaigns. Non-state actors, such as al-Qa'ida, do not have these same centers of gravity.

Harmony and Disharmony: Exploiting al-Qa'ida's Organizational Vulnerabilities, Combating Terrorism Center, Department of Social Sciences, United States Military Academy, February 14, 2006



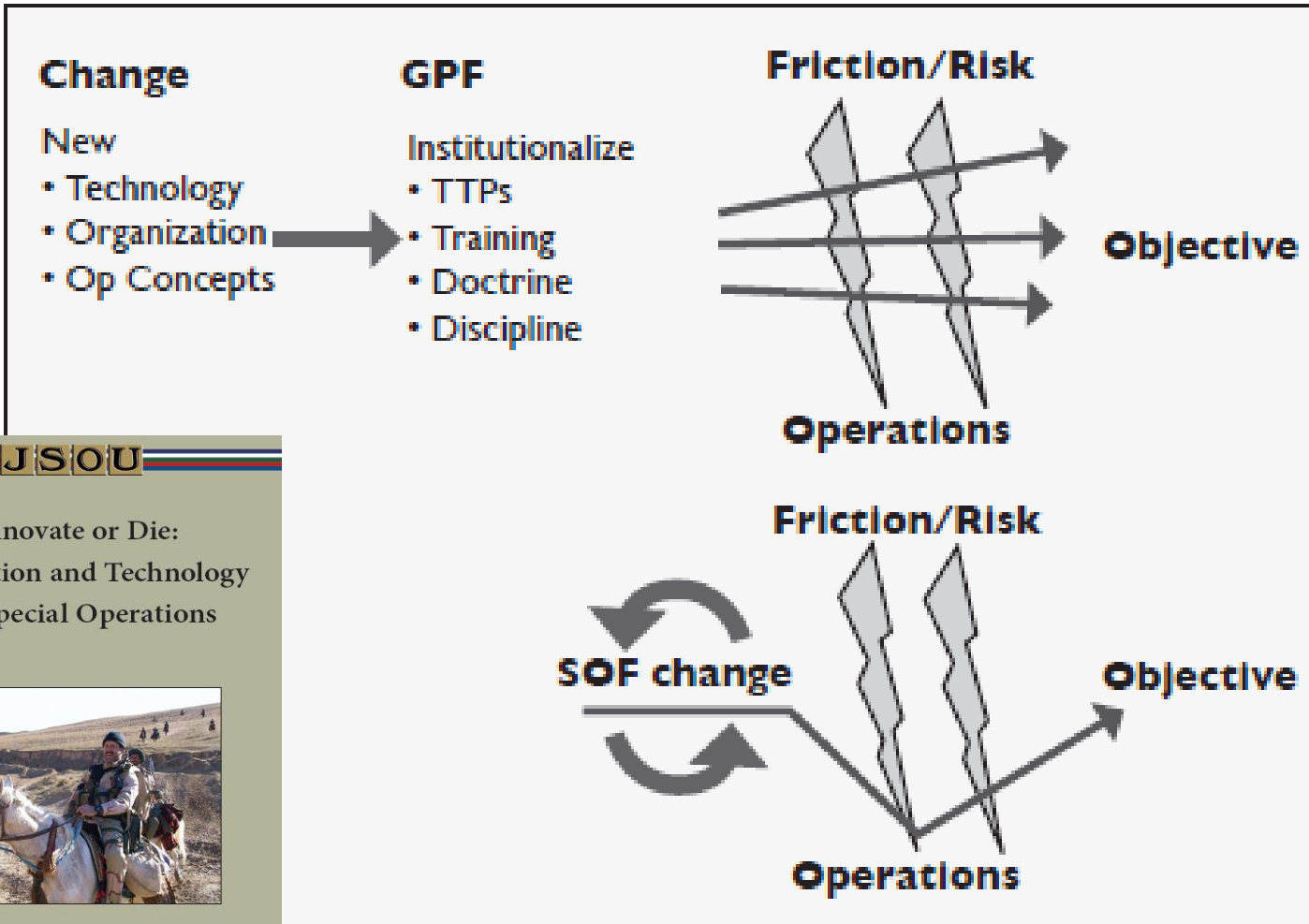
Operationalizing Innovation



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Rapid Operational Innovation



