
Systems Engineering For Peace

Introduction

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- Peace System Scale
- Peace State Analysis and Sustainability
- Background And References

Big Picture

Systems Engineering For Peace

How Arrogant!

But what's the alternative?

Systems Engineering

- Systems engineering is a discipline that concentrates on the design and application of the whole (system) as distinct from the parts.
- It involves looking at a problem in its entirety, taking into account all the facets and all the variables and **relating the social to the technical aspect.**

Ref: From Simon Ramo, left Hughes Aircraft, Founder of TRW, INCOSE Systems Engineering Handbook 2011

Systems Engineering Space Observations

- Critical needs are apparent
- Conflicting Stakeholders
- Alternative Architectures
- Alternative Technologies
- Alternative Products
- Alternative Human Interactions
- Alternative Functionality
- Alternative Performance Envelops
- Alternative Designs Implementations and Production
- Alternative Distribution Maintenance and Shutdown

This is About
Conflicting
Views

Systems Engineering Space Observations

- Systems Engineering is about Conflict Resolution
- Time is of the essence
 - There may be no market to make a decision
 - Can't trust market to make decision
 - Can't wait for market to make decision
- Status quo is unacceptable
 - Existing system even if its not called a system is breaking down

Why Systems Engineering For Peace

- All Systems are natural systems including human systems
 - Contrary to many system expert views
 - Because humans are part of nature
- All natural systems are self correcting
 - Nature seeks stability
- During periods of system instability
 - Humans suffer
- Natural systems will correct / stabilize over time but
 - Humans have short life spans
- What is a reasonable correction time
 - day, week, month, year, decade, life time, generation, generations

Why Systems Engineering For Peace

Correction Time and Suffering

During System Instability

Is the Challenge

Why Systems Engineering For Peace

System Stability can be Temporary

Preventing System Instability

Is also the Challenge

Systems Transcends Other Approaches

- Management theory
 - Does not acknowledge altruism
 - Based on self interest
 - This is viewed as truth
- Biology has shown
 - Symbiosis & cooperation leads to success
 - Not based on self interest
 - This is viewed as truth
- Other approaches
 - Similar stories
- Systems seeks stability
 - Uses all our tools from 5000+ years
 - This is viewed as truth

Systems Process for Peace

How Can Systems Be Applied to Peace

Lets Build a Systems Based Approach

- Identify the need
 - Peace
- Identify the stakeholders and their perspectives
 - They have needs and requirements
 - There are conflicting stakeholders / needs and requirements
- Study the past and postulate a future
 - In current domain and outside current domain
- Clearly describe the current Architecture
 - No matter how ugly

How Can Systems Be Applied to Peace

- Propose possible conceptual architectures
 - From each conflicting stakeholder camp
 - Outside conflicting stakeholders
- Postulate an ideal architecture
 - There may be something that everyone agrees to
 - But they don't know how to implement it or get there
- Develop transition strategies for each approach
 - Clearly describe each phase and length of transition

How Can Systems Be Applied to Peace

- Model current approach & each conceptual architecture
 - Start with mental models from each stakeholder camp
 - Continue with other models
 - So all understand each architecture ramifications
- Develop an architecture that everyone can agree with
 - Will not happen with great effort
- Never forget about transition strategy including time
 - Where might transition break down and why
 - What are strategies to ensure most effective transition
- Architecture models extrapolated to 100 years
 - Current situation plus stakeholder 1 to n perspectives (5-9 models)
 - Compromise approaches 1, 2 and 3 after significant analysis

How Can Systems Be Applied to Peace

- Perform formal tradeoff using MOE (3-5 approaches)
 - Remember it is not about the answer but the journey
 - The journey is fully disclosed to all stakeholders
- Submit proposed and final architectures and all analysis
 - To the world
 - For final review and comment
- Start to roll out the new architecture
 - Gather metrics to ensure architecture is behaving as expected
- Metrics for new peace architecture fully disclosed
 - Life expectancy, birth deaths, education levels, income, happiness measures, birth rates, death rates, etc
 - As identified in new peace architecture
 - Search for unintended consequences

Systems Engineering Peace Process Summary

- All stakeholder needs fully disclosed
 - Full transparency in the end
- Study the past and postulate a future
 - To surface all aspects of situation
- All architecture approaches disclosed
 - Clearly described
 - Transition is critical
- All architecture models disclosed
 - To the world for review and comment
- Roll out includes
 - Metrics to monitor results
 - Search for unintended consequences

Systems Engineering Peace Process

Key Points

- Needs
- Stakeholders
- Current Approach
- Study Past Approaches
- Study Current Approach
- Develop Alternatives
- Model Alternatives
- Disclose Models
- Tradeoff
- Optimize 3 Approaches
- Test Alternatives
- Select
- Transition
- Measure Results

