Airborne, Maritime/Fixed Station Joint Tactical Radio System

NPS 6th Annual Research Symposium:
Networked Warfighter
'A Revolution in Military Affairs'
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Agenda

- AMF JTRS: Revolution in Military Affairs
- Making the JTRS RMA a Reality
- Total Systems Integration Realities

Revolution in Military Affairs

'...a major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military doctrine and operational and organizational concepts, fundamentally alters the character and conduct of military operations'.

Dr Andrew Marshall
Director of the Office of Net Assessment

Historical Examples

- ■ **Crossbow**

- ■ **Gunpowder**

- ■ **Cannon**

- ■ **Air Power**

- ■ **Radio**

- ■ **Networks…**

Worst-case scenario is an "RMA breakout" by an adversary!

Revolution in Battlespace Awareness

From This to….

The Revolution in Battlespace Awareness begins with the network-centric enabler (JTRS); NOT another Radio!
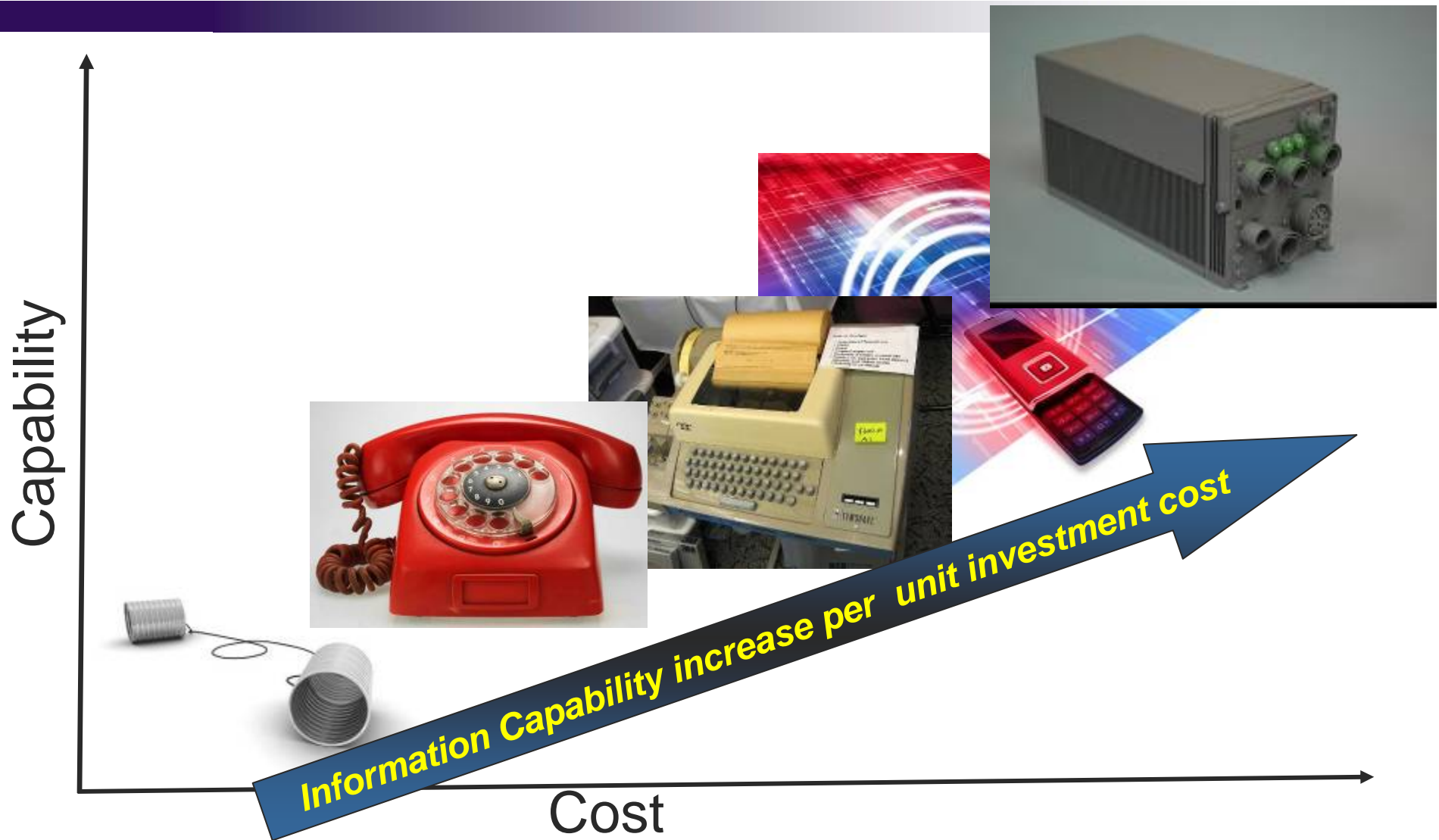
AMF JTRS Networked Device: 'Everything is in the Box'