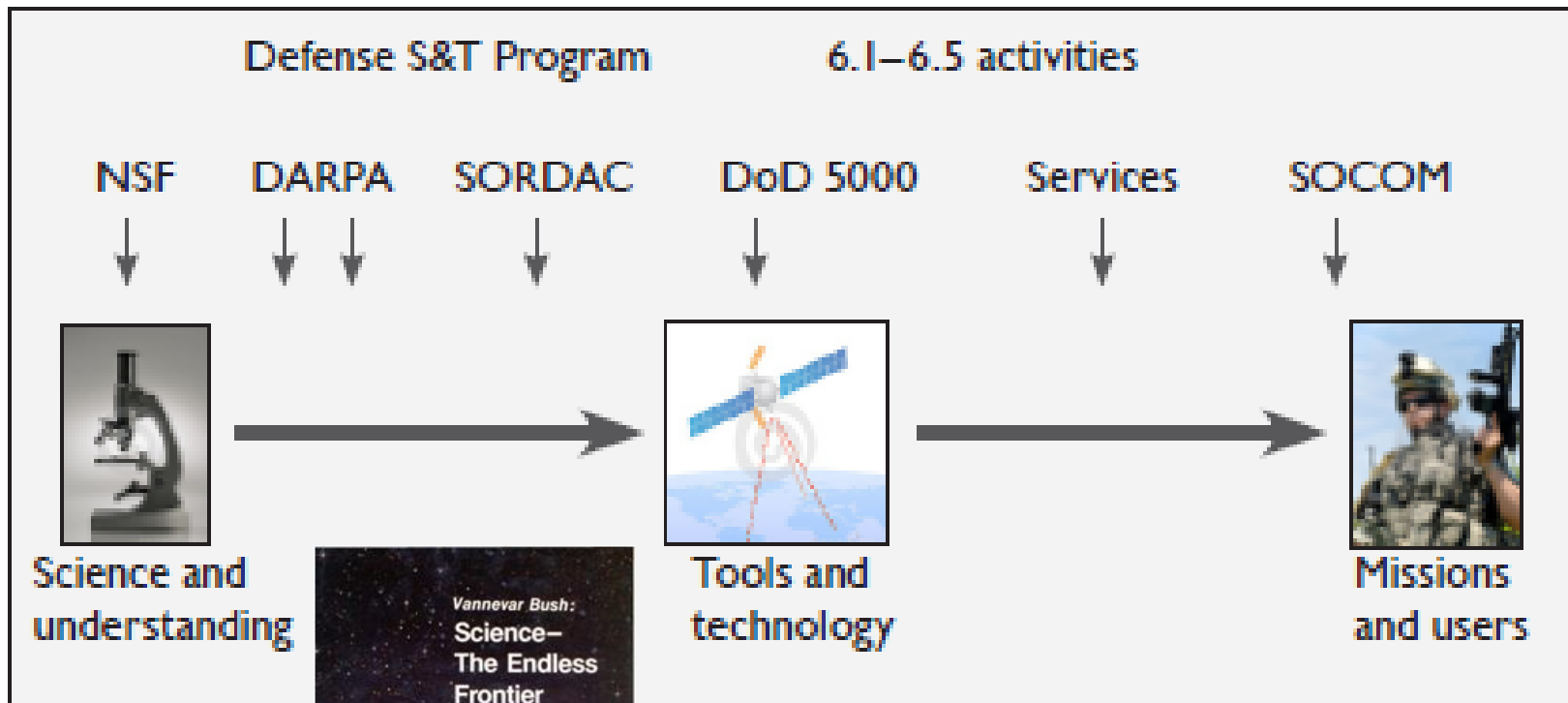
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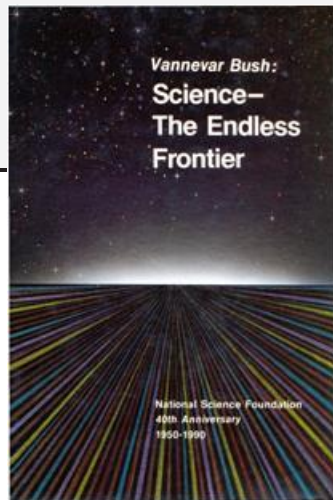


