Squad X Experimentation Program

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Proposers Day

22 April 2016

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Opening Comments

- The Proposers' Day briefing is intended to provide an orientation to DARPA BAA–16–30 (can be found on fbo.gov, released May 6, 2016), and is solely for information purposes
- The solicitation (BAA–16–30) supersedes anything presented or said by DARPA at the Proposers Day
- Examples in this briefing (e.g., technologies, use cases) are chosen for ease of illustration only and do not constitute endorsement of any particular approach
- Squad X Experimentation is a DARPA program that seeks to design, develop, integrate, and validate system prototypes that enable next-generation combined arms for the dismounted squad
- Interested performers are expected to be able to articulate a clear and compelling vision for their proposed system, integration approach, and experiment plan
- We need your help to make this program a success!

Why Squad X?

WWII Europe

Korea

Vietnam

Desert Storm

Afghanistan

Iraq

Squads Operate in Diverse Environments

Rifle Squads in the 21st Century

Where am I? Where are my friends? Where is the enemy? What can I do?

Traditional Threats

Assault Rifles

RPGs and Sniper Rifles

Improvised Explosive Devices

ISR with Mobile Phones

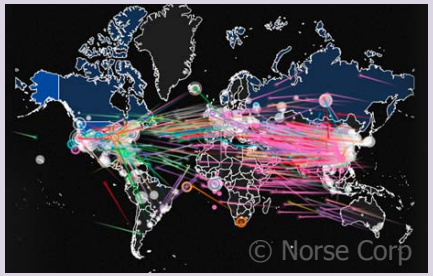
Technology Enabled Threats

UAVs as IEDs or for ISR

Twitter
YouTube
Snapchat
Facebook

Command and Control with Social Media

Overhead Imagery Exploitation



Cyber Attacks

The mission of the infantry is to close with the enemy by means of fire and maneuver in order to destroy or capture him, or to repel his assault with fire, close combat, and counterattack

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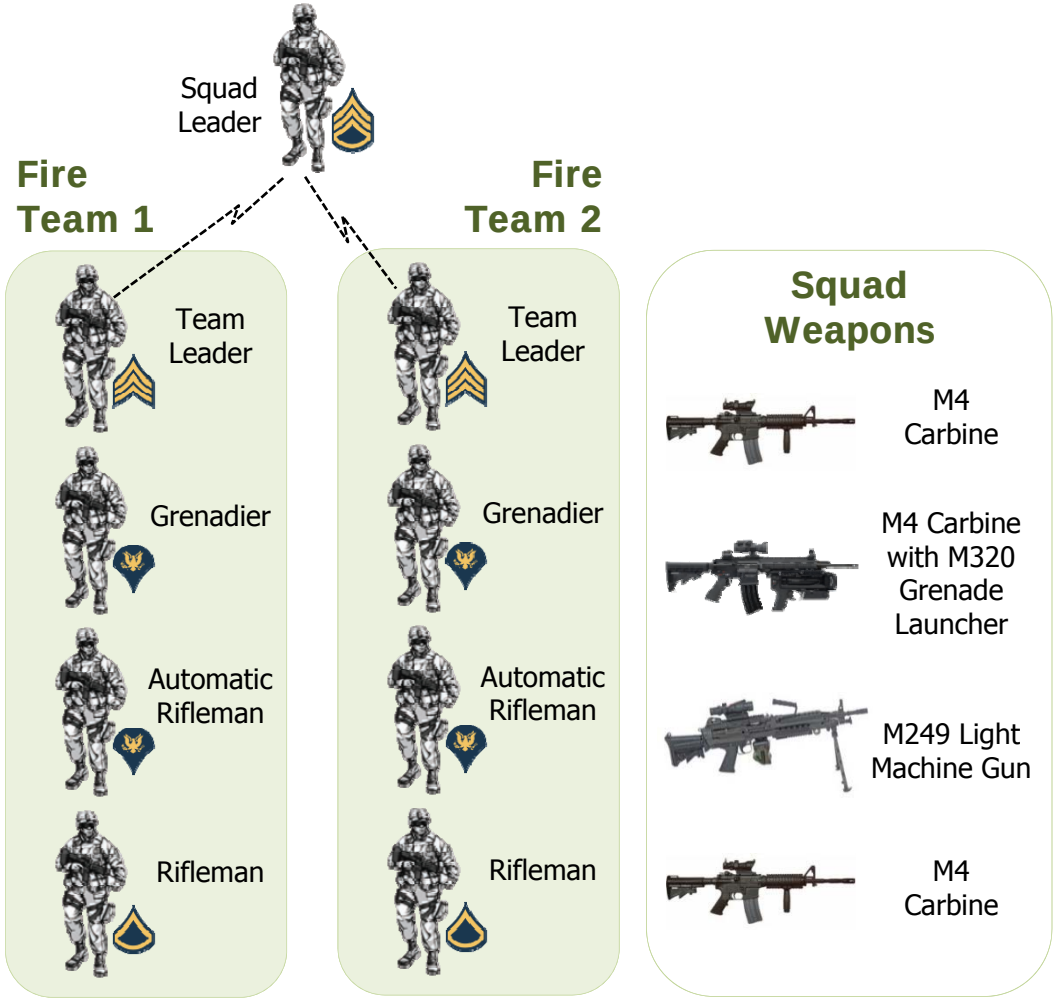
The Squad

Army Rifle Squad



Key Soldier Equipment:

- Night vision goggles
- Optical weapons sights
- Thermal weapons sights, binoculars (some)

Squad/Team Leaders (3):

- Radio with GPS
- Nett Warrior end-user device with mission planning tools

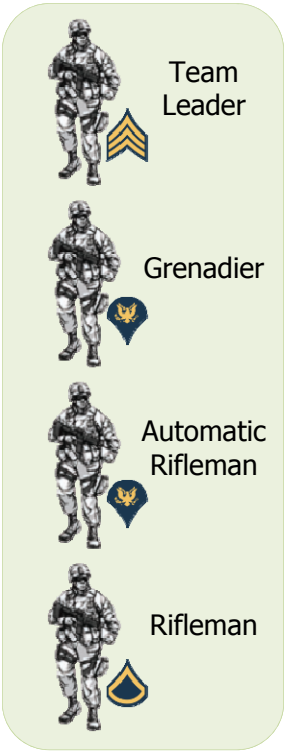
A Few Squads:

- Unmanned air or ground vehicle

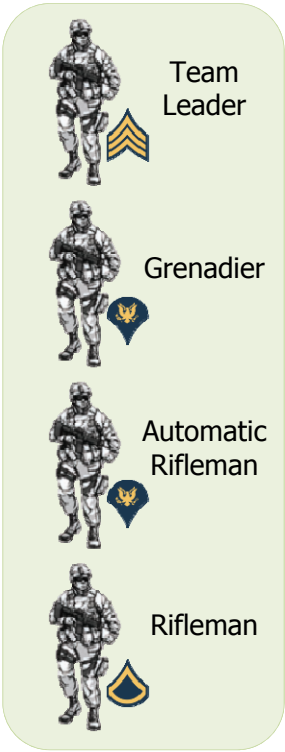
Army vs. Marine Squads

Army Rifle Squad

Fire Team 1

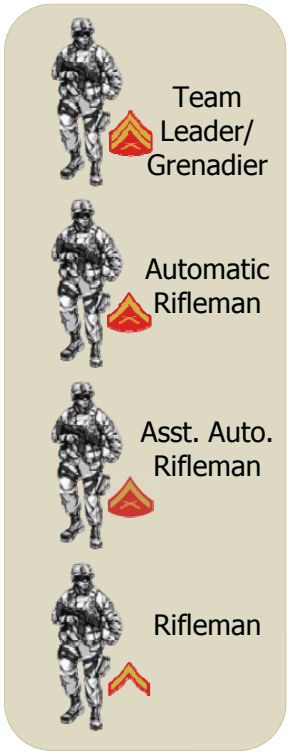


Fire Team 2

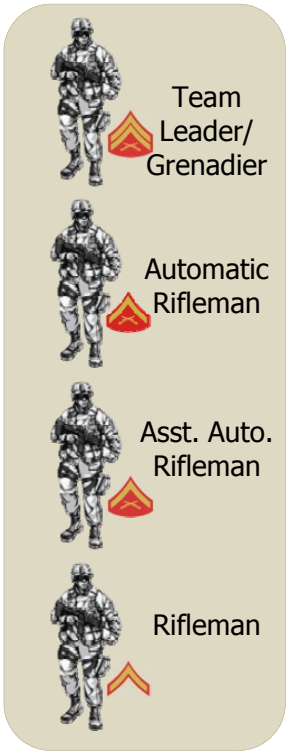


Marine Rifle Squad

Fire Team 1



Fire Team 2



Fire Team 3

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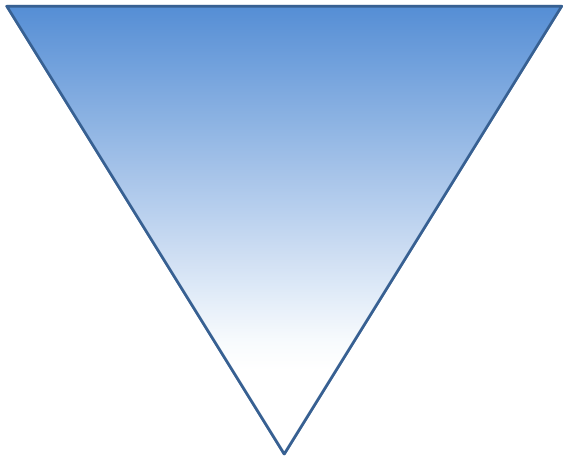
Paradigm Shift for Building Combat Power

Precision Effects and Intelligence Capabilities Today

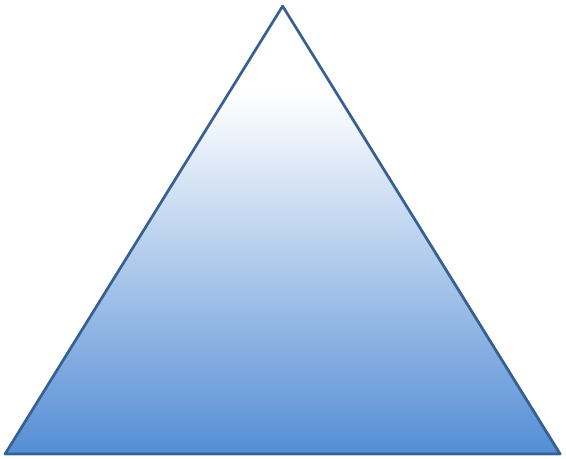
Precision Effects and Intelligence Capabilities Needs Tomorrow[1]



Strategic

Operational

Tactical



Forces designed for linear, conventional operations; challenged to adapt and be flexible across the range of military operations

Squad X

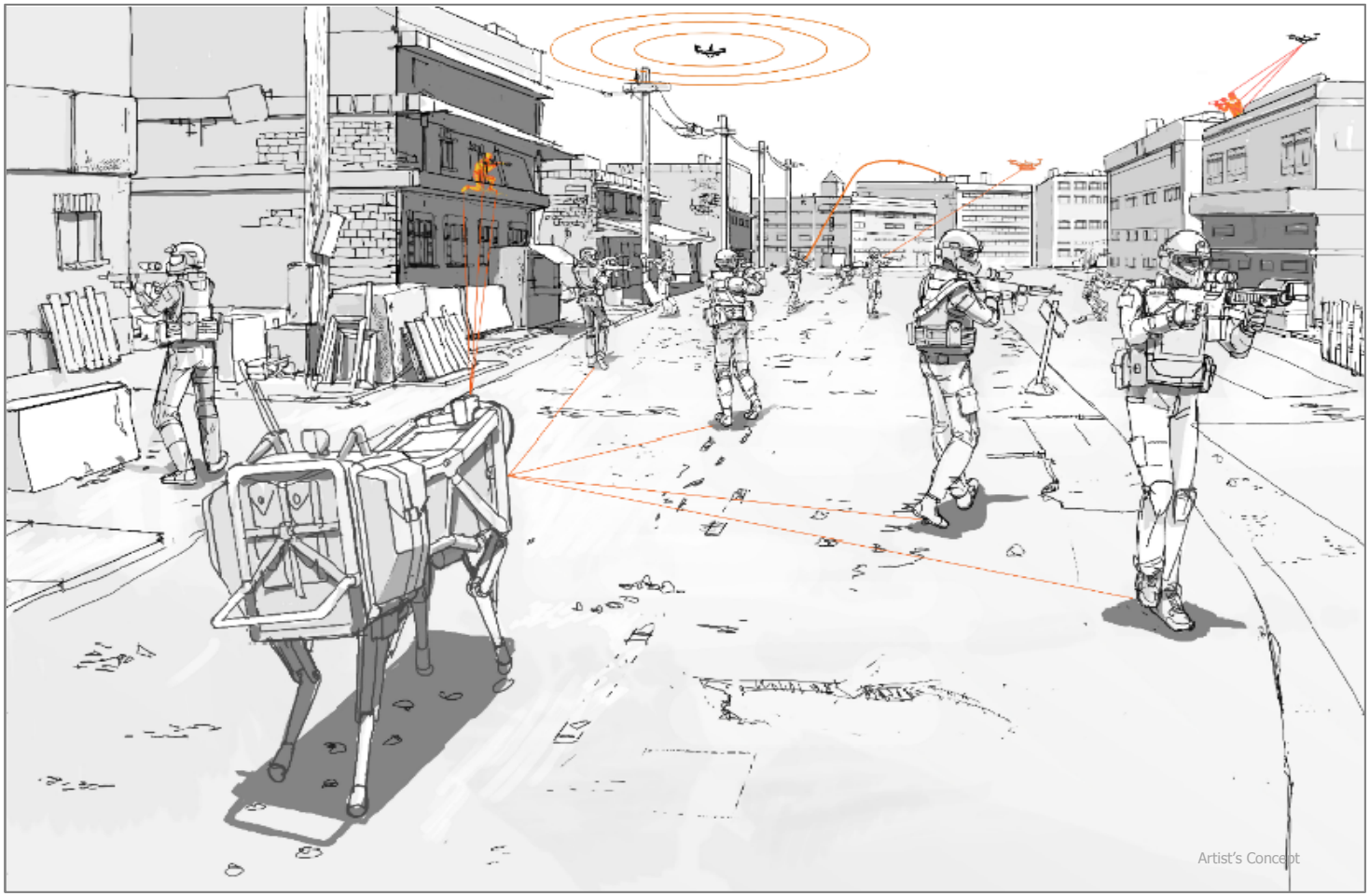
Forces designed for linear and nonlinear, conventional and nonconventional, operations; adaptable and flexible across the range of military operations