AMF JTRS

Information Capability

Capability

Cost

Information Capability increase per unit investment cost

AMF JTRS
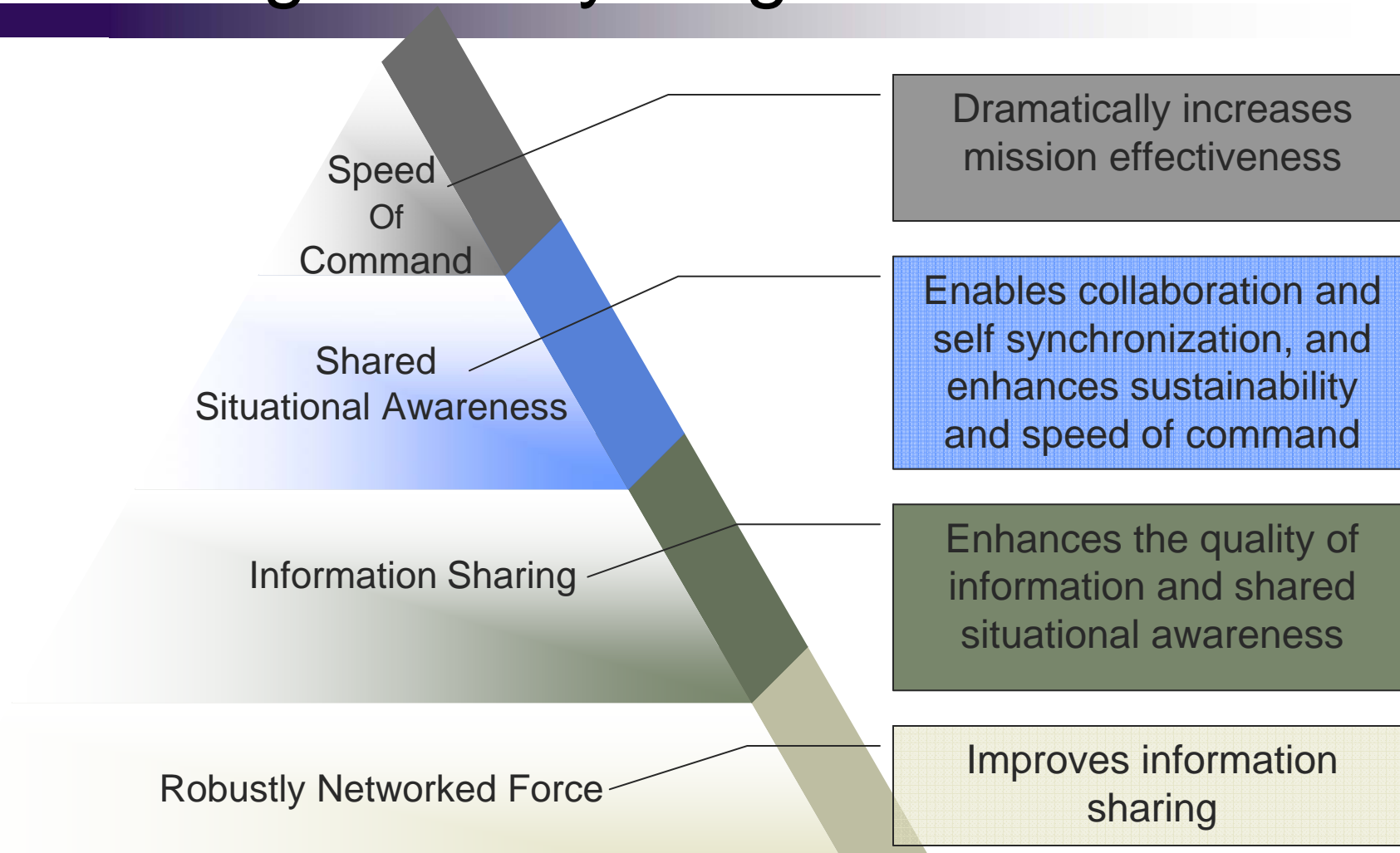# Warfighting Advantage

Opportunity

- The opportunity now exists for our Military to make enormous gains in its ability to share information (extend reach)