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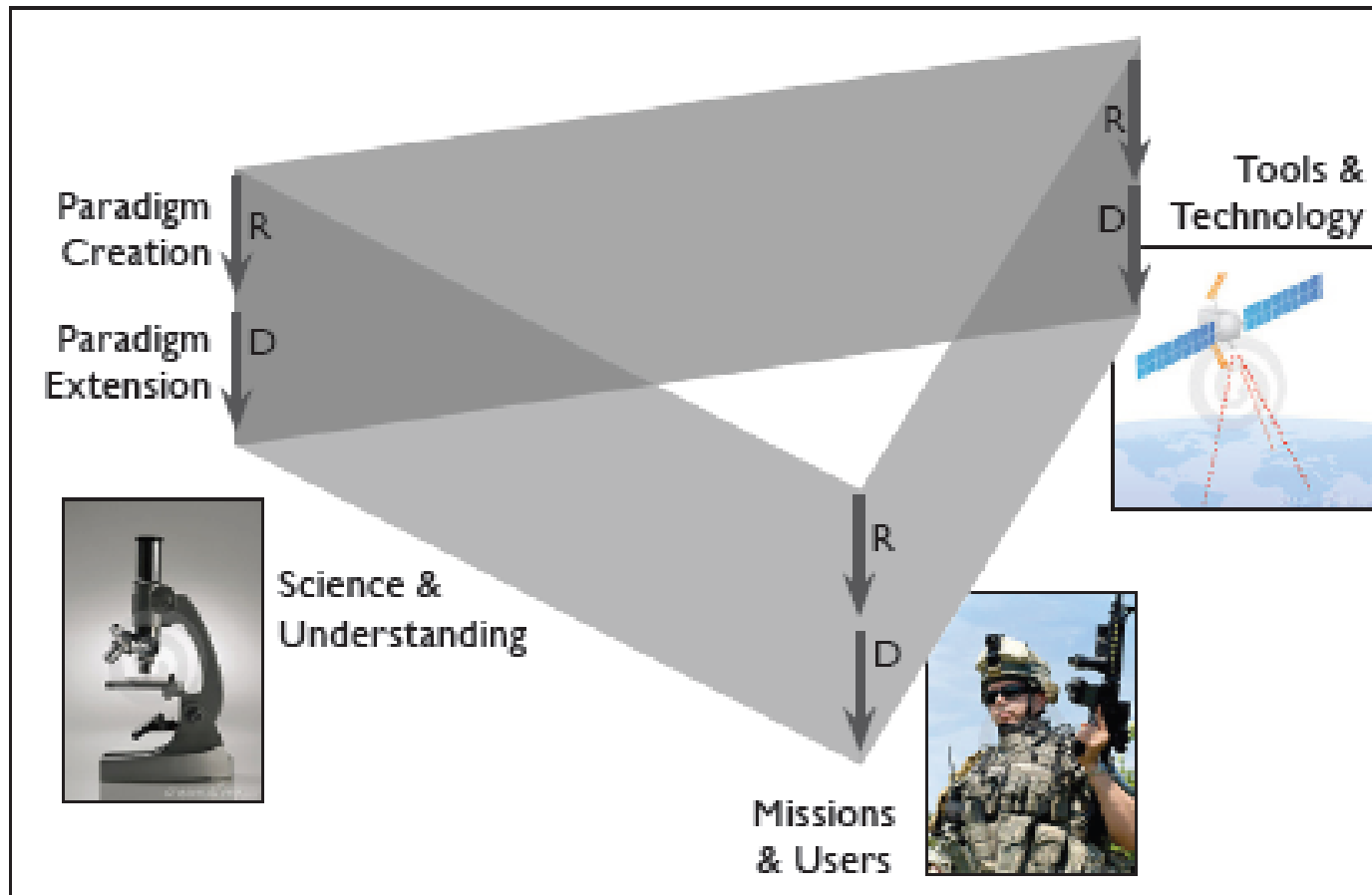
Paradigm Since WWII: Linear Model of Innovation



1947

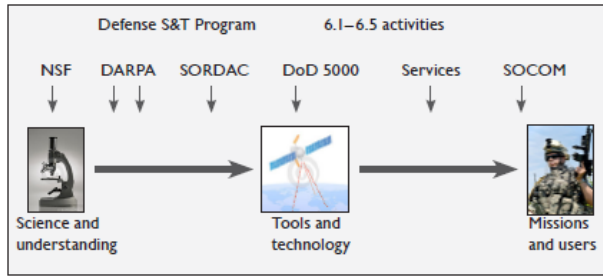


A Different View of Innovation



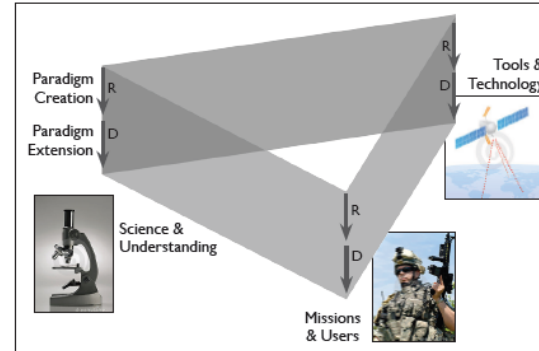
J.Y. Tsao, K.W. Boyack, M.E. Coltrin, J.G. Turnley, and W.B. Gauster, "Galileo's stream: A framework for understanding knowledge production," *Research Policy*, 2008

