Requirements Driven Test Design:
Quickly Aligning to the Third Offset Strategy

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Requirements Driven Test Design: Quickly Aligning to the Third Offset Strategy

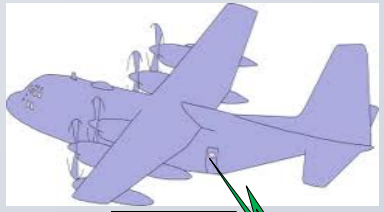
- Introduction
- Offset Strategies: One slide to cover a 67-year history
- Solution
- Requirements Driven Methodology – Answering your question, “What’s In It For Me?”

Introduction

- Test & Evaluation (T&E)
  - System or components are compared against requirements and specifications through testing
  - Results are evaluated to assess progress
    - Design
    - Performance
    - Supportability
- Finding the requirements
  - Performance gaps
    - Capability and / or capacity
  - Evolution and maturity of the strategy

System Effectiveness and Component Performance

Operational Construct: United States Air Force Personnel Recovery

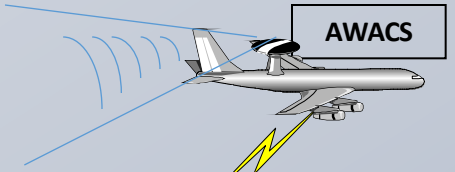


HC-130

SADL

ALL Areas, minus Sells

HH-60



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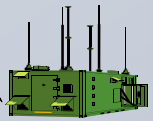

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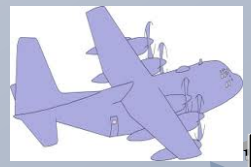
JSTARS



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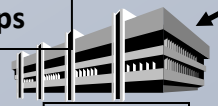

Douglas

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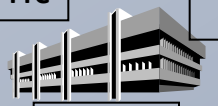

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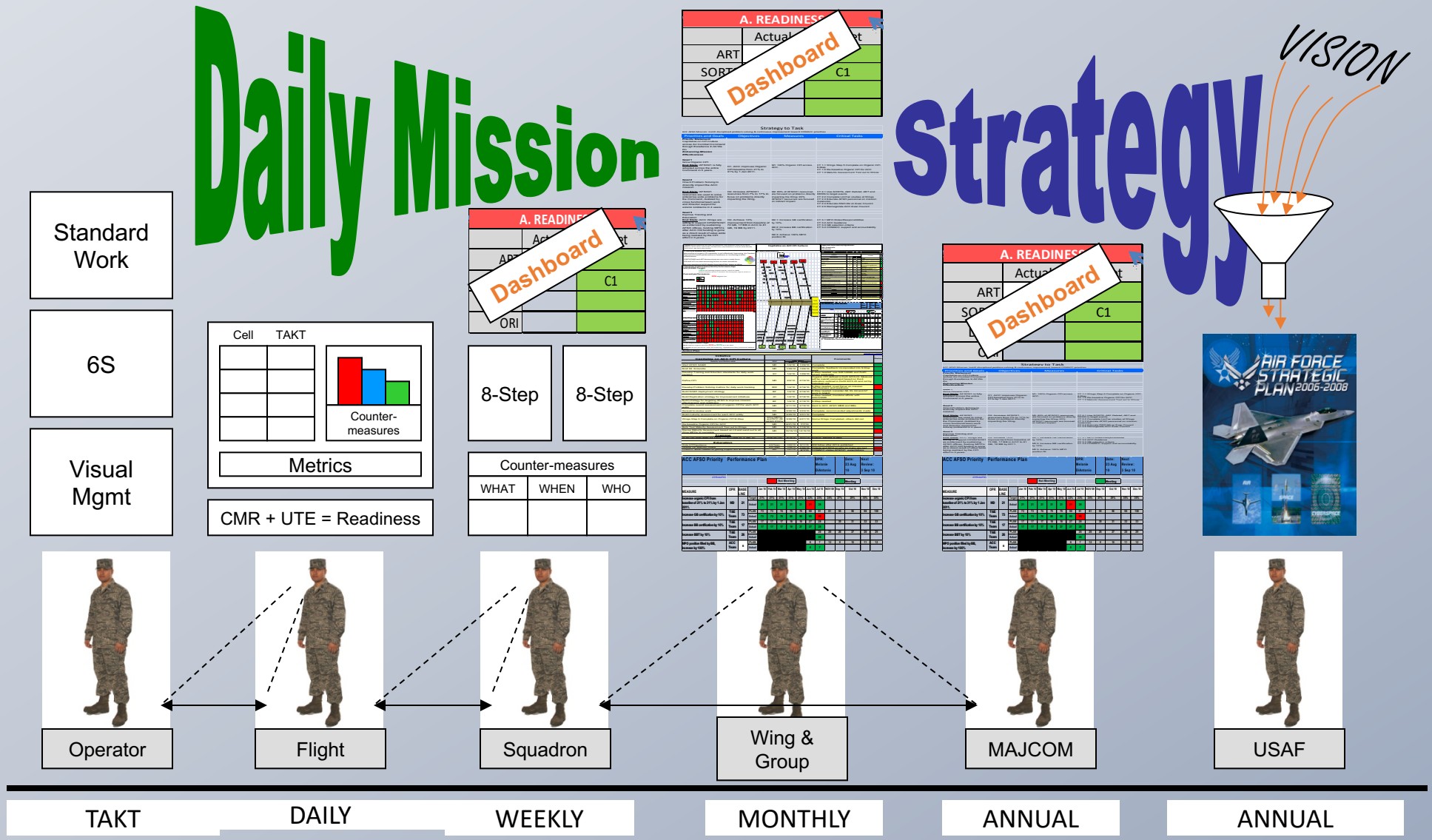
System Effectiveness and Component Performance