Change

- Changes in the flow of information could be dysfunctional if these changes were not also accompanied by changes to concepts of operation, doctrine, organization, command concepts, training, and other elements of a mission capability package
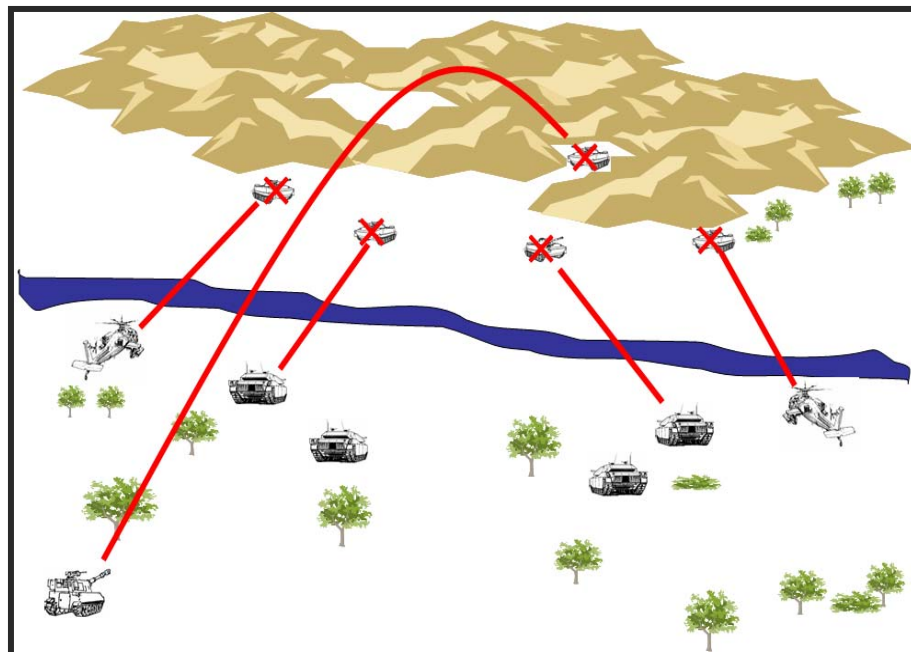
Networked Warfighting: Changes Everything

Speed
Of
Command

Shared
Situational Awareness

Information Sharing

Robustly Networked Force

Dramatically increases mission effectiveness

Enables collaboration and self synchronization, and enhances sustainability and speed of command

Enhances the quality of information and shared situational awareness

Improves information sharing

Warfighters will be able to dominate any situation; and day-to-day operations will be optimized with accurate, timely, and secure information

'A Systems of Systems Solution'