A New Paradigm: Integrate All Areas of Innovation

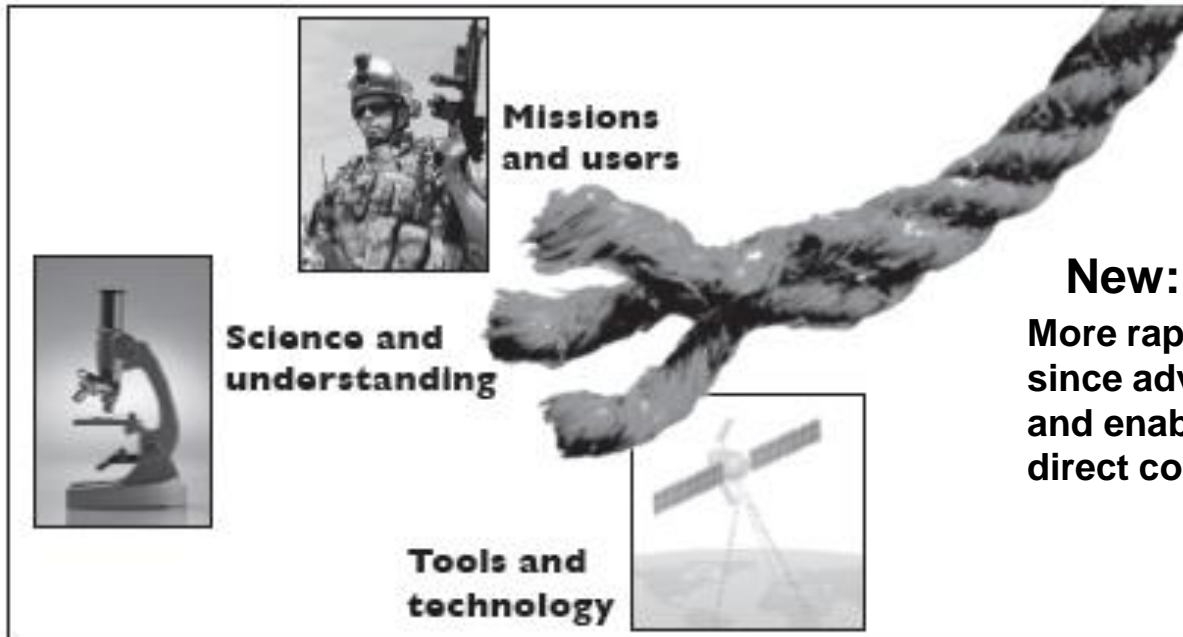


Old: linear, top-down

Lengthy process to minimize risk to programs and budget and risk of fielding immature technology.



Implement for speed

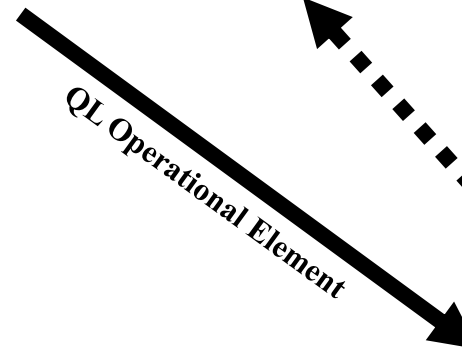
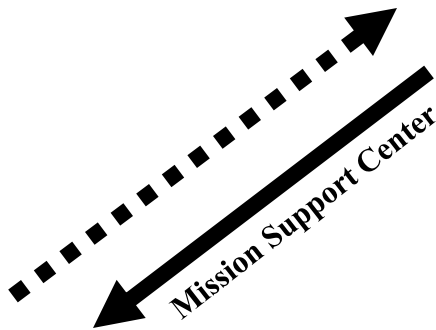
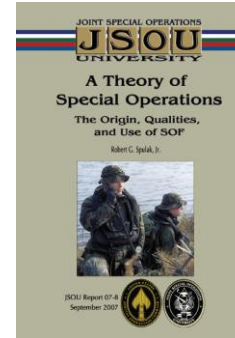
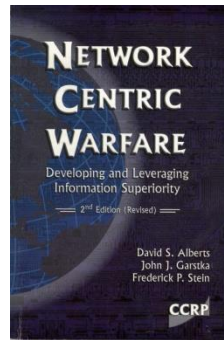


New: rapid innovation braid
More rapid and revolutionary innovation since advances in each area can inspire and enable innovation in the other two by direct contact.