Organizational Construct: Strategic Planning



Offset Strategies

- Asymmetrically compensating for a disadvantage
- Seeks to deliberately change an unattractive competition to one more advantageous for the implementer
- Seeks to maintain advantage over potential adversaries
- Countering an apparent advantage – finding ways to counter a threat

Offset Strategy

- First Offset Strategy
  - 1950's: Counter the numerical strength of military adversaries with technical innovation
  - Solution: Grow an arsenal of nuclear weapons for deterrence
- Second Offset Strategy
  - 1970's/1980's: Precision-guided conventional weapons with Joint Operations
  - Solution: Precision and stealth to achieve desired military effects
    - Intelligence, Surveillance, and Reconnaissance
    - Precision Guided Weapons and Stealth Technology
    - Space-based military communications and navigation
- Third Offset Strategy
  - 2017:
    - Outmaneuver adversaries through technology
    - Technologically enable operational and organizational constructs to give the joint force an advantage operationally and tactically, thereby strengthening conventional deterrence
  - Solutions:
    - Artificial Intelligence, autonomy – joint collaborative human-machine battle of networks

What do Offset Strategies Create?????

Gaps

Once you Identify the Gap – then what do you have?

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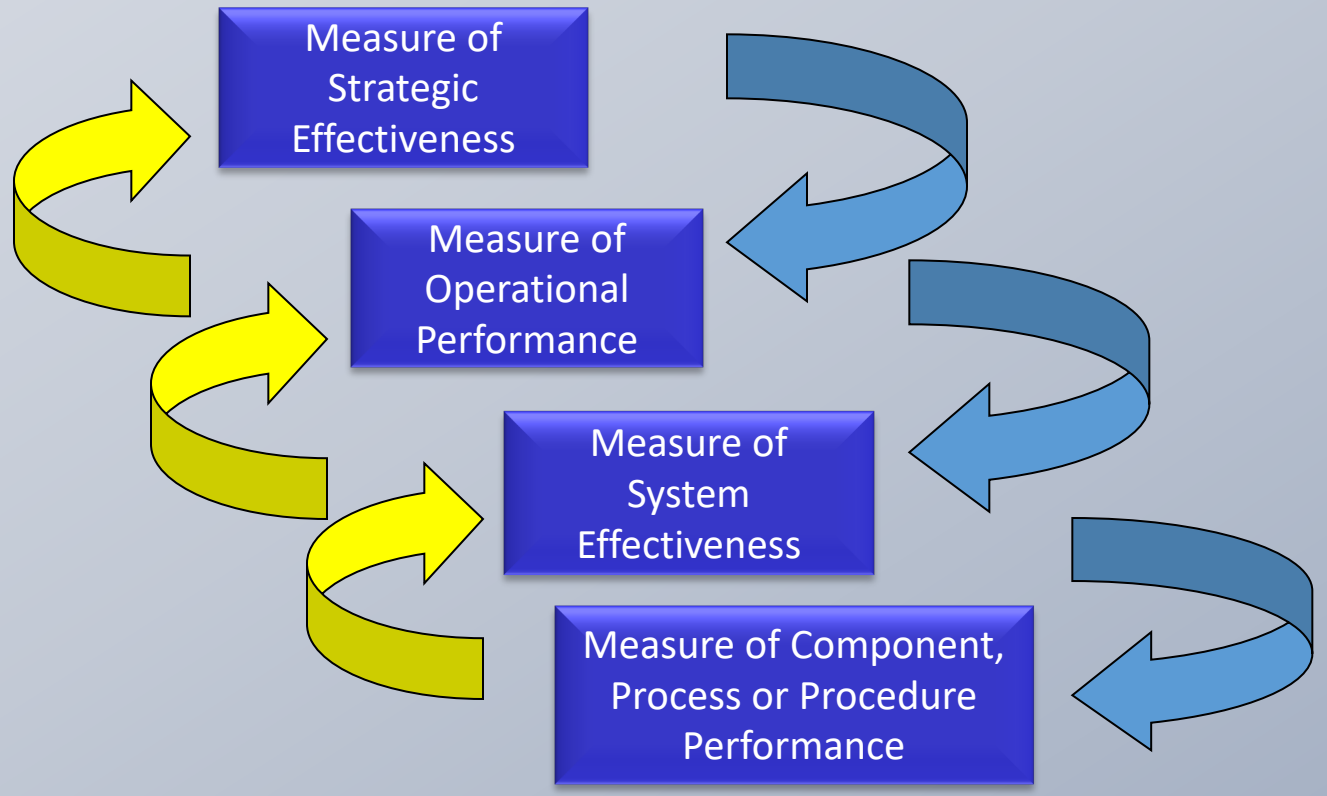
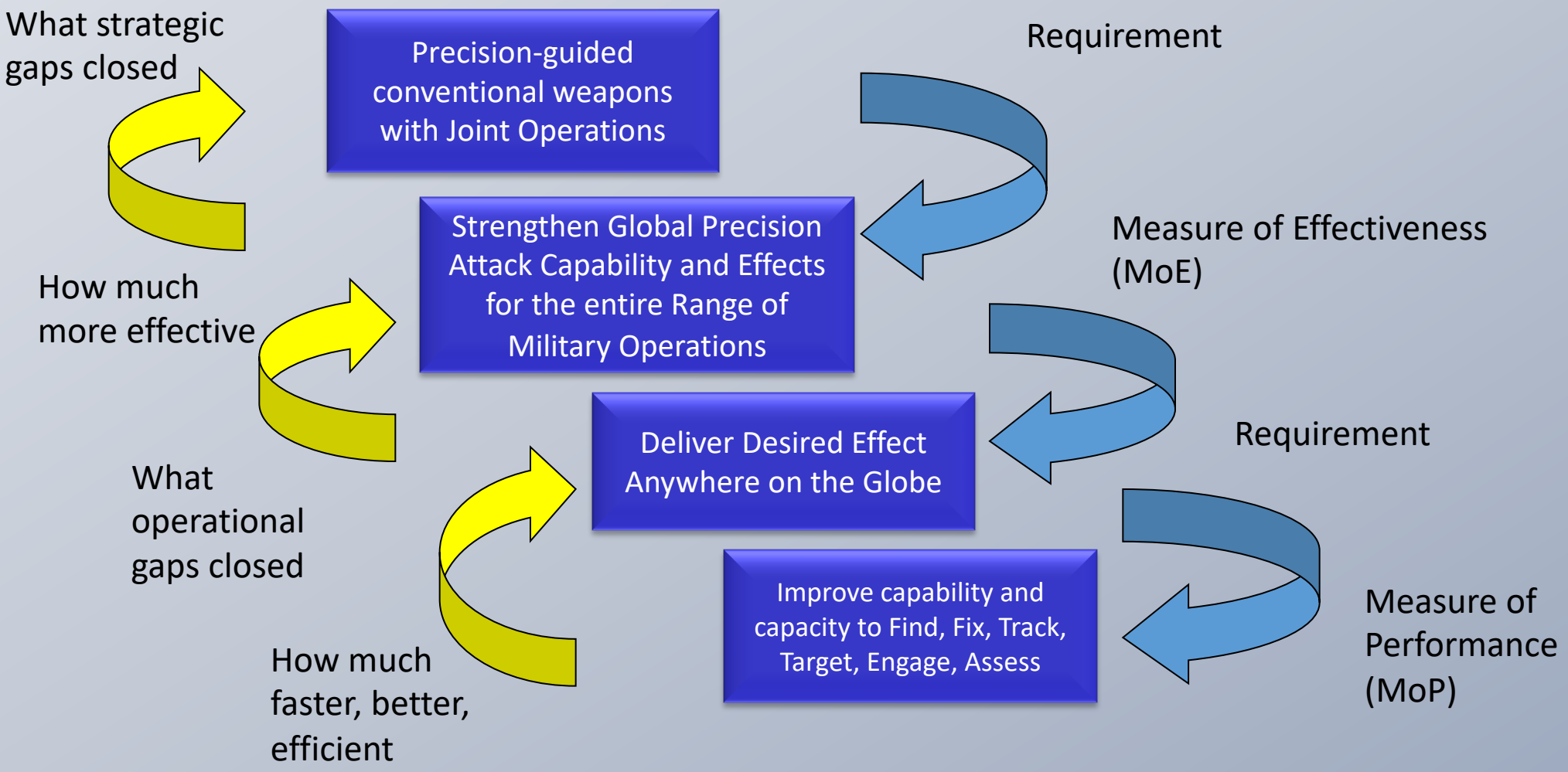
Requirements