Synchronize Acquisition with Warfighter

Command and Control Capability

Combat Vehicle Integration

Rqmnts Def — Test — MS Decision

Fire Support Vehicle Integration

Rqmnts Def — Test — MS Decision

Aircraft Integration

Rqmnts Def — Test — MS Decision

Fielded Command and Control Capability

On the battlefield all components have to function as a cohesive force in order to achieve success
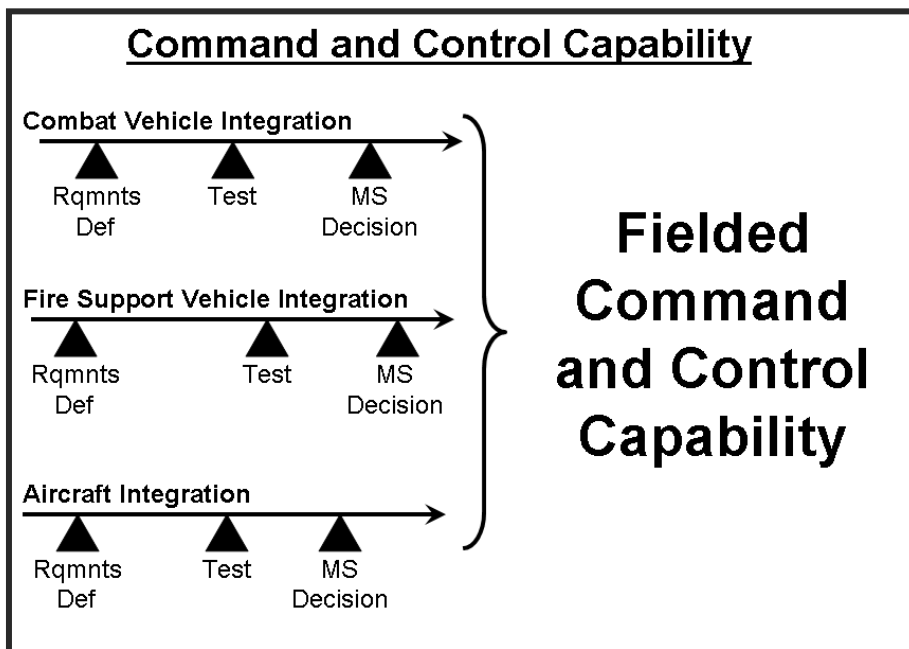
Same is true for the acquisition of a capability. Multiple organizations need to be synchronized in order to achieve success
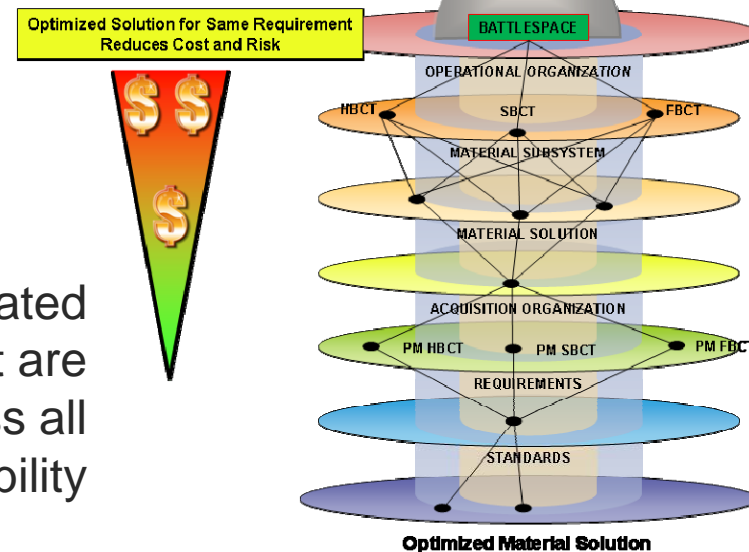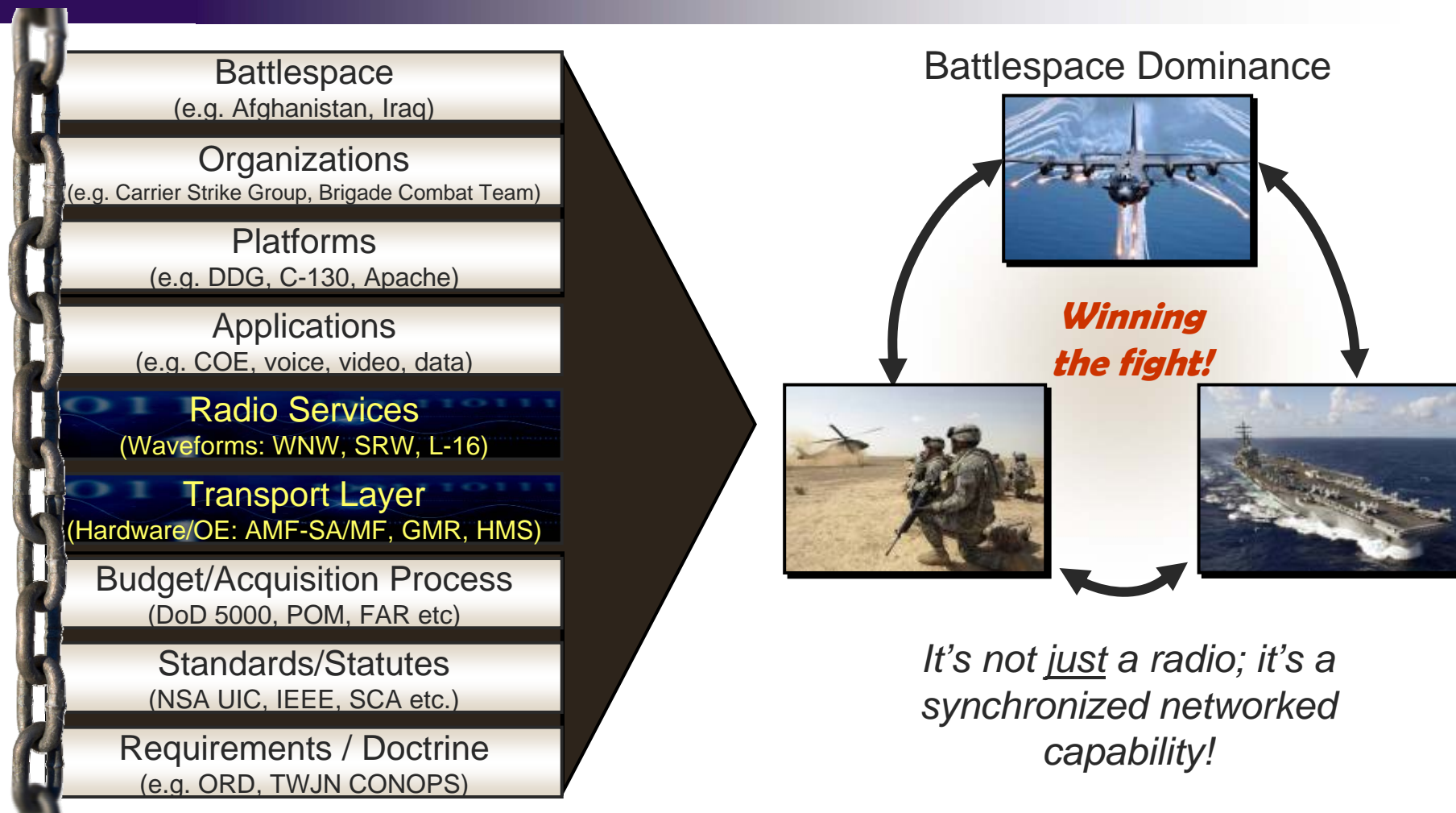
Capabilities Management Challenge

