Symposium on Systems Thinking and Design

Panel 2
Design and Systems Thinking Within the Canadian Armed Forces

Moderator: Lieutenant-Colonel Anne Reiffenstein, Canadian Forces College
Panelists: Mr. Robert Lummack, Royal Military College Saint-Jean
Dr. Paul Mitchell, Canadian Forces College
Colonel Kevin Whale, Special Assistant to the Minister of National Defence
Lieutenant-Colonel James (Jimbo) Chorley, Commander’s Action Group, Canadian Special Operations Forces Command
Teaching Systems Thinking and Design to Senior NCMs

Robert Lummack, Royal Military College SAINT-JEAN
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<th>Course</th>
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<td>• Residential Lecture</td>
<td>• Complexity of Operations and the Women, Peace and Security Agenda</td>
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<td>• Design experience</td>
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**What:**
- Wicked Problems (Rittel and Webber, 1973)
- Complex Adaptive Systems
- Context

**How:**
- Andragogy
- Experience
- Design Activity
Global Data Growth Rising Fast = +50% CAGR since 2010... Data Infrastructure Costs Falling Fast = -20% CAGR

Data in Digital Universe vs. Data Storage Costs, 2010 – 2015

- Data in Digital Universe (Petabytes)
- Storage Costs ($/GB)

Source: IDC, May 2016.
Why Teach this to senior NCMs?

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• Ensuring message is relevant to institution
• Greater WoG/coordination
Stumbling into Design
Teaching Operational Warfare for Small Militaries in Senior PME

Dr. Paul T. Mitchell
Canadian Forces College
Introduction

• Design is an approach for thinking through complex problems

• Employed in a variety of contexts including product design, architecture, medical services, and business strategy

• Growing numbers of militaries are employing
  – Israel: Systemic Operational Design
  – US: Army Design Methodology
  – Australia: Complex Adaptive Operations
  – United Kingdom
  – Netherlands
The “Military Artifact Trajectory”

• Historical Development of Military Activity demonstrates growing structural complexity

• Structural complexity is compounded by increasing interactive complexity as stakeholders multiply
Methodology

• Most design techniques employ similar model
  – What does the current environment look like?
  – What do we want the environment to look like?
  – What is stopping us from achieving our goals?
  – How might we influence the environment in desired direction?
  – What does the environment look like after we have intervened?
  – What have we learned?
  – How do we change what we are doing?

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The “Environmental Frame”

- Development of “Modern Comprehensive Operations and Campaign Design”
- Operational Warfare for small militaries
  - Separation of Strategy from Operations
  - Complex Battlespace at Strategic and Operational levels
  - Niche roles: “Contribution Warfare”
  - Civilian Academic Faculty develops course

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Course Design Evolution

- Advanced Military Studies Course, 2007
- DS 592: Critical Operational Epistemology
- Solving Complex Problems
- Growing controversy

Course Evolution

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<th>Operational Doctrine</th>
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Conclusions

• “Endogenizing Design”
• The intersection of theory and practice
• Creating staff capacity
• Friction and Champions
  – NIMBYs vs. Early Adopters
References

Systems Thinking

…the “beer game” in a military context

“The challenge of systems thinking lies in the ability to identify patterns by analyzing the system as a whole instead of focusing on isolated events or factors…”

Bently, B, & Davy, M., Military Decision Making and Soft Systems Methodology, (26)

“Dividing an elephant in half does not produce two small elephants.”

Peter M. Senge, The Fifth Discipline, (66)
Outline

• Why Systems Thinking?
• Complicated vs. Complex
• The Beer Game
• Applying The Beer Game in a Military Context
• Questions
Why Systems Thinking?

- because in a complex strategic environment the answer is rarely, if ever, linear…
Systems

Complicated or Complex?

- Logical
- Linear & inflexible
- Predictable
- Proportional
  - output is direct result of input
- Additive
  - whole = sum of parts
- External environment has little impact

- Often illogical
- Non-linear & adaptive
- Often un-predictable
- Un-proportional
  - output varies with the same input
- Non-additive
  - whole > sum of parts
- External environment can have large impact
The Beer Game

Simple system “game”...

Complicated System?
The “Lover’s Beer” Game
Complex System!

Lover’s Beer Game Results…Every Time!

Rock video is released with “Lover’s Beer” in the lyrics

Lover’s Beer Game Results…Every Time!

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Applying the Beer Game in a Military Context
1 Wing (tactical aviation)
1990s Cold War Design

- 3 X independent “Sabre” Sqns
- One per Army Brigade
OP RENAISSANCE Avn Det for Philippines Relief
...a full system effort...

- **1 Wg HQ, Kingston**
  - tactical C2 of Avn Det force generation via JFACC
  - battle rhythm surge
  - Load Master & RMS support at APOE

- **400 Sqn, Borden**
  - provision of 1 X CH146, aircraft prep/load team, air transport kits, eqpt

- **403 Sqn, Gagetown**
  - provision of Log/Mov O at APOE, ALSE gear

- **408 Sqn, Edmonton**
  - generate Avn Det pers, vehs, equipment
  - pack, load, deploy

- **427 Sqn, Petawawa**
  - provision of CH146 Contingency Response Kit

- **430 Sqn, Valcartier**
  - provision of 2 X CH146, vehs & augmentee stby
  - ready to provide additional 3 pack if required

- **438 Sqn, St Hubert**
  - provision of mission kit, augmentee stand-by

- **450 Sqn, Petawawa**
  - Provision of DART ALO, Traffic Tech at APOE

- **Plus...**
  - 1 CAD/CANR HQ, Winnipeg, key staff coord
  - 8 Wing, Trenton, Ops-424 Sqn-436 Sqn-24 H Svcs Unit support
  - 1st Cdn Div, Kingston, DART force generation lead
  - 3rd Cdn Div/1 ASG, Edmonton, support to 408 pers prep
  - 4th Cdn Div/2 Svc Bn, Petawawa, deliver pers wpns for recce party
  - ADM(Mat)/DAEPM(TH), Ottawa, CH146 Wpn System Manager support
  - Industry Partner - Bell Helicopter Textron Canada, Montreal, CH146
    parts prioritization & OEM support
  - and, and, and...
1 Wing Restructure 2013-2017 - System of Systems

Air Maint Sqn

CH146 Tech Trg Tactics Test & Eval

CH146 Sqn

CH146 School

Special Ops Sqn

CH147F Heavy Lift School & Sqn

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1 Wing Restructure 2013-2017
Required Regular Force Position Changes

Complicated?