Now to find the data.

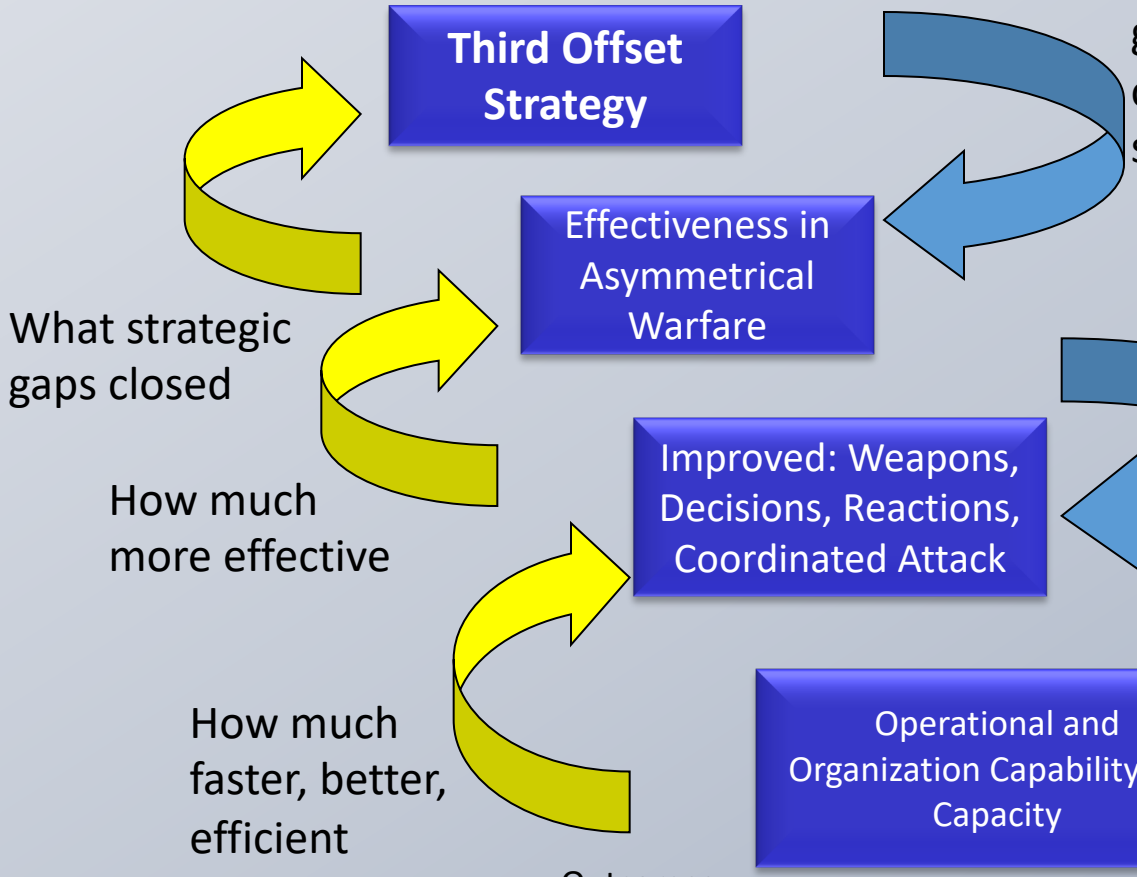
Solution: Statistically Aligning to Requirements



How It Works: Second Offset Strategy



Solution: Statistically Aligning Test to Requirements



Requirement: Technologically enable operational and organizational constructs to give the joint force an advantage operationally and tactically, thereby strengthening conventional deterrence

Measure of Effectiveness (MoE)

Requirement: High Quality, On-Time Delivery, Best-Value, Compliant

Measure of Performance (MoP)

Outcomes:

- Outmaneuver our Adversaries
- Joint collaborative human-machine battle of networks

Artificial Intelligence
Autonomous Systems

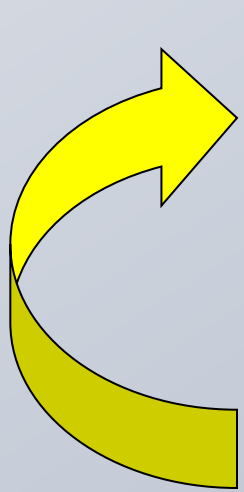
Measures of Effectiveness and Measures of Performance

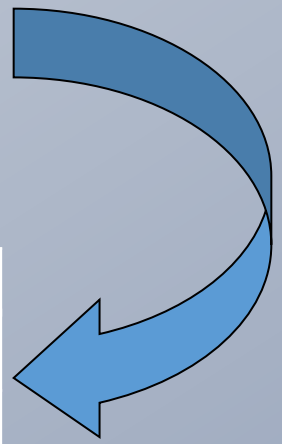
- Measures of Effectiveness (MoEs)
  - How well an operational task is accomplished through the weapon system
- Measures of Performance (MoPs)
  - Quantitative (or qualitative) measures of system capabilities
- MoPs are components of MoEs
  - The degree to which a system performs tells us how well a systems task is accomplished
  - Quantitatively can be collected through metrics to feed the MoE

Rule of Thumb:
MoPs tell us if we do things right
MoEs tell us if we do the right things

How It Works: Second Offset Strategy and Global Precision Attack

20 Year Plan		Measures of Performance				
		CONOPs, Weapon Systems, TTP, etc. OBJECTIVE In terms of Quality, Delivery, Cost and/or Compliance				
Measures of Effectiveness	**Scalability**	Data	Data	Data	Data	Data
	Stealth	Data	Data	Data	Data	Data
	Connectivity	Data	Data	Data	Data	Data
	Flexibility	Data	Data	Data	Data	Data
	Speed	Data	Data	Data	Data	Data