Increase Cost Due to Multiple Solutions for the Same Requirement

Non Optimized Platform Centric
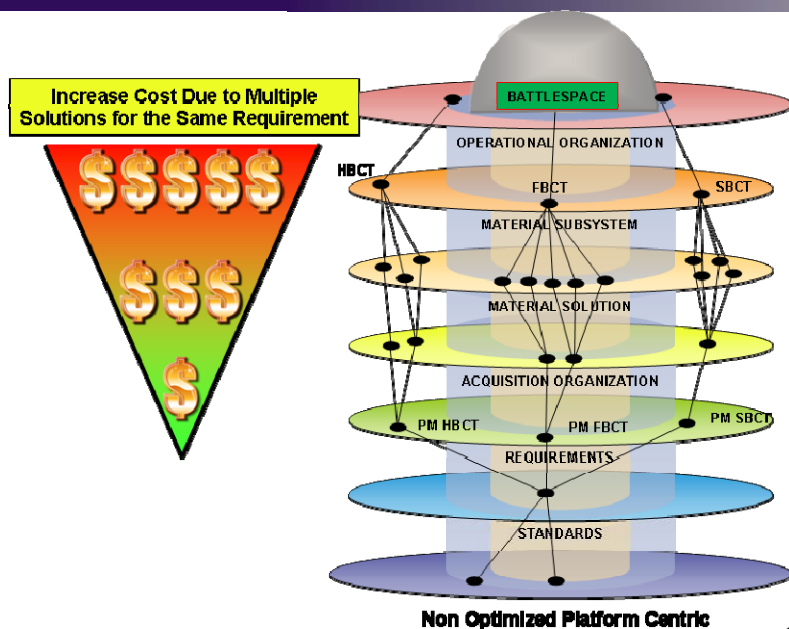
Multiple, independent solutions increasing burden on the unit and impacting overall capability

Optimized Solution for Same Requirement Reduces Cost and Risk

Optimized Material Solution

Fewer, well coordinated materiel solutions that are employed consistently across all systems & optimizing overall capability

# Networked Dependencies

| Battlespace |
| (e.g. Afghanistan, Iraq) |

| Organizations |
| (e.g. Carrier Strike Group, Brigade Combat Team) |

| Platforms |
| (e.g. DDG, C-130, Apache) |

| Applications |
| (e.g. COE, voice, video, data) |

| Radio Services |
| (Waveforms: WNW, SRW, L-16) |

| Transport Layer |
| (Hardware/OE: AMF-SA/MF, GMR, HMS) |

| Budget/Acquisition Process |
| (DoD 5000, POM, FAR etc) |

| Standards/Statutes |
| (NSA UIC, IEEE, SCA etc.) |

| Requirements / Doctrine |
| (e.g. ORD, TWJN CONOPS) |

Battlespace Dominance

Winning the fight!

It's not just a radio; it's a synchronized networked capability!