Build Combat Power from the Rifle Squad Up

1 Adapted from War From the Ground Up, Emile Simpson, Oxford University Press, 2012

Squad X

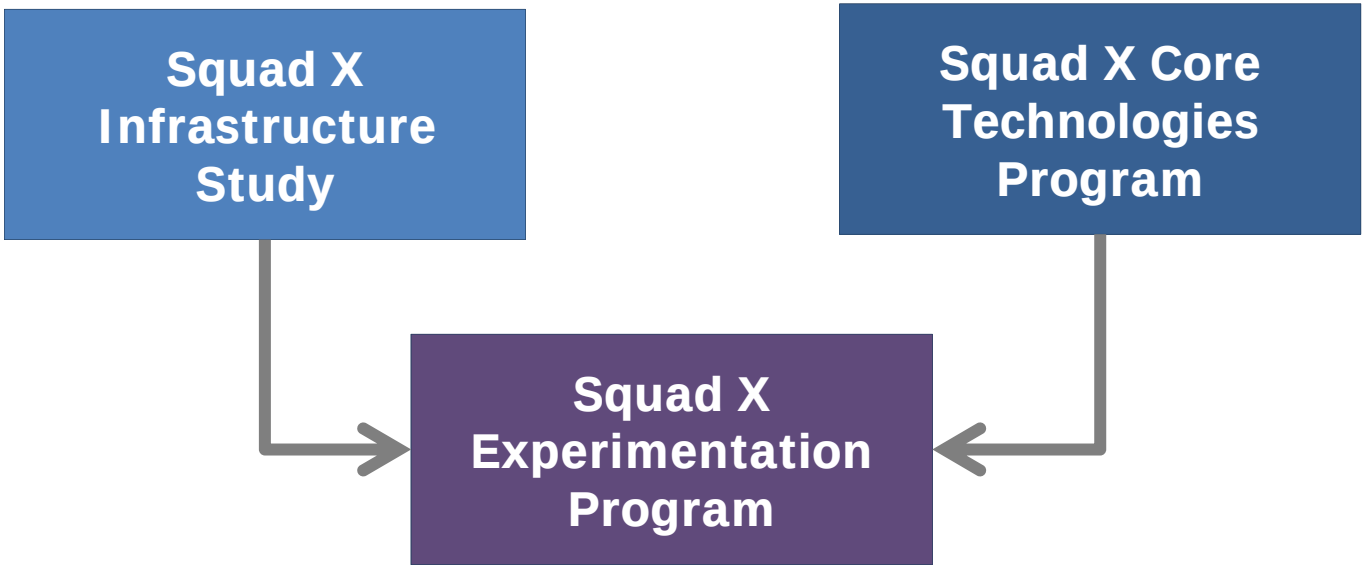
Squad X seeks to enable the humans in the squad to be increasingly effective in future complex and uncertain environments



The Squad X Portfolio

The Squad X vision:

- Extend and enhance the **situational awareness** of the rifle squad
- Provide small unit leaders with **increased maneuver time and space**
- Enable rifle squads to **shape and dominate their battlespace**



Together these efforts build the Squad X Vision

The Squad X Portfolio

Current Investments

Squad X Infrastructure Study
Evaluate architectures, technologies, and experimentation plans to inform program investments and reduce technical risk

Squad X Core Technologies Program
Develop core, enabling technologies that extend and enhance Squad situational awareness and provide capabilities to shape and dominate its battlespace

New Investment

Squad X Experimentation Program
Design, develop, and validate system prototypes for a combined arms squad. Overmatch adversaries through the synchronization of fire and maneuver in the physical, electromagnetic spectrum, and cyberspace domains

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Squad X Infrastructure Study

Squad X Infrastructure Study

- 3QFY14 through end 2QFY16
- Perform Integration Studies and Define Reference Architecture
  - Define open, common, commercially extensible Government-owned architecture
  - Define key interfaces and standards
- Conduct USA, USMC, and SOF Workshops
  - Key takeaways:
    - **Communications** – lack of horizontal information flow; improved and increased communications was number one priority
    - **Response time** – lack capabilities for rapid identification and response to threats
    - **Agility and flexibility** – threats readily adapt to our TTPs, we need to be able to do the same
    - **Situational awareness** – atmospheric changes in the operational environment; friendly casualty notification
    - **Precision capabilities** - kinetic and non-kinetic (left and right of bang)
- Conduct Experimentation Site Selection and Operational Support
- Conduct Baseline Technology Evaluation
- Establish Tactical Edge Standards Board (TESB)

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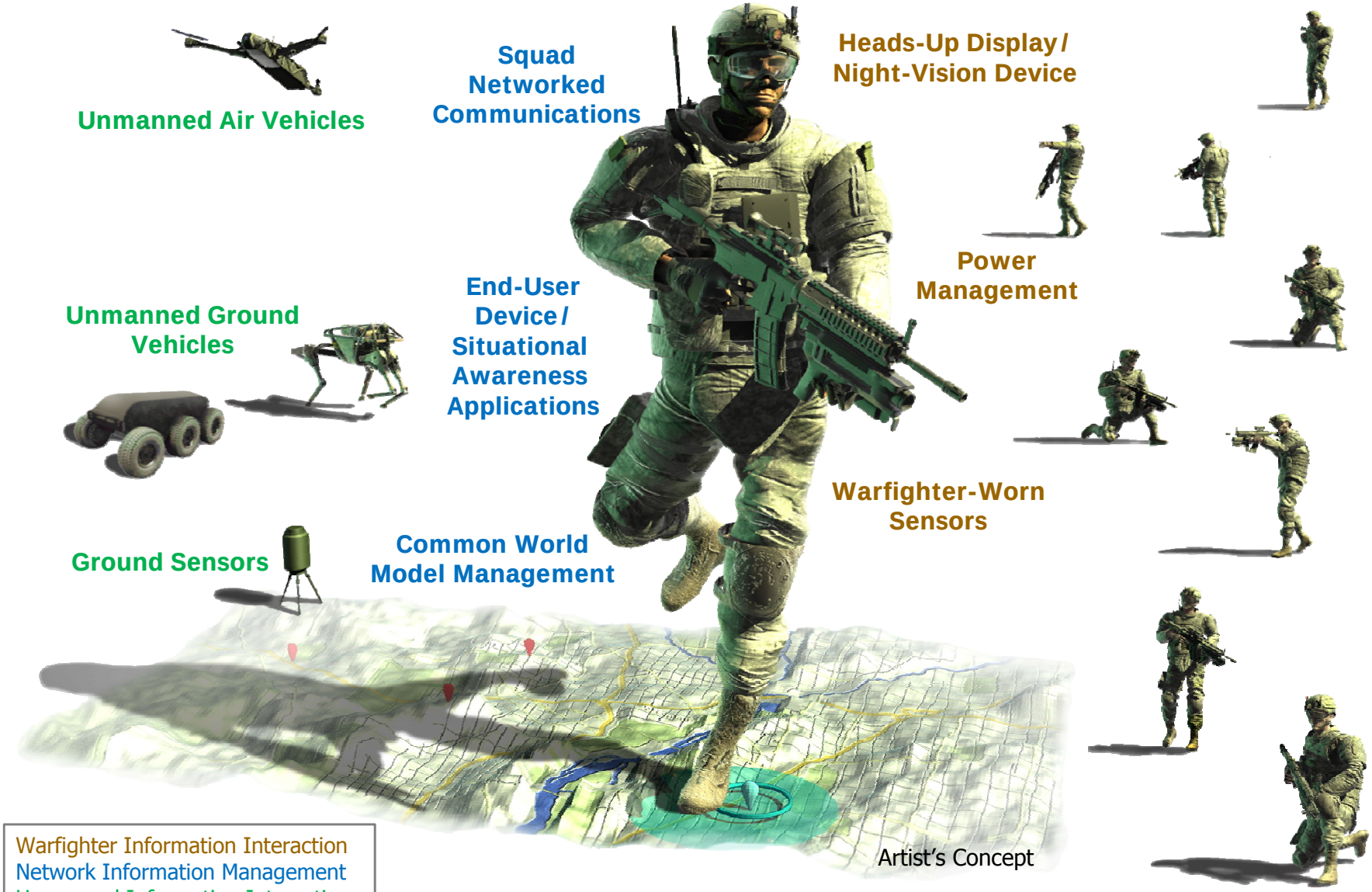
Squad X Infrastructure Study Baseline



Warfighter Information Interaction
Network Information Management
Unmanned Information Interaction