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1 Wing Restructure 2013-2017
Required Regular Force Position Changes
Complex!

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The Tactical Aviation Enterprise (TAE) (a system of systems)

Circle of control

System influence!
Questions...
OUTLINE

• CONTEXT (PAYOFF)

• HYPOTHESES

• TACTICAL / OPERATIONAL PLANNING

• STRATEGIC PLANNING

• QUESTIONS

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CONTXT (PAYOFF)

CANADIAN SPECIAL OPERATIONS FORCES COMMAND

CONTEXT (PAYOFF)

CONFLICT CLARITY

HIGH CLARITY = LOW “PAY-OFF”

LOW CLARITY = HIGH “PAY-OFF”

CONFLICT CLARITY

SOF “PAY-OFF”

WILLINGNESS FOR RISK

• HIGH REPUTATIONAL RISK FOR DEPL’D TFC’s AND OPERATIONAL COMDS
• MORAL DILEMNAS FOR THOSE IN CHARGE
• POOR TACTICAL MORALE

• APPETITE FOR MAJOR COMBAT DEPLOYMENTS
• “GENERAL’S WARS”

• OPERATIONS BY CONOP TO THE HIGHEST LEVEL
• LONG-TIME FRAMES TO ACHIEVE MIL OBJECTIVES
• LOW COALITION “TRUST ENVIRONMENT” AS EVERYONE CHECKS WITH CAPITALS

• OPTIMIZED FOR SOF DEPLOYMENTS
• “SHAPING” BY SOF
• TRUST NEEDS TO BE DISTRIBUTED
• “SERGEANTS WARS”

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TWO HYPOTHESES

HYPOTHESIS #1: CULTURE IS THE PRIMARY DRIVER FOR HOW YOUR ORGANIZATION APPROACHES PLANS AND PLANNING

HYPOTHESIS #2: IN LARGE, JOINT, COMBINED OR INTERAGENCY SCENARIOS - PLANNING (TOOLS, PROCESS AND METHODOLOGY) “SINK” TO THE LOWEST LEVELS OF THE DOMINANT CULTURE

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CANSOF PLANNING

- PROBLEM DEFINITION IS #1 PRIORITY
- LEAN BY DESIGN
- PRECARIOUS VALUE / NATURE OF HQ
- INCREASINGLY MULTI-DISCIPLINARY WRT STAFF COLLABORATION (INTERNAL and EXTERNAL)
- DESIGN-LIKE (or light)
CANSOF PLANNING

• EMPHASIS ON COMMANDERS (AT ALL LEVELS) AND PRESERVING COMMANDER’S DISCRETIONARY SPACE

• UNDERSTANDING ARAs (AUTHORITIES, RESPONSIBILITIES AND ACCOUNTABILITIES)

• ARTICULATING AND MITIGATION OF RISK IS MOST IMPORTANT OUTPUT

• MAXIMIZING ACCEPTABLE CHAOS IN PLANNING AND EXECUTION

• IF IN DOUBT, DEVELOP THE SITUATION...(BIASED TOWARDS ACTION)
HOW WE ARE STRUCTURED AS A HIERARCHY DOES NOT REFLECT THE CONTEMPORARY OPERATING ENVIRONMENT

HOW WE ARE STRUCTURED ALSO DOES NOT REFLECT HOW WE OPERATE

STRATEGIC

TACTICAL

COMMAND HQ

IRTF / NMF

SOTFs

HOW WE ARE STRUCTURED (CAF)

WHAT WE ARE FACING (COE)
• THE SPACE BETWEEN MIL/POL/STRAT

• THE VIRTUAL OPERATIONAL LEVEL (PLANNING BUT NOT EXECUTION)

• SUPPORTED / SUPPORTING COMMAND, CONTROL AND PLANNING RELATIONSHIPS but....

• DEFINITION OF OPERATIONAL RELATIONSHIP IN COALITION ENVIRONMENT IS CRUCIAL (ADCON v OPCON for example)
TWO HYPOTHESES

HYPOTHESIS #1: CULTURE IS THE PRIMARY DRIVER FOR HOW YOUR ORGANIZATION APPROACHES PLANS AND PLANNING

HYPOTHESIS #2: IN LARGE, JOINT, COMBINED OR INTERAGENCY SCENARIOS - PLANNING (TOOLS, PROCESS AND METHODOLOGY) “SINK” TO THE LOWEST LEVELS OF THE DOMINANT CULTURE
STRASTRICIC PLANNING
RESTRAINT as CRITICAL

FUTURE OPERATING ENVIRONMENT

COMBINATION OF TOP DOWN and BOTTOM-UP INNOVATION / ADAPTATION

ND & SA

SOF

Δ WARFARE

= INNOVATION + ADAPTATION

LEGITIMACY

= EXISTENCE WITHIN ND&SA ARCHITECTURE

CONVERGENCE

= CULTURE AS KEY
• Future by CONOP

• Future by Moonshot

• The Imitation Game

• The 5-Year Plan

• The Hedge