To provide Battlespace networked communications, all layers are interlinked and dependent
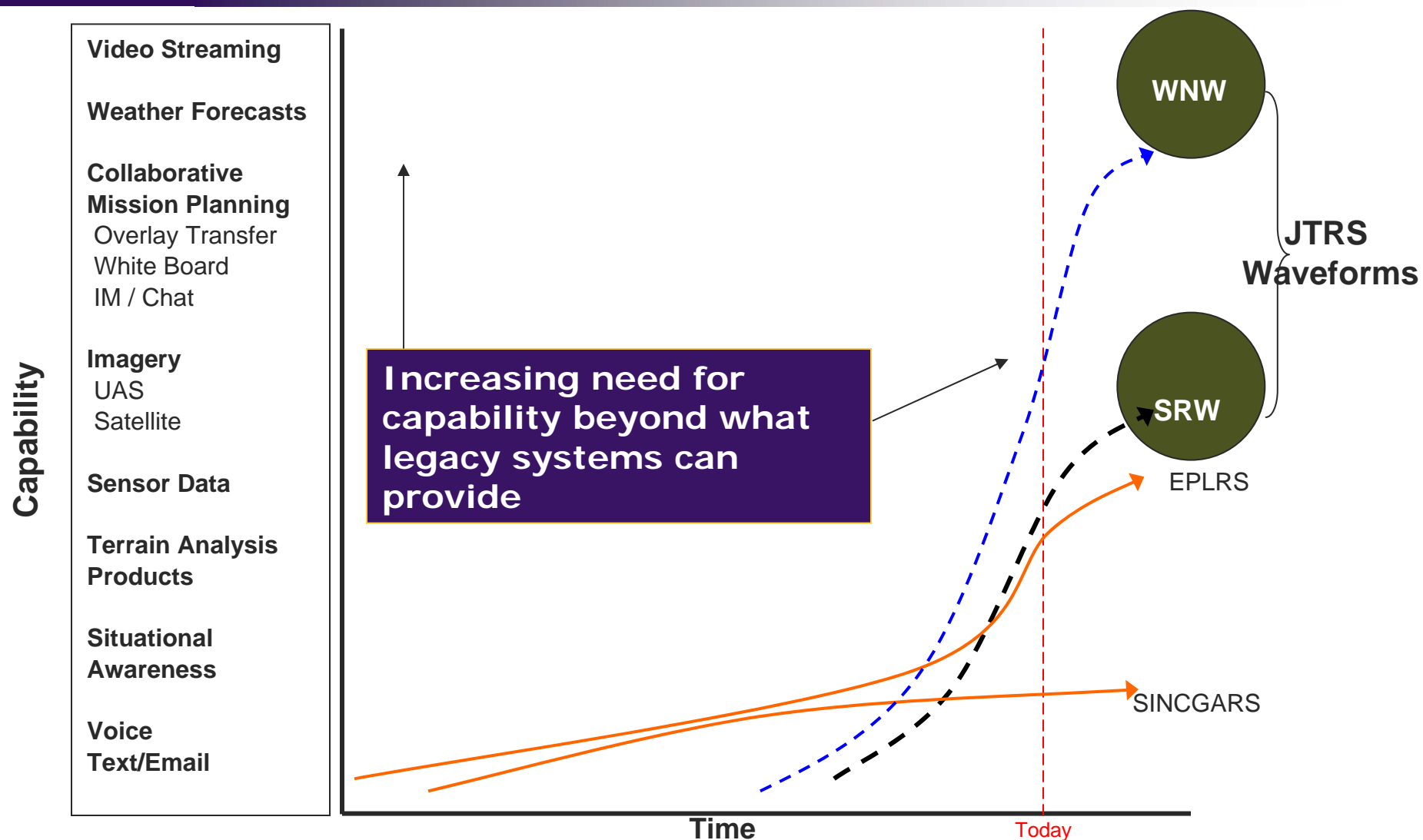
WNW and SRW: Components of a Layered Tactical Network
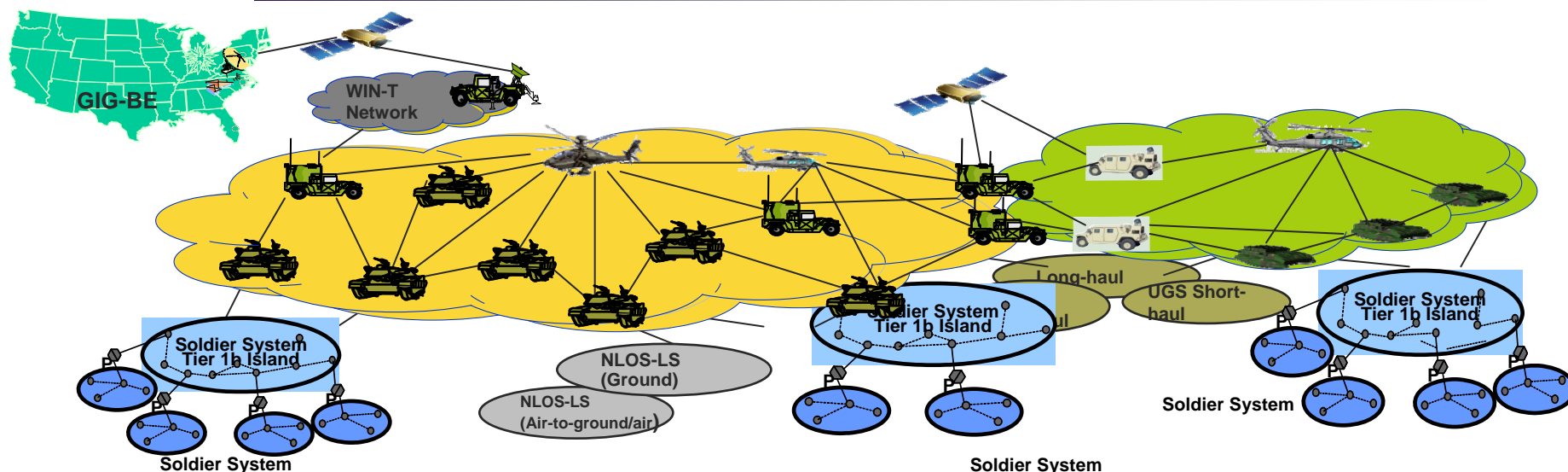
- **Integrated WNW and SRW Ground Domain network provides the dynamic, scalable, mobile network architecture for tactical network communications**
  - **WNW** provides necessary <u>large scale, highly mobile wide area backbone</u>
    - Interconnects SRW stub networks to form integrated ground domain network
    - Dynamic IP routing, IP encryption, IP QoS for GIG interoperability
    - Leverages advantaged nodes to enhance network extensibility and performance
  - **SRW** provides critical tactical edge connectivity for the <u>dismounted operator and sensor networks where battery conservation is at a premium</u>
  - **JTRS Enterprise Network Manager** provides a single, user-friendly system to plan, monitor and "over-the-air" reconfigure the integrated WNW/SRW
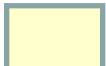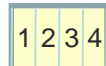
# Required Capabilities in an Integrated Net-Centric Environment