Systems Engineering for Peace (Challenges and Mitigation)

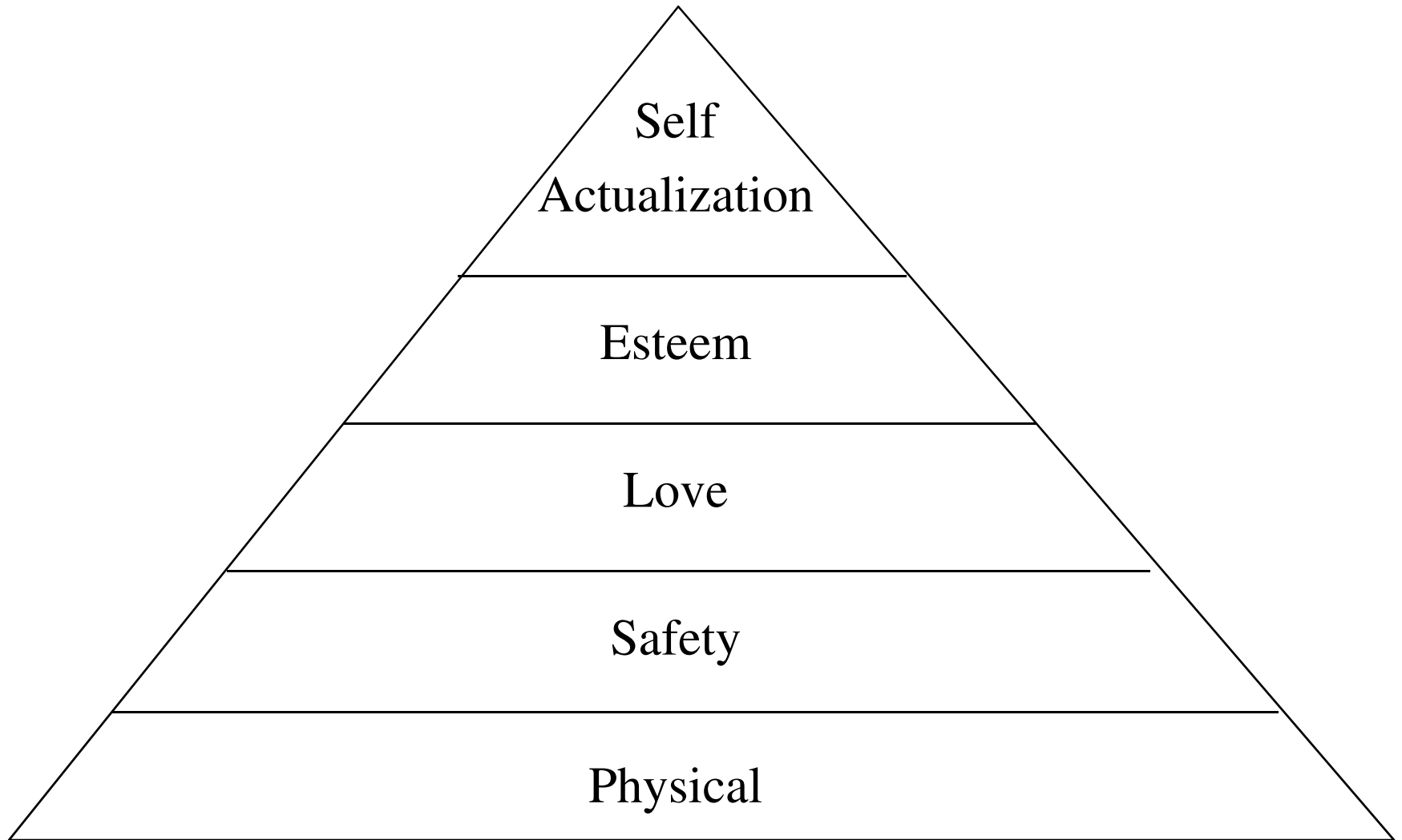
- Propaganda is reality
 - It will sabotage peace process
- Unintended Consequences
 - Reality is very different from initial vision
- Communications is key
 - To capture and monitor the peace process
 - Newspapers, books, magazines, print media, music
 - Theatre, film, radio, TV, games
 - Conferences, symposiums, meetings, local pubs
 - Establish official web portals
 - Encourage other internet websites, social media

Systems Engineering for Peace (Systems Practices to Consider)

- Needs Analysis
 - Stakeholder Analysis
 - Study of the Past
 - Root Cause Analysis
 - Cause and Effect Analysis
 - Modeling and Simulation
 - Impact of Failure Analysis
 - Operational Analysis
 - Functional Analysis
 - Performance Analysis
-
- Architecture Development and Depiction
 - Architecture Transition Analysis
 - Architecture Tradeoff Analysis
 - Architecture Verification and Validation
 - Implementation Test via Metrics Monitoring