Squad X Core Technologies (SXCT) Program

Squad X Core Technologies Program Goals and Metrics

1	Precision Engagement	Enable the rifle squad to precisely engage threats out to 1,000 meters, while maintaining compatibility with infantry weapon systems and human factors limitations	Accuracy: 2 m CEP Mass: ≤ 1.0 kg Recoil Energy: ≤ 70 joules
2	Non-Kinetic Engagement	Enable the rifle squad to disrupt enemy command and control, communications, and use of unmanned assets to ranges in excess of 300 meters at a squad-relevant operational pace	Squad Speed: ≥ 2 m/s Mass: ≤ 900 g Volume: ≤ 500 cm^3
3	Squad Sensing	Enable the rifle squad to detect line of sight and non-line of sight threats from 1 to 1000 meters at a squad-relevant operational pace	Accuracy: 0.9 Squad Speed: ≥ 2 m/s Mass: ≤ 350 g Volume: ≤ 200 cm^3
4	Squad Autonomy	Enable the rifle squad to improve their individual and collective localization accuracy to less than 6 meters in GPS-denied environments through collaboration with unmanned systems maneuvering reliably in squad formations	Absolute Position: ≤ 6 m Interventions: 0 Mass: ≤ 350 g Volume: ≤ 200 cm^3

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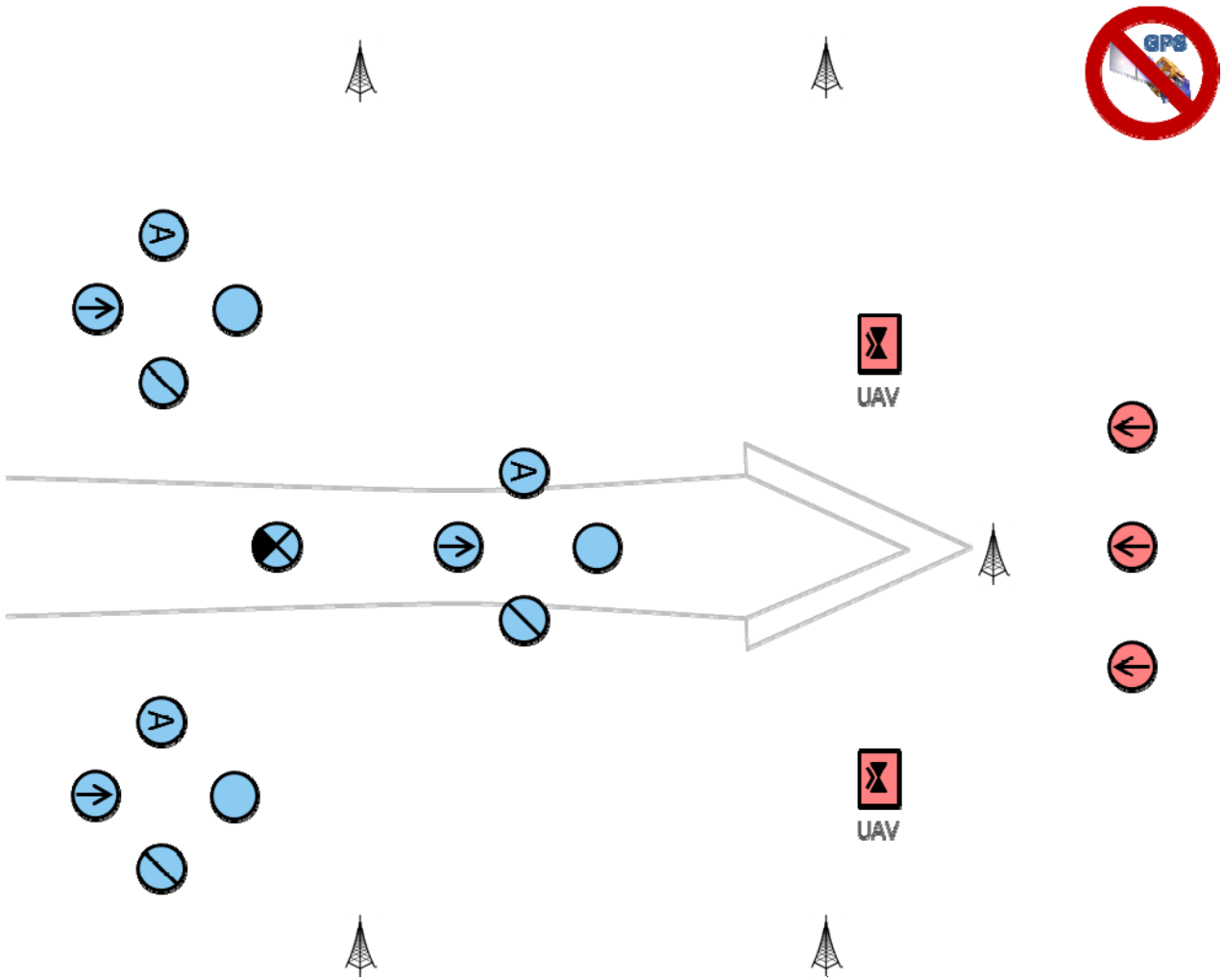
A Complex, Multi-Domain Operational Environment



Challenges

- Ubiquity of modern, commercial technology
  - Communications
  - Unmanned systems
  - Cyber attacks
  - Overhead imagery
- Diverse threats
- Unpredictable environments
- Operating in and around dense populations

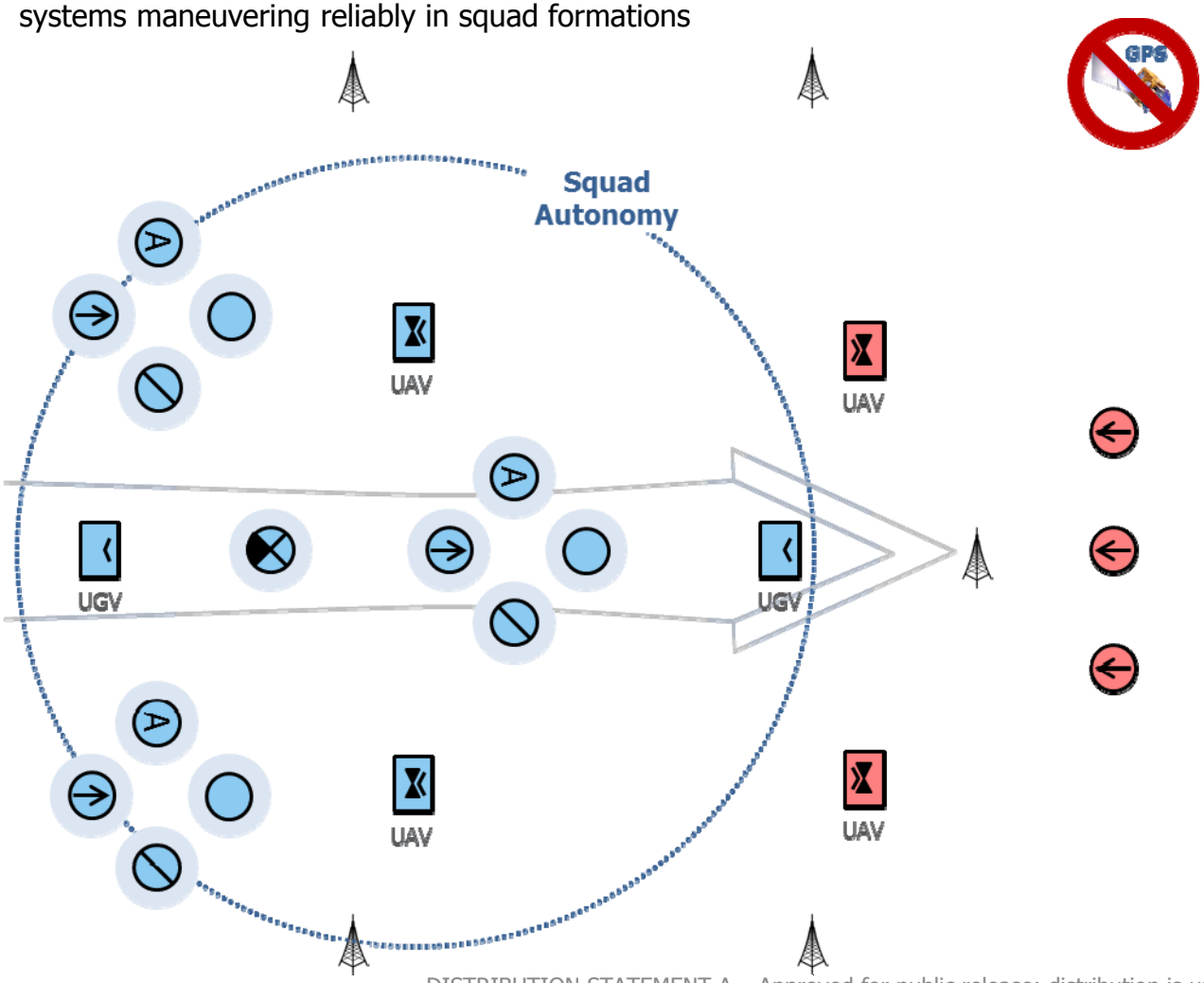
Adversaries will continue to utilize materials and tools available in everyday society and will not be limited by a requirement to manufacture, transport, store, or maintain weapons and equipment.[1]

[1] Adapted from *The Sling and the Stone: On War in the 21st Century*, Col(R) T.X. Hammes, Zenith Military Classics, 2006.