Video Streaming

Weather Forecasts

Collaborative Mission Planning
 Overlay Transfer
 White Board
 IM / Chat

Imagery
 UAS
 Satellite

Sensor Data

Terrain Analysis Products

Situational Awareness

Voice Text/Email

Capability

Increasing need for capability beyond what legacy systems can provide

WNW

SRW

JTRS Waveforms

EPLRS

SINCGARS

Time

Today

Current vs. JTRS Capabilities

| Current	Future
Legacy	**AMF**
	1 2 3 4
"Fixed" Waveform	"Selectable" Waveforms

Current radio systems are designed to operate in a specific or "fixed" spectrum / waveform. **Future advancements limited and costly**

AMF can individually "select" the specific spectrum/waveform for each channel → **provides operational flexibility as technology advances**
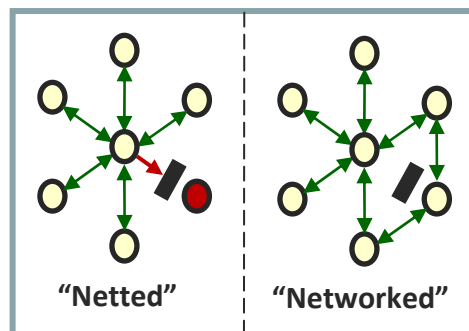
"Netted"	"Networked"

Communications between current "netted" radio systems are dependent upon line of sight with all stations in a net. **Single point of failure**

In a JTRS "networked" sub-net all stations can communicate as long as there is line of sight to any other station that has line of sight with the source / originating station. → **Information Assurance of delivery**