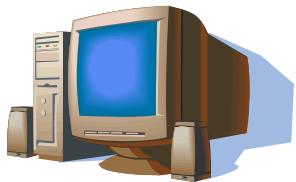
Quantum Leap



Science and Understanding



*Small teams,
Indirect action*



Tools and Technology

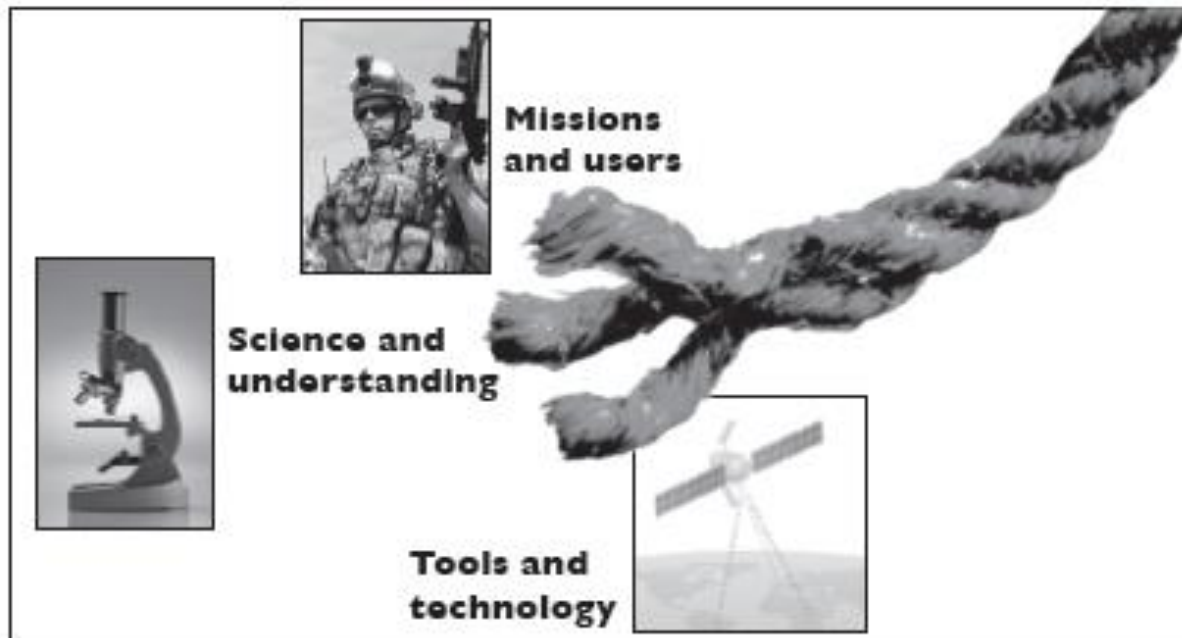


Missions and Users



Building a Rapid Innovation Braid

- Individual creativity – genesis of innovation
- Effectiveness of technology transfer
- Speed of adoption
- From the bottom-up





Creativity

- **Creativity = the association of ideas that have not previously been connected.**
- **Novel ideas are**
 - Not from deduction or from a process of pure conscious calculation.
 - From preparation, incubation, inspiration, and elaboration.
- **Intrinsic task-focused motivation is important.**
- **Personality traits of innovators in organizations match attributes of SOF for creativity.**



Four Stages of Creativity

- **Preparation.**
 - Study the problem, learn about ideas that might be relevant.
 - Broad understanding far beyond the problem at hand is far more likely to lead to a creative solution.
- **Incubation.**
 - Unless the problem is trivial, a solution will not be apparent by direct study.
 - Need time to make subconscious associations between the widely differing kinds of ideas.
- **Inspiration.** A novel solution appears seemingly without effort.
- **Elaboration.** The new idea is subjected to scrutiny to develop it and make it useful.



Key Variables of “Technology Transfer”

- **Communication interactivity**
 - From passive media to **interactive person-to-person**
 - “Innovation is a contact sport”
- **Geographic and cultural distance -- Low**
- **Personal motivation -- High**
- **X Technology equivocality**
 - Unequivocal technology is self-contained, fully developed: ease of transfer
 - **Equivocal** technology
 - » Uses discovered during use
 - » Requires a creative user – often early adopter

Equivocal Technologies

- Intranets, Smartphones
- Magnetic resonance
- UAVs



Speed of Adoption

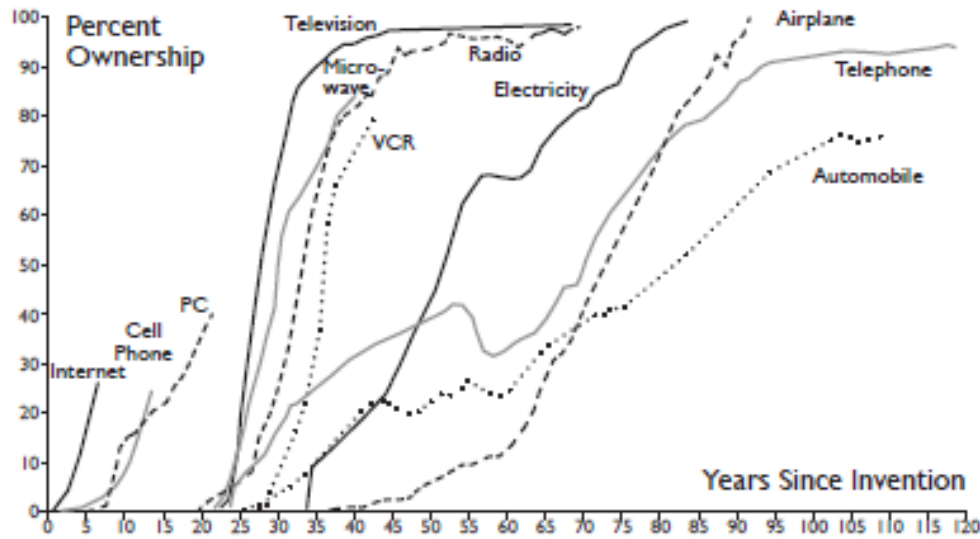
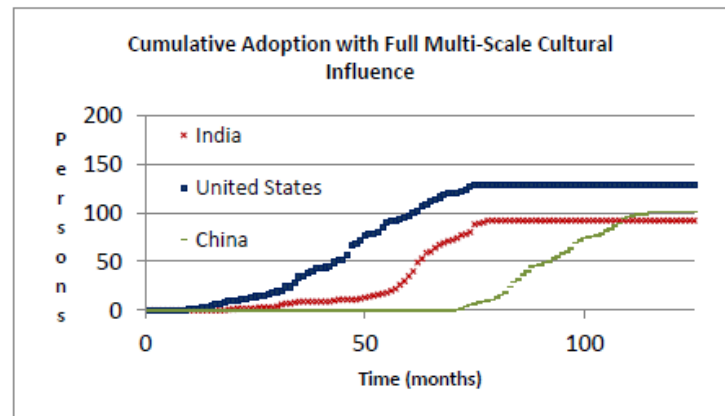