Sources of Conflict and System Mitigation

Maslow's Hierarchy of Needs



Maslow's Hierarchy of Needs

- Physical
 - air, water, food, clothing, and shelter
- Safety
 - personal security, health, well being, avoiding accidents, illness, stability, justice, fairness, consistency, reliability, predictability, employment, personal finances / savings / investments, resources, family, health, property, morality or laws
- Love
 - friendship, intimacy, family, friends, children, social groups, clubs, religious affiliations, professional organizations, mentors, close colleagues, confidants
- Esteem
 - confidence, achievement, respect of others & self, strength, usefulness
- Self Actualization
 - self-fulfillment, what one can be must be

Sources of Serious Conflict

- Maslow's Pyramid
- Insanity
- Ignorance
- Arrogance
- Fear

Root Cause Analysis Example

- Maslow's Pyramid
 - Physical & safety
 - Geography
 - Resources
 - » Agricultural Land
 - » Water
 - » Animals
 - » Plants
 - » Minerals
 - » Physical Labor
 - Intellectual Labor

Cause and Effect Analysis

- French revolution
 - Let them eat cake
 - Ignorant aristocracy
 - Aristocracy divine rule
 - » Warlords and Dictators
 - » Tribes
 - Subjugated people
 - Unable to check power

What matters is chain of
real history events

Someone needs to identify
and communicate those
events

Historians

Engaged and empowered
citizens

Directly resulted in **SYSTEM** of Government!

System Mitigation Strategies

- Maslow's pyramid
 - Education and technology
- Insanity
 - Vetting, checks and balances, rule of law
- Ignorance
 - Education, checks and balances, rule of law
- Arrogance
 - Education, checks and balances, rule of law
- Fear
 - Education, support from the fearless

System Mitigation Strategies

- Communications
- Diplomacy
- Trade
- Treaties
- Shared Science
- Shared Engineering
- Shared Finance
- Technology
- Education
- Vetting
- Checks and balances
- Rule of law
- Sanctions
- Embargos
- Support from fearless
- Conflict

Existing Tools To Maintain Peace

- Broad Approaches
- Institutions
- Societal Approaches
- Organizational Tools
- Nation State Tools
- International Tools
- Social Warnings
- National Roles
- International Roles
- Special Interests
- Emotions
- Overall Reaction

Source: Policy document analysis template from GDA tool

<http://www.cassbeth.com/gda>

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Existing Tools To Maintain Peace

- Broad Approaches
 - Markets, Technology, Education, Science, Government
 - People, International, Engineering, Systems, Alternatives
- Institutions
 - Academia, Government, Industry, Labs, Think Tanks
 - NGO, Non Profits, Popular Media, Technical Media, Associations
- Societal Approaches
 - Peaceful, Sacrifice, Stressed, Violent
- Social Warnings
 - General, Human, Anger, Environment, Health, Economic, Earth
- Organizational Tools
 - Technical, Process, Management, Gestalts, Implementation

Source: Policy document analysis template from GDA tool

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Existing Tools To Maintain Peace

- Nation State Tools
 - Policy, Legislation, Regulation, Deregulation, Tax
 - Military, Departments, Resources, Proactive, Transparency
- International Tools
 - Policy, Resources, Proactive
- National Roles
 - Religion, Defense, Money, Wealth, Education
 - Agriculture, Health, State, People, Labor
- International Roles
 - People, Government, Industry, International, Academia
 - Community, Money, Time

Source: Policy document analysis template from GDA tool

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Existing Tools To Maintain Peace

- Special Interests
 - Defense, Intelligence, Food, Health, Pharmaceuticals
 - Chemicals, Mining, Energy, Transportation, Manufacturing
 - Education, Science, Technology, Environment, Non Profit
 - Financial, Property, Utilities, Communications,
 - Entertainment Groups, Elderly, Young Adults, Workers
- Emotions
 - Happy, Sad, Love, Hate, Fear
- Overall Reaction
 - Positive, Negative

Source: Policy document analysis template from GDA tool

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Peace System Scale

Example System Practice Application

Peace Scale

- Can such a scale be useful
 - Unknown
- Can such a scale be accepted
 - Unknown
- Can such a scale be developed
 - Yes
- Can existing systems practices be applied - Yes
 - Classifying Defects quality, verification, validation, and operations
 - Safety hazard severity levels, hazard risk assessment
 - Security Threat Assessment Levels
 - Penetration Analysis Criteria

Existing Systems Scales Observations

- All go from
 - Acceptable to unacceptable conditions
- Unacceptable condition
 - Leads to loss of life
 - Massive unrecoverable system damage
 - Catastrophic Collapse
- All scales respect the magic number 7 + or - 2
 - George A. Miller on short term memory