RETRANS or Relay

Warfighter A — Warfighter B

Warfighter A — 1 2 3 4 — Warfighter B
AMF
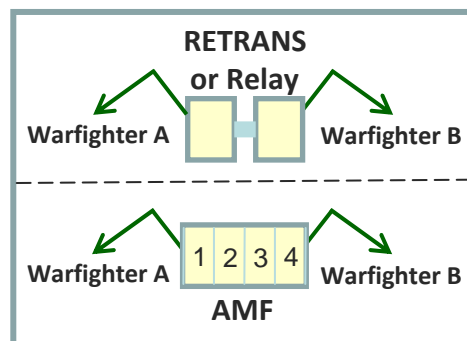
For current radio systems – two retransmission (RETRANS) or Relay radios are required to connect stations – or - other nets not within line of sight of the originating radio. **Communications are vulnerable to failure**

JTRS provides this connectivity between channels internal to the radio system --- connecting different sub-nets or access to higher level networks → **Built in capability**

Composition of Integration Cost
(Longbow Apache Example)
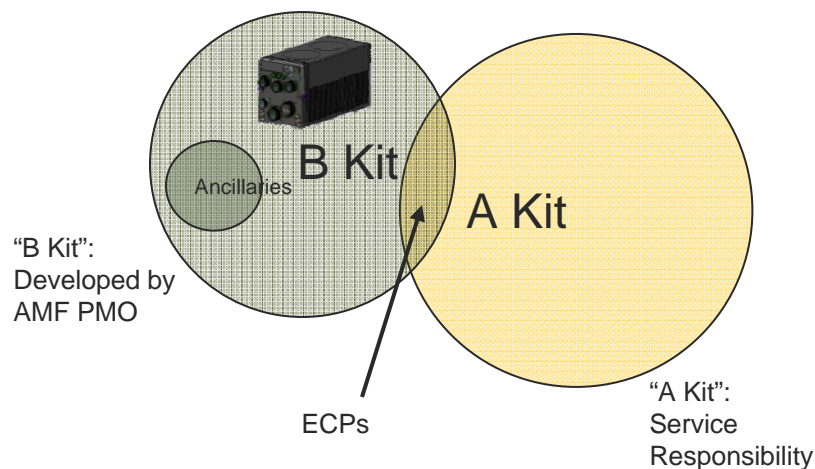
TOTAL INTEGRATION COST
(Installed Capability Cost)

Design	Production
• B-Kit NRE	• B-Kit Production
• B-Kit EDM	• A-Kit Production
• A-Kit NRE	• A & B Kit Installation
• Platform Integration NRE	
• Platform Quals & Certs	

Design Integration Costs (R&D) are one-time (per platform type) while "production" integration costs are recurring but typically decrease with time (learning curve)

B Kit

Ancillaries

A Kit

"B Kit": Developed by AMF PMO

ECPs

"A Kit": Service Responsibility

Design Integration Costing Methodology

Determining Design Integration Costs (ACTUAL)

| AMF SDD Contract Cost | For Each Platform Class (n) EDM cost | For Each Platform Class (n) A Kit material cost | For Each Platform Class (n) Platform Integration labor cost | For Each Platform Class (n) Qual/Cert cost |

$$DTIC_{R\&D} = BKitNRE + \sum_1^n BKitEDM + \sum_1^n AKitNRE + \sum_1^n PlatformIntegrationNRE + \sum_1^n Qual$$

Data Source	**AMF PMO**	**AMF PMO/Services**	**Services**	**Services**	**Services**
Funding Source	**AMF PMO**	**Services**	**Services**	**Services**	**Services**
Cost Category	**Design**	**Material**	**Design**	**Design**	**Test**

Determining Design Integration Costs (ROM)

| AMF SDD Contract Cost | For Each Platform Class (n) EDM cost | For Each Platform Class (n) A Kit material cost based upon a historical percentage of the BkitNRE cost | For Each Platform Class (n) Platform Integration labor cost based upon a historical percentage of the BkitNRE cost | For Each Platform Class (n) Qual/Cert cost based upon a historical percentage of the BkitNRE cost |

$$eDTIC_{R\&D} \approx BKitNRE + \sum_1^n BKitEDM + \sum_1^n (BKitNRE * x_n) + \sum_1^n (BKitNRE * y_n) + \sum_1^n (BKitNRE * z_n)$$

Data Value	**AMF SDD Contract Cost**	**AMF SDD Option CLIN And Quantities**	**"A Kit" Historical ROM**	**"Platform Integration" Historical ROM**	**"Qualification" Historical ROM**

$(x \approx HistoricalAkitNRE \div HistoricalBkitNRE)$
$(y \approx HistoricalIntegrationNRE \div HistoricalBkitNRE)$
$(z \approx HistoricalQualNRE \div HistoricalBkitNRE)$

ROM Methodology - Estimate costs as percentage of radio development effort (i.e. BKitNRE)