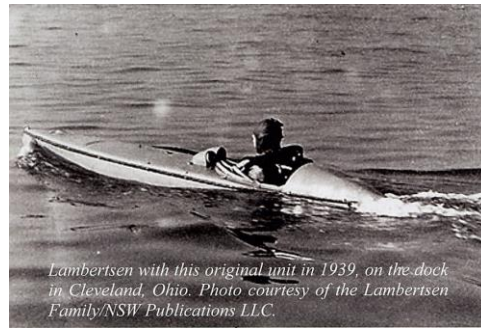
Figure 4. The S Curve of Adoption of Various Technologies (1996)⁴⁶



From “Closing the Micro-Macro Divide in Modeling Technology Adoption,” Briscoe, *et al.*

Bottom-up Archetype: Dr. Christian Lambertsen

**Officer in the OSS
Maritime Unit during
World War II.**



Lambertsen with this original unit in 1939, on the dock in Cleveland, Ohio. Photo courtesy of the Lambertsen Family/NSW Publications LLC.

**Medical researcher
in respiratory
physiology.**



**Science and
understanding**

**Tools and
technology**

**Missions
and users**

**Inventor and tester of
underwater rebreather
systems.**



“Lawrence of Arabia”

Led the tribes to victory in battle. Participated in the Paris Peace Conference.



Missions and users

Science and understanding

Tools and technology



Archeologist. Deep understanding of Arab tribes and culture.

Conceived and planned the Arab guerilla campaign against the Turks.



Innovation Options

- **Tiqui-taca** – Emphasize rapid incremental introduction of technology by the operators to advance capabilities.
- **S&T UW** – Effectively leverage external and potentially revolutionary S&T development by those who have the resources.
- **Quantum Leap 2.0** – Identify or redirect an independent source of funding solely for a SOF innovation cell, including technology.
- **Project Lambertsen** – Create an operational unit and recruit the right people as both operators and innovators.

Pros and Cons

	Pros	Cons
Tiqui-taca	<ul style="list-style-type: none"> - Doesn't require extensive new resources - Will result in increased effectiveness 	<ul style="list-style-type: none"> - Least likely to result in revolutionary capability
S&T UW	<ul style="list-style-type: none"> - Makes maximum use of external S&T resources - Focuses on revolutionary capabilities 	<ul style="list-style-type: none"> - Requires a large cadre of SOF SMEs to "advise" other agencies - Requires a long term commitment
Quantum Leap 2.0	<ul style="list-style-type: none"> - Focused on a specific vision - Funds S&T directed specifically at that vision - Includes more than technology 	<ul style="list-style-type: none"> - Requires dedicated funds and personnel - Requires leadership and vision - May be hard to sustain without short-term results
Project Lambertsen	<ul style="list-style-type: none"> - Makes maximum use of the conditions for successful innovation - Radical departure from business as usual may have best chance for revolutionary capabilities 	<ul style="list-style-type: none"> - Will be difficult to implement a new operational capability - May be difficult to recruit the right personnel - May be difficult to sustain in the force structure



Some Things Terrorists Need

- **Diplomatic**
 - Legitimize political goals
 - Move/exist
 - Cross international borders
- **Informational**
 - Communicate political goals (access to leadership, credibility)
 - Communication tools
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- **Military**
 - Survivability
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 - Platforms/vehicles
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 - Raise funds
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Technology Examples



Lambertsen
Lung



HALO



Credible Sport/
Honey Badger



SOFLAM



SATCOM



Gunship



NVGs



MSC



SDV/DDS



What do SOF Need?