CAPABILITIES AND CAPACITY		Measures of Performance					
		Find	**Fix**	**Track**	**Target**	**Engage**	**Assess**
Measures of Effectiveness	**Precision**	Data	Data	Data	Data	Data	Data
	Lethality	Data	Data	Data	Data	Data	Data
	Survivability	Data	Data	Data	Data	Data	Data
	Persistence	Data	Data	Data	Data	Data	Data

Identify the Data

Command & Control Example

MoP	Choices	(# of levels)
Mission Snapshots	Entry, Operations, Consolidation	(3)
Network Size	10 Nodes, 50 Nodes, 100 Nodes	(3)
Network Loading	Nominal, 2X, 4X	(3)
Movement Posture	ATH, OTM1, OTM2	(3)
SATCOM Band	Ku, Ka, Combo	(3)
SATCOM Look Angle	0, 45, 75	(3)
Link Degradation	0%, 5%, 10%, 20%	(4)
Node Degradation	0%, 5%, 10%, 20%	(4)
EW	None, Terrestrial, GPS	(3)
Interoperability	Joint Services, NATO	(2)
IA	None, Spoofing, Hacking, Flooding	(4)
Security	NIPR, SIPIR	(2)
Message Type	Data, Voice, Video	(3)
Message Size	Small, Medium, Large, Mega	(4)
Distance Between Nodes	Short, Average, Long	(3)