Squad Autonomy

Manned-Unmanned Teaming for Squad Situational Awareness

Enable the rifle squad to improve their individual and collective localization accuracy to less than 6 meters in GPS-denied environments through collaboration with unmanned systems maneuvering reliably in squad formations



Squad X Core Technologies Program Efforts

- Unmanned systems behaviors for robust sensing and collaborative localization
- Non-GPS geolocation using individual and multi-agent techniques
- Surrogate soldier interface system that integrates with unmanned systems for organic localization and autonomy

Program Success Metrics

Absolute Position	≤ 6 m
Interventions	0
Mass	≤ 350 g
Volume	≤ 200 cm^3

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Squad Autonomy Performing Teams

- **SoarTech**

  University of Michigan, Neya Systems, Robotic Research, Sophia Speira

- **Leidos**

  GTRI, Auburn University

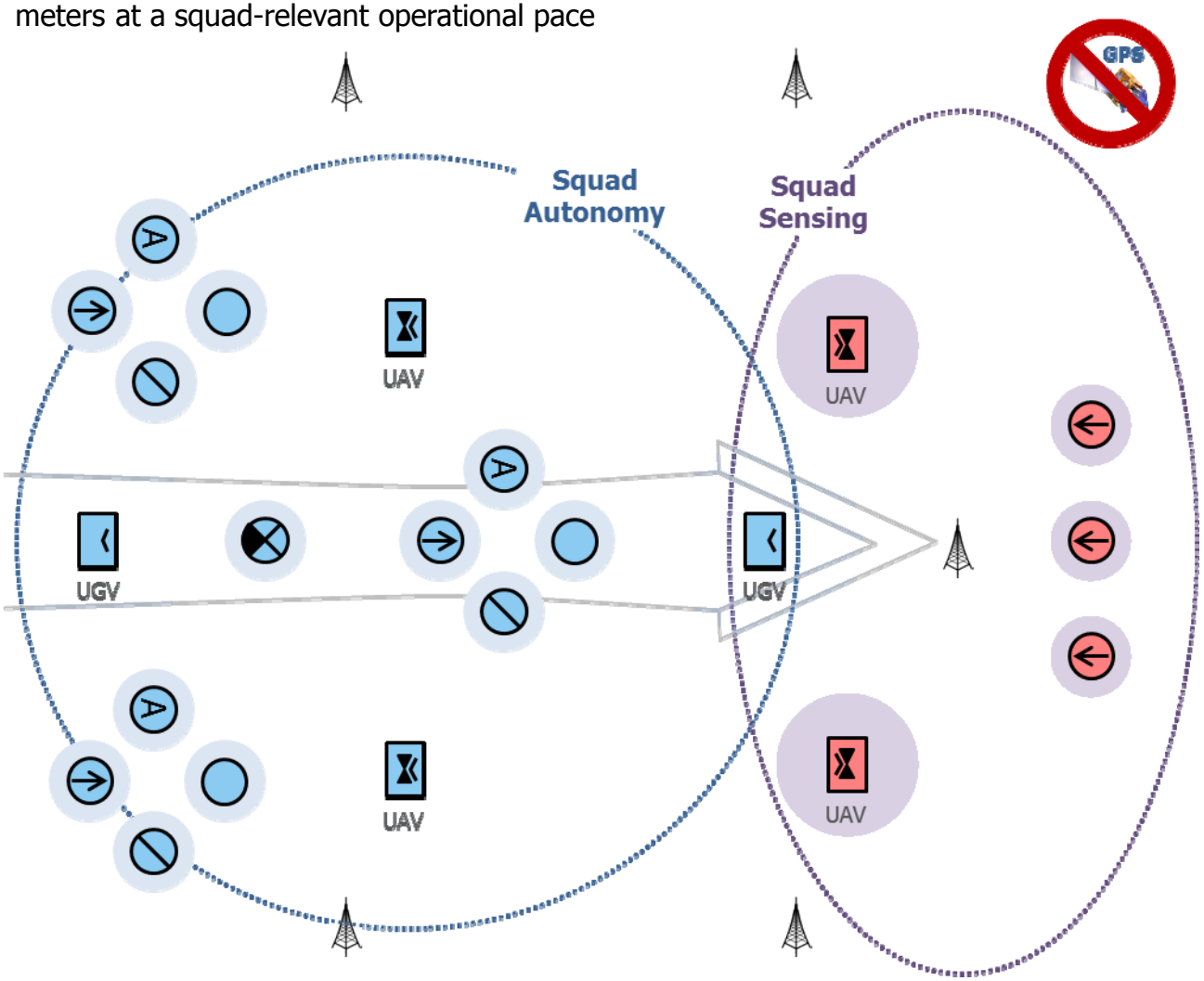
- **Raytheon Missile Systems**

  Draper Laboratory, TORC Robotics

Squad Sensing

Fusion and Exploitation for Situational Awareness about Adversary Forces

Enable the rifle squad to detect line of sight and non-line of sight threats from 1 to 1000 meters at a squad-relevant operational pace



Squad X Core Technologies Program Efforts

- Hearing enhancement using acoustic array and ultrasound
- Novel UAV vision sensing with sensing-aware behaviors
- Unmanned systems with multiple, fused sensor modalities
- Squad-carried radar arrays for seeing through walls and foliage
- Vibration imaging sensors for detecting and classifying threats

Program Success Metrics

Accuracy	0.9
Squad Speed	≥ 2 m/s
Mass	≤ 350 g
Volume	≤ 200 cm^3

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Squad Sensing Performing Teams