- **Operators as early adopters or originators of innovation**
 - Resources for rapid innovation as part of the resources to perform the mission.
 - Innovation not a separate function top-down under acquisition but bottom-up under operations.
- **Individual creativity**
 - “SOF Truth:” *Humans are more important than hardware.* It’s not about technology, but about technologists.
 - Creativity always consists of novel combinations of preexisting elements – broad range of interests, experience, and expertise.



What do SOF Need?

- **Speed of adoption of new technology or ideas:**
 - High motivation, low geographic and cultural distance, highly interactive personal communication among all three areas of innovation:
 - » Science and Understanding
 - » Tools and Technology
 - » Missions and Users
- **Ability to use “equivocal” technology**
 - Early adopters
 - Creative users



Restrictions on CT

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- Terrorism usually isn't an existential threat, so governments can't devote large resources
 - DIME are mostly sources of power against other states, not terrorists.
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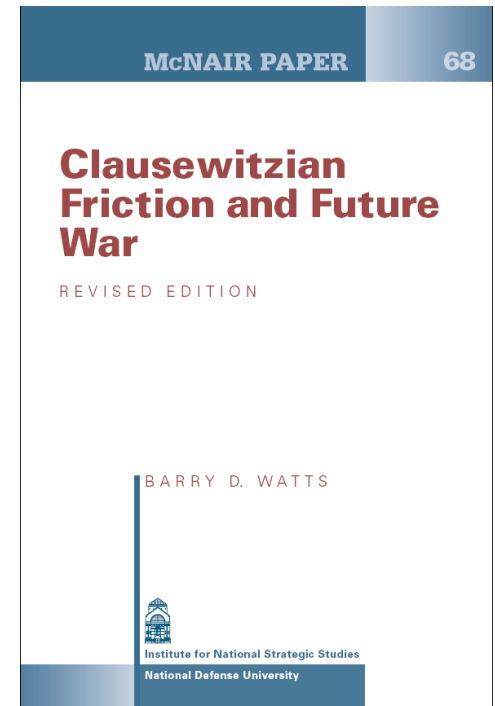


Backups



Causes of Friction

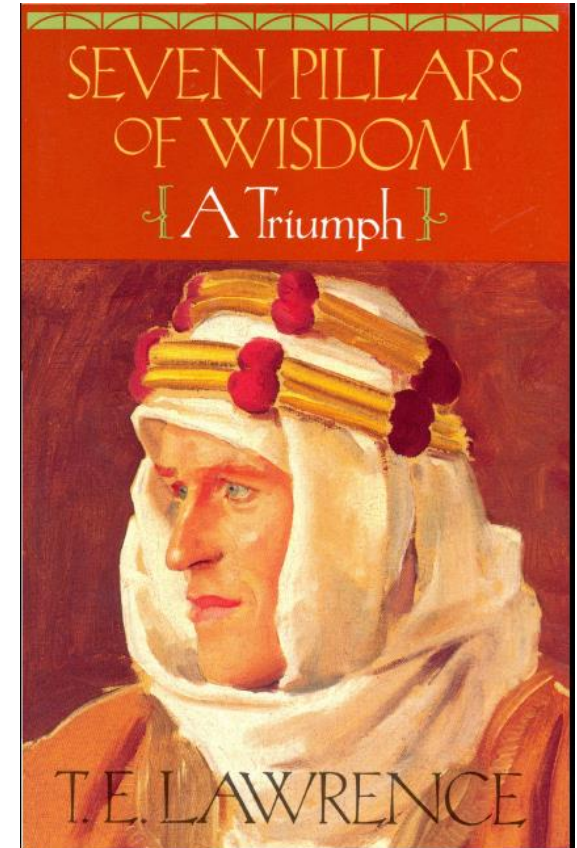
1. **Danger's impact on the ability to think clearly and act effectively in war.**
2. **The effects on thought and action of combat's demands for exertion.**
3. **Uncertainties and imperfections in the information on which action in war is based.**
4. **Friction in the narrow sense of the internal resistance to effective action stemming from the interactions between the many men and machines making up one's own forces.**
5. **The play of chance, of good luck and bad, whose consequences combatants can never fully foresee.**
6. **Physical and political limits to the use of military force.**
7. **Unpredictability stemming from interaction with the enemy.**
8. **Disconnects between ends and means in war.**