Potential Peace Scale Elements

Levels of

- Happiness
- Suffering
- Conflict
- Peace

Peace Elements Levels

- 1H All are Happy
- 2H Most are Happy
- 3H Some are Happy
- 4H None are Happy
- 1S No Suffering Detected
- 2S Rumors of Suffering
- 3S Suffering Detected
- 4S Massive Suffering
- 1C No Conflict Detected
- 2C Rumors of Conflict
- 3C Conflict Detected
- 4C Massive Conflict
- 1PS Stable System
- 2PS Unstable System
- 3PS Collapse Immanent
- 4PS Collapsed System

Conflict Prediction

	1H	2H	3H	4H
1S	1C	1C	2C	3C
2S	2C	2C	2C	3C
3S	2C	2C	3C	3C
4S	2C	3C	4C	4C

- What is going on with Conflict?
 - $1S + 4H = 3C$
 - $3S + 4H = 3C$
- Conflict ranges from
 - Friendly disagreement
 - To armed conflict
- CA Friendly Words
- CB Hostile Words
- CC Threats with Actions
- CD Armed Conflict

Peace System Scale

	1H	2H	3H	4H
1S	1C	1C	2CA	3CA
2S	2CA	2CA	2CB	3CB
3S	2CC	2CC	3CC	3CC
4S	2CC	3CD	4CD	4CD

Transformation PS1-PS4 ~ CA-CD

	1H	2H	3H	4H
1S	1PS	1PS	2PS	2PS
2S	2C	2C	2PS	2PS
3S	3PS	3PS	3PS	3PS
4S	4PS	4PS	4PS	4PS

Peace System Scale

- Conflict prediction and peace scale do not match
 - Why, what happened in the transformation
- One could test system by checking for
 - H, S, C, PS indications
- Once detected problem report can be generated
 - Captured via world press
- What other tools exist
 - As suggested by GDA?

Peace System Scale

- Without world communications / press
 - There is a serious peace system collapse
 - World communications / press is part of the Peace System
- Communications has changed
 - Internet has displaced previous mechanisms
 - Previous mechanisms have a few hundred years of evolution
- Previous communications mechanisms
 - Were difficult to compromise on a world wide scale
 - There was always the opposing view even if propaganda

What happens with Internet may determine what happens with world Peace

Peace State Analysis and Sustainability

States of Conflict

- None
 - Escalating
 - Steady state conflict
 - Deescalating
-
- Once conflict starts can it deescalate
 - What does it take for conflict to end
 - Can conflict be resolved in a stalemate
 - What is the chance conflict will escalate to nuclear

Mutually Assured Destruction (MAD)

- No way to protect against nuclear missile attack
 - Some will make it through
 - With enough launches other side will be destroyed
- Mutually assured destruction is defense strategy
 - If one side starts, other side automatically launches
 - Because it's unknown if it is isolated event
 - or full out launch for complete destruction
- MAD worked for cold war...
 - In TIC TAC TOE no one wins
 - There is no win strategy

Mutually Assured Destruction (MAD)

- It has assumptions
- It has givens
- It has rules
- It has potential inputs
- It has potential outputs

Is it a form of systems engineered peace?

Does MAD apply today?

Sustainability

- Brundtland Commission: “meets the needs of the present without compromising the ability of future generations to meet their own needs.”
- Applies to peace
- There is internal sustainability
- There is external sustainability

Background

- Peace and conflict studies (PACS) program
 - University of Waterloo
 - May be the oldest program
- Agent Based Modeling
 - Upenn Barry Silverman
- Global Database of Events, Language, and Tone (GDELT)
 - Yahoo and Georgetown University
- Integrated Crisis Early Warning System (ICEWS)
 - Lockheed Martin

Memex Findings

Models

- <http://www.gdeltproject.org>
- <http://www.lockheedmartin.com/us/products/W-ICEWS.html>
- https://en.wikipedia.org/wiki/Agent-based_model

Education Programs

- <https://uwaterloo.ca/peace-conflict-studies/>
- <http://web.pdx.edu/~abyron/CRSystems201201.pdf>
- Memex 1945: <http://worrydream.com/refs/Bush%20-%20As%20We%20May%20Think%20%28Life%20Magazine%209-10-1945%29.pdf>

Memex Findings

Books

- TBD. ISBNs: 0787901628, 1899820396, 0471642959 ?
- <https://imimmediation.org/conflict-management-systems>
- https://imimmediation.org/document_309
- <http://www.beyondintractability.org/essay/designing-dispute-systems>

Movies

- Wargames 1983

Software

- Policy document analysis
 - <http://www.cassbeth.com/gda>
- Constitutional analysis for education
 - <http://www.cassbeth.com/cat>