- **Helios Remote Sensing Systems**

  Millennium Antenna, TAI, nCk

- **Kitware**

  University of Maryland, University of Pennsylvania, ISCI, SSCI, NuAir

- **Leidos**

- **Scientific Systems (SSCI)**

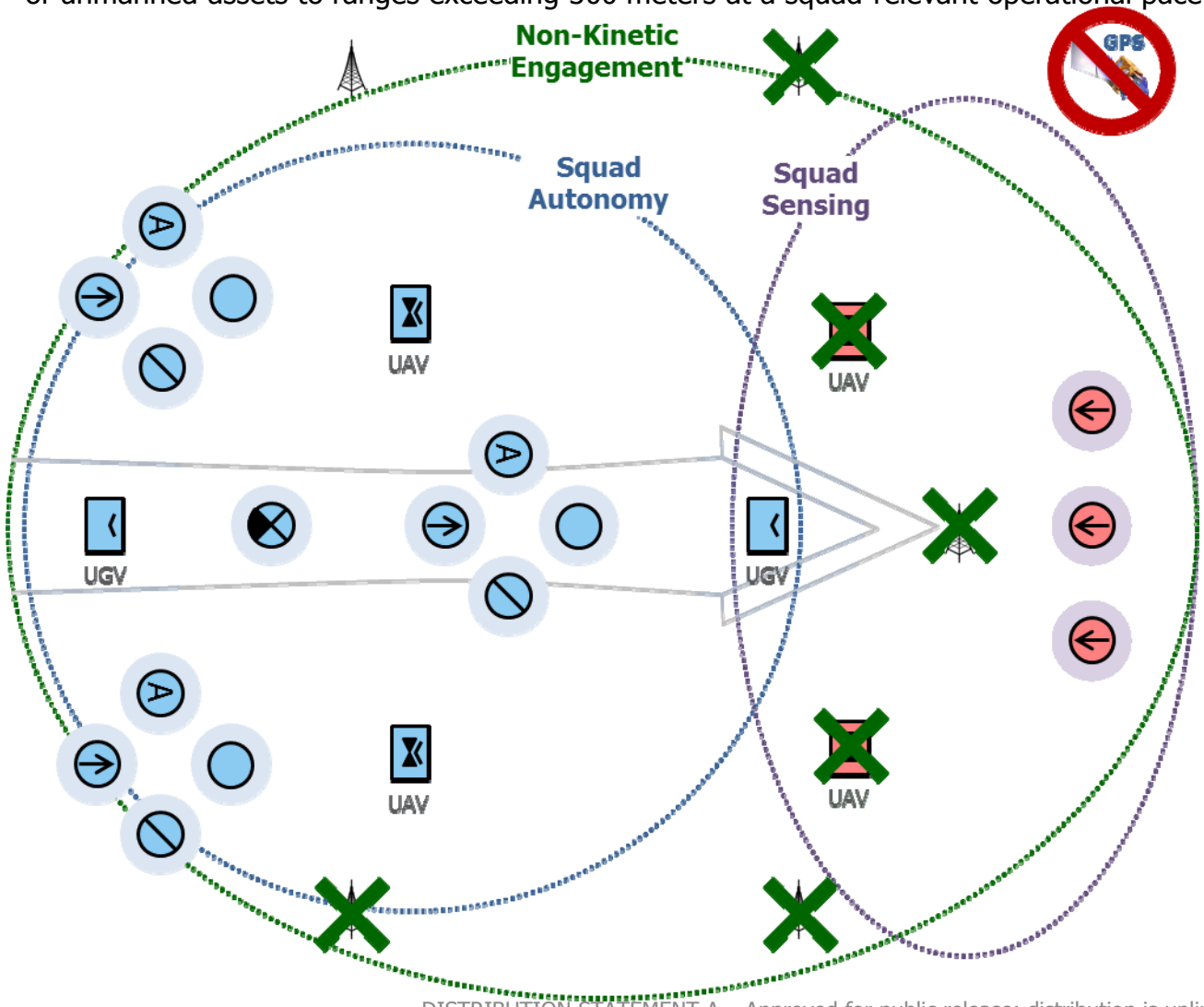
  Progeny Systems, Olin College, Kitware

- **SRI International**

Non-Kinetic Engagement

Environmental Effects to Shape the Battlespace

Enable the rifle squad to disrupt enemy command and control, communications, and use of unmanned assets to ranges exceeding 300 meters at a squad-relevant operational pace



Squad X Core Technologies Program Efforts

- Simultaneously deny the enemy the ability to use communications, command and control, or unmanned systems
- Distributed Array of Cognitive Electronic Warfare (EW) Platforms to deny communications, command and control, and unmanned systems while employing cyber effects

Program Success Metrics

Squad Speed	≥ 2 m/s
Mass	≤ 900 g
Volume	≤ 500 cm^3

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Non-Kinetic Engagement Performing Teams

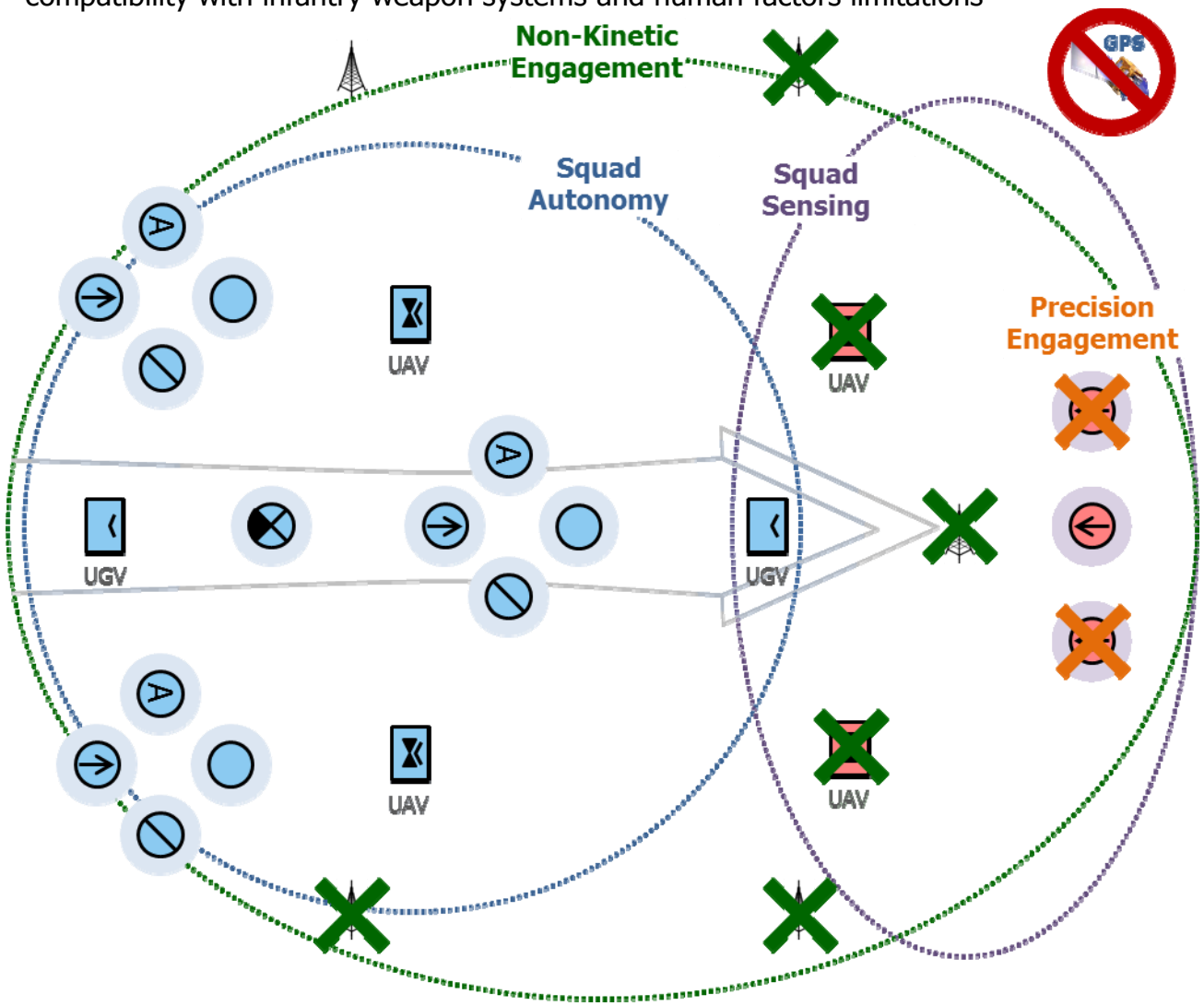
- **Lockheed Martin Advanced Technology Laboratory**

- **Six3 Advanced Systems, dba BIT Systems**
  Virginia Tech Hume Center, Charon Technologies

Precision Engagement

Guided Effects to Dominate the Battlespace

Enable the rifle squad to precisely engage threats out to 1,000 meters, while maintaining compatibility with infantry weapon systems and human factors limitations



Squad X Core Technologies Program Efforts

- Squad munitions for indirect target engagement, featuring dual modes of engagement in the same organic capability

Program Success Metrics

Accuracy	2 m CEP
Mass	≤ 1.0 kg
Recoil Energy	≤ 70 joules

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Precision Engagement Performing Teams

- **Lockheed Martin Missiles and Fire Control**
  Nammo Talley

Additional Details

- **Additional details about the Squad X Core Technologies efforts are available upon request**
  - Information must be requested per instructions provided in the BAA

Squad X Experimentation Program

A Multi-Domain Operational Environment

Among the people

Complex, urban terrain

Underground/indoors

Squads will operate where an adversary can readily exploit the physical, electromagnetic spectrum, and cyberspace domains for movement and communications and in an increasingly connected, global society that requires precise operations in all domains

Current Dismounted Forces

What is a squad?