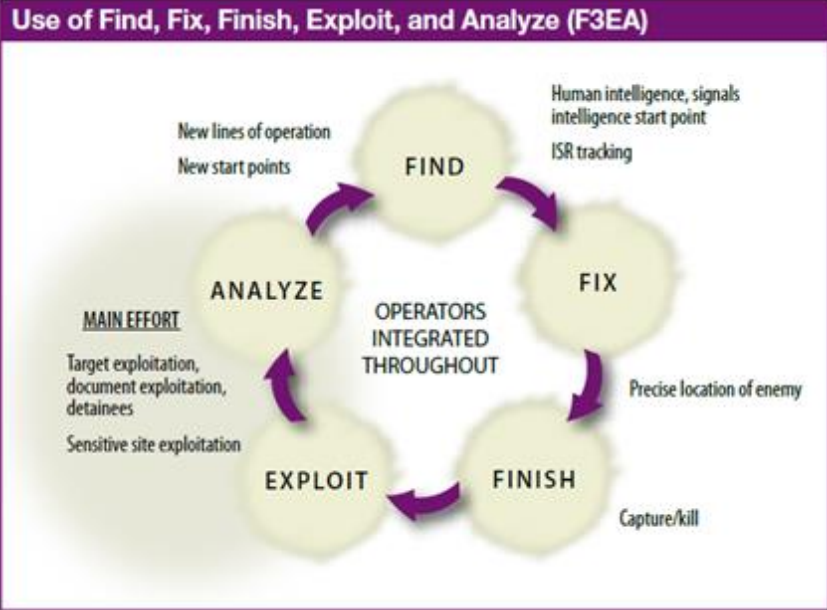
Impact of Friction on Military Forces

The aim was to render the unit a unit, the man a type; in order that their effort might be calculable, and the collective output even in grain and bulk. The deeper the discipline, the lower was the individual excellence; also the more sure the performance.

By this substitution of a sure job for a possible masterpiece, military science made a deliberate sacrifice of capacity in order to reduce the uncertain element, the bionomic factor, in enlisted humanity. Discipline's necessary accompaniment was the product of the multiplied exertions of a long hierarchy, from workshop to supply unit, which kept him active in the field.



Counter-terrorists



Abu Musab al-Zarqawi
al-Qaida in Iraq



Osama bin Laden

US CT origins: hostage rescue



US Embassy Hostages, Iran



Desert One, Iran



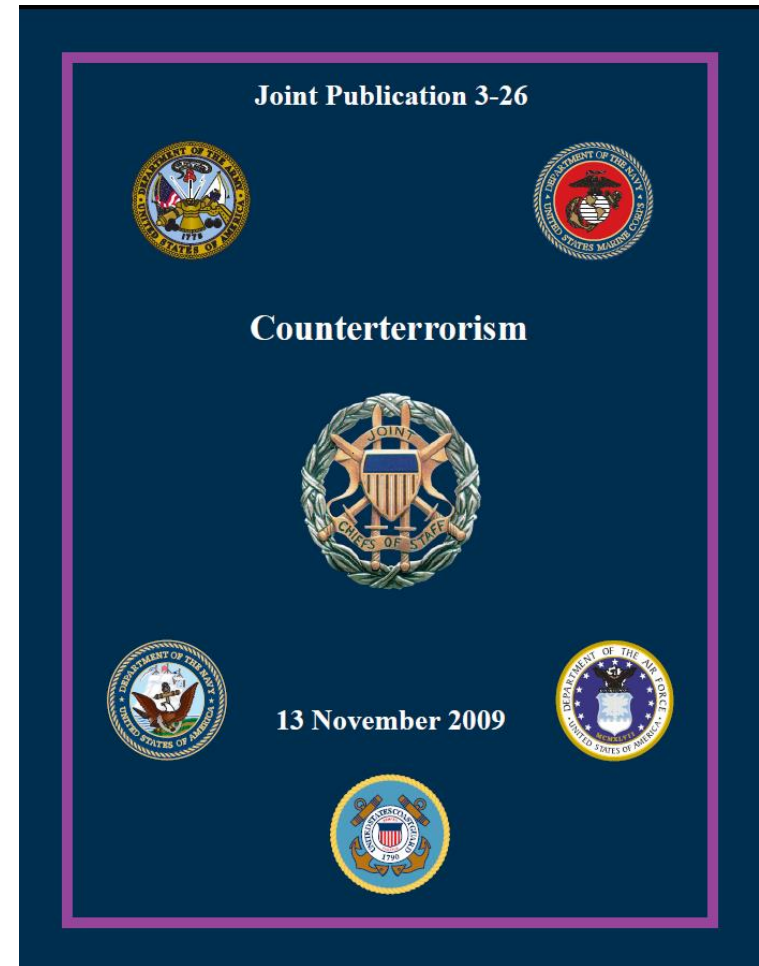
SAS, Iranian Embassy, Prince's Gate, London



Definitions

per JP 3-26 *Counterterrorism*

- The broader construct of combating terrorism is defined as “actions, including antiterrorism and counterterrorism (CT), taken to oppose terrorism throughout the entire threat spectrum.”
- CT: “Actions taken directly against terrorist networks and indirectly to influence and render global and regional environments inhospitable to terrorist networks.”



Asymmetrical Warfare

- **Battle of Rorke's Drift, 1879**
 - **British and Zulus each had advantages and disadvantages**