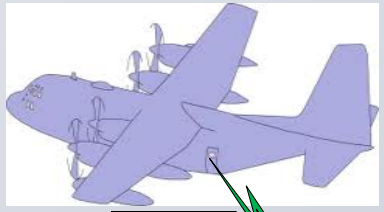
Collect the Data

Command & Control Example

	Factor_A	Factor_B	Factor_C	Factor_D	Factor_E	Factor_F	Factor_G	Factor_H	Factor_I	Factor_J	Factor_K	Factor_L	Factor_M	Factor_N	Factor_O
Factor Name	Mission	Network Size	Network Load	Movement	SATCOM Band	SATCOM Angle	Link Degradation	Node Degradation	EW	Interoperability	IA	Security	Message Type	Size of Message	Node Distance
Case 1	Entry	100 nodes	4X	OTM2	Combo	0	0%	0%	None	NATO	None	SIPIR	Voice	Medium	Short
Case 2	Consolidation	10 nodes	Normal	ATH	Ka	45	5%	5%	GPS	NATO	Spoofing	NIPR	Video	Large	Normal
Case 3	Operation	50 nodes	2X	OTM1	Ku	75	20%	20%	Terrestrial	Joint Serv	Hacking	NIPR	Voice	Small	Long
Case 4	Entry	50 nodes	2X	ATH	Ku	45	10%	10%	None	NATO	Flooding	NIPR	Data	Mega	Short
Case 5	Operation	100 nodes	Normal	OTM1	Combo	75	10%	10%	GPS	NATO	Spoofing	SIPIR	Data	Small	Normal
Case 6	Operation	10 nodes	4X	OTM2	Combo	45	0%	5%	Terrestrial	Joint Serv	None	NIPR	Video	Mega	Long
Case 7	Consolidation	100 nodes	4X	ATH	Ka	75	20%	10%	Terrestrial	NATO	Hacking	SIPIR	Video	Medium	Long
Case 8	Operation	10 nodes	Normal	ATH	Ka	0	20%	0%	Terrestrial	Joint Serv	Flooding	NIPR	Data	Large	Short
Case 9	Consolidation	10 nodes	2X	OTM2	Ku	45	5%	20%	None	Joint Serv	Flooding	SIPIR	Voice	Medium	Normal
Case 10	Consolidation	50 nodes	2X	OTM1	Combo	0	0%	20%	GPS	NATO	None	NIPR	Data	Mega	Normal
Case 11	Entry	50 nodes	Normal	OTM2	Ka	75	10%	5%	GPS	Joint Serv	Hacking	SIPIR	Voice	Large	Long
Case 12	Entry	50 nodes	4X	OTM1	Ku	0	5%	0%	None	Joint Serv	Spoofing	SIPIR	Video	Small	Long
Case 13	Consolidation	100 nodes	4X	OTM2	Ku	45	20%	5%	GPS	Joint Serv	Flooding	NIPR	Data	Small	Short
Case 14	Entry	10 nodes	2X	OTM1	Ka	75	5%	0%	None	Joint Serv	Hacking	SIPIR	Data	Mega	Normal
Case 15	Entry	50 nodes	2X	ATH	Ka	75	0%	20%	Terrestrial	NATO	Spoofing	NIPR	Video	Large	Short
Case 16	Consolidation	10 nodes	4X	ATH	Ku	0	10%	20%	Terrestrial	NATO	None	NIPR	Video	Small	Normal
Case 17	Operation	50 nodes	Normal	OTM1	Ku	75	0%	5%	None	Joint Serv	Flooding	NIPR	Data	Medium	Short
Case 18	Operation	10 nodes	Normal	OTM1	Ka	75	20%	10%	None	Joint Serv	None	SIPIR	Video	Large	Normal