- A mostly human, resource-constrained system that relies on brittle/constrained/limited sensing and communications

Squads rely on:

- Sensing threats and communicating via line of sight
- Receiving command and control (C2) from higher echelons
- The ability to call for non-organic assets

What if a Squad is attacked?

- Forces' ability to respond is limited
- Networked links and non-organic assets are not available quickly, if at all
- Time and space become extremely important to mission success and survival

Squad Combined Arms Today

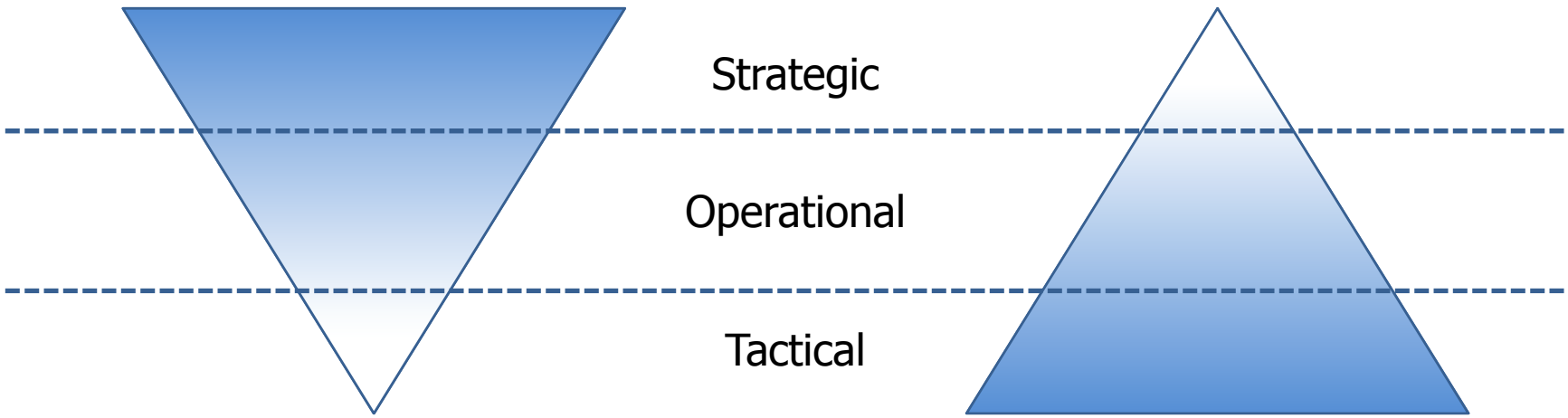
Combined arms is the synchronized and simultaneous application of arms to achieve an effect greater than if each arm was used separately or sequentially

- Squad combined arms is limited to the physical domain
- Synchronized electromagnetic spectrum operations are binary (on/off), lack precision and require additional, burdensome resources
- Cyberspace operations do not exist
- Cannot be solved by solely adding resources due to the physical, cognitive, and material constraints of a dismounted squad

Create a Paradigm Shift for Combined Arms

Precision Effects and Intelligence Capabilities Today

Precision Effects and Intelligence Capabilities Needed Tomorrow[1]



Squads designed for linear, deterministic, and single-domain operations

Squad X

Squads designed for nonlinear, stochastic, and multi-domain operations

Build the foundation of the next generation of combined arms

1 Adapted from War From the Ground Up, Emile Simpson, Oxford University Press, 2012

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Squad X Experimentation: Objective and Vision

Objective: The Squad X Experimentation program seeks to design, develop, and validate system prototypes for a combined arms squad. The combined arms squad would overmatch its adversaries through the synchronization of fire and maneuver in the physical, electromagnetic spectrum, and cyberspace domains.

The Squad X Experimentation program seeks to lay the technical foundation for the combined arms squad to:

- Extend and enhance their situational awareness of their entire operational environment
- Increase their maneuver time and space through optimized use of physical, cognitive, and material resources
- Shape and dominate their battlespace through synchronization of fire and maneuver in the physical, electromagnetic spectrum, and cyberspace domains

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What Is DARPA Looking For?

Squad X Experimentation is a
system development program

System prototypes will be refined through
extensive experimentation

DARPA seeks teams that demonstrate expertise in:

- Developing architecture-based, software and hardware, systems
- Experimenting with equipment in the field
- Network protocols and military radio communications
- Electronic and cyber warfare
- Robotic platforms and behaviors
- Hardware and software integration
- Managing a complex system development and team structure

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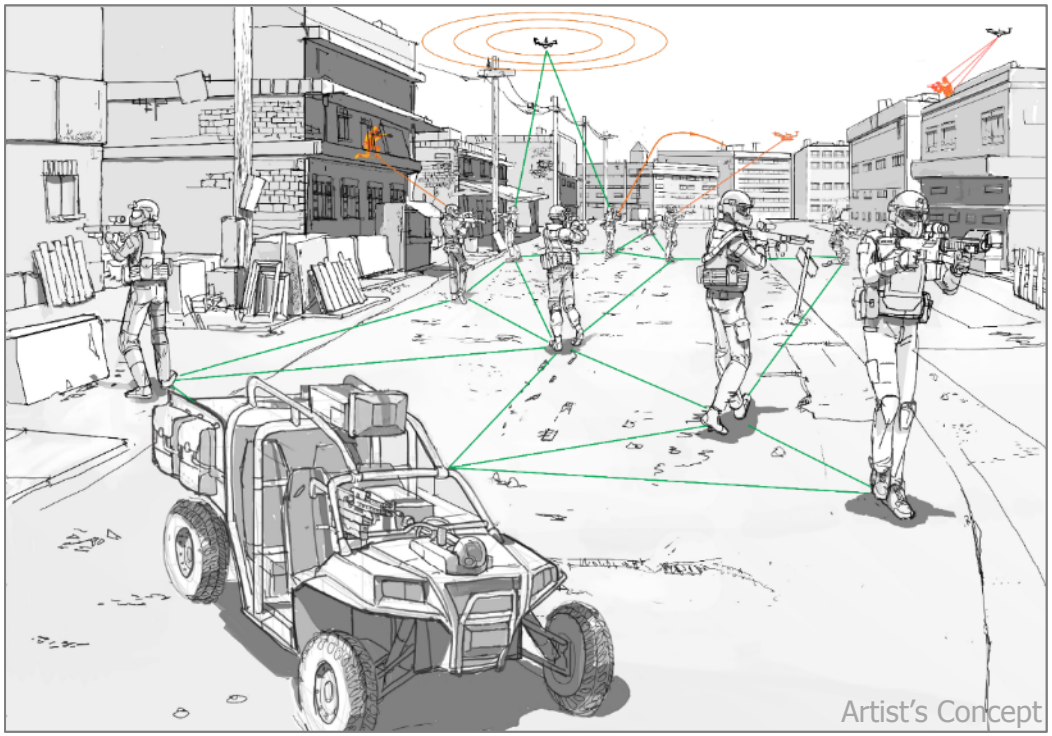
The Squad System