Case 19	Operation	100 nodes	2X	OTM2	Combo	0	5%	10%	Terrestrial	NATO	Hacking	SIPIR	Data	Large	Short
Case 20	Consolidation	100 nodes	Normal	ATH	Combo	0	20%	20%	Terrestrial	Joint Serv	Spoofing	NIPR	Voice	Mega	Short
Case 21	Consolidation	50 nodes	2X	OTM1	Ka	45	10%	0%	GPS	Joint Serv	Spoofing	SIPIR	Data	Medium	Normal
Case 22	Entry	100 nodes	Normal	OTM1	Combo	0	20%	5%	GPS	NATO	Flooding	NIPR	Video	Medium	Long
Case 23	Operation	10 nodes	Normal	ATH	Ka	45	0%	10%	None	NATO	Hacking	SIPIR	Voice	Small	Normal
Case 24	Entry	50 nodes	4X	ATH	Ku	45	5%	20%	None	NATO	None	NIPR	Video	Large	Long
Case 25	Consolidation	10 nodes	2X	ATH	Ku	75	10%	5%	None	Joint Serv	Spoofing	NIPR	Data	Large	Long
Case 26	Consolidation	100 nodes	Normal	OTM2	Combo	45	5%	20%	GPS	Joint Serv	Spoofing	NIPR	Voice	Mega	Normal

MoPs to MoEs

Operational Construct: United States Air Force Personnel Recovery



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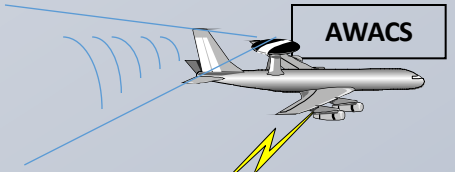

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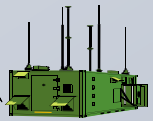

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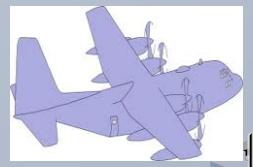

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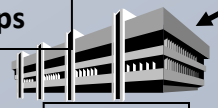

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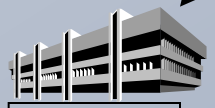

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Requirements Driven Methodology

- Fact-based decisions for testing technology vs. consensus-driven decision making
  - Relevant measures provide clarity about current
    - Realities
    - Risk
    - Threats
    - Opportunities
- Provides predictability around driving new enabling concepts and technologies forward
  - MoEs and MoPs add precision and accuracy
    - Adapting strategy
    - Changing operations
    - Investing and divesting in technologies
    - Evolving tactics, techniques and procedures
- Competitive advantage for providing warfighters with technologies (Third Offset Strategy)
  - Enables organizational and operational constructs
  - Mitigates risk
  - Closes capability gaps

Questions and Answers

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