Point of Departure

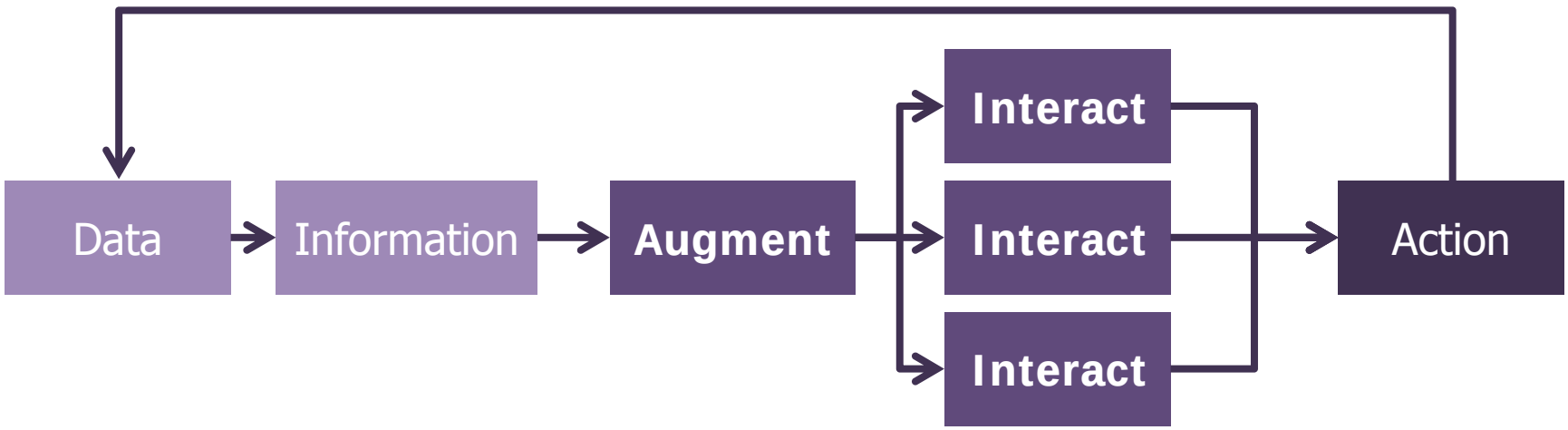
- Assume that the squad is comprised of both human and unmanned members with the following capabilities:
  - Every squad member has local processing and communications
  - Data and information can be passed between all squad members, including unmanned systems
  - Unmanned systems are capable of following behaviors and waypoint navigation



The Three Squad X Dimensions

The Squad X system seeks to:

- Enable the squad to understand their entire operational environment: physical, electromagnetic spectrum, cyberspace
- Optimize use of the squad's limited physical, cognitive, and material resources
- Synchronize fire and maneuver in the physical, electromagnetic spectrum, and cyberspace domains



Synthesize **Data** to distribute critical **Information** to Squad Members

Augment limited Squad resources and **Interact** efficiently with the disaggregated system

Enable new multi-dimensional **Action** through asymmetric advantages

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Shared Situational Understanding

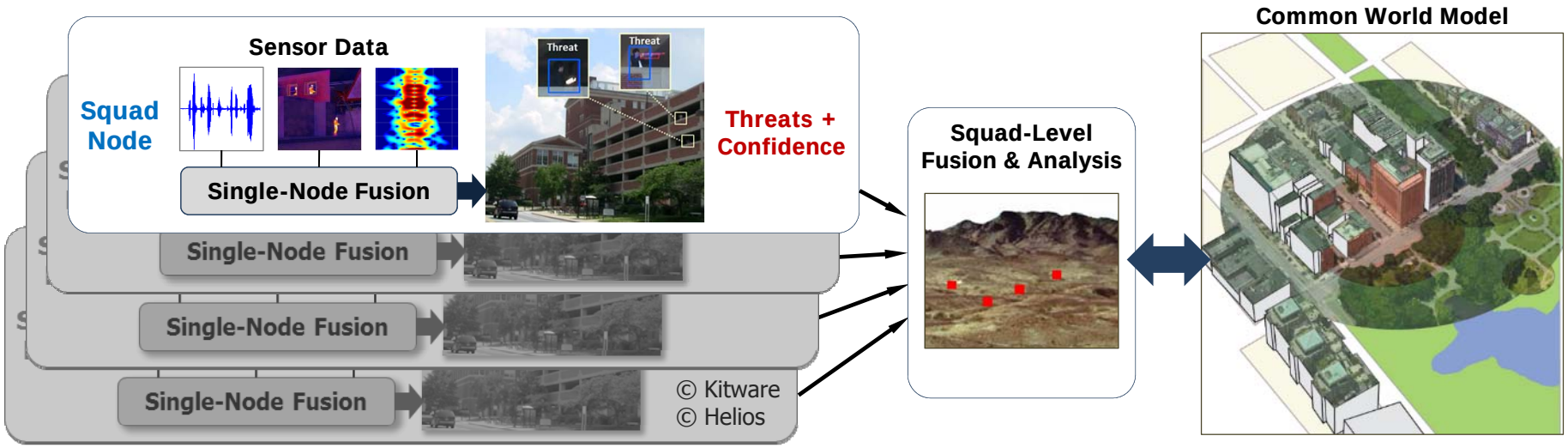
Today: Squads have limited situational understanding of their physical battlespace and no situational understanding of the electromagnetic spectrum or cyberspace

Enablers: Off-the-shelf communications, processors, sensors, and software; SXCT investments in Squad Autonomy and Squad Sensing

New Investments:

- Data collection, prioritization and dissemination
- Data synthesis and analysis to create actionable information
- Information management with communications constraints

Risk: Detrimental system latency due to disaggregated processing and communications



Impact: Efficient, shared understanding of the battlespace

Optimized Resources

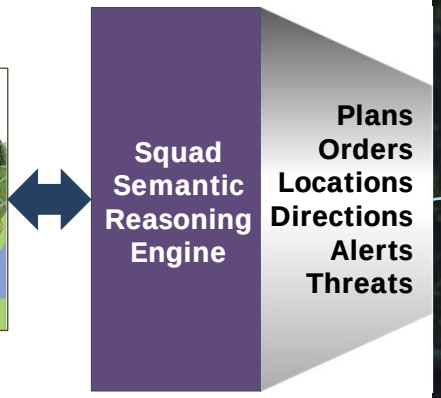
Today: Squads are physically and cognitively burdened with limited material resources; only leaders have access to information

Enablers: Off-the-shelf displays, interfaces, and unmanned platforms; SXCT investment in Squad Autonomy

New Investment:

- System resource management, prioritization, and tasking
- Semantic reasoners for context and mission specific functionality
- Tailored information presented on intuitive input and output mechanisms

Risk: System increases the physical and cognitive burden of Squad



Impact: Optimized use of the squad's resources and information

Synchronized Action

Today: Squads primarily engage in the physical realm and have limited capabilities in the electromagnetic spectrum; squads lack capability to fire and maneuver in cyberspace

Enablers: Off-the-shelf software and hardware; SXCT investments in Non-kinetic and Precision Engagement

New Investment:

- Automated tasking and cueing of sensors and shooters
- Coordinated physical, electromagnetic spectrum, and cyberspace attack
- Effective action proved through experimentation

Risk: Squad cannot take effective action in any dimension

Impact: Multi-dimensional, asymmetric advantages

Multi-Domain Combined Arms

Domain	Find	Fix	Finish
Physical	Sensing through physical properties of an object	Suppression through volume of direct and indirect fires	Precision fires targeting physical properties
Electromagnetic Spectrum	Detection/ identification of electronic signals	Electronic attack	Anti-radiation munitions
Cyberspace	Associating signals with a specific connected device	Deceive, degrade, disrupt	Deny, destroy, manipulate

Accurate relative and absolute localization of the squad in GPS-challenged and GPS-denied environments underlies all of these capabilities

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What Are the Expected Components?

- DARPA asks teams to propose integrated systems that implement the desired Squad X dimensions
- *An example* of the desired capability improvements and allocation:

Technologies	Squad X Envisioned End State
Intra-squad digital communications	Each squad member
Processing/software	Each squad member
Interfaces: Phone, tablet, watch or heads-up display	Each squad member
Localization (non-GPS) sensors	Each squad member
Ground and/or air unmanned systems	Each fire team
Threat sensing, exploitation, and fusion	Sensors on humans and unmanned systems for each fire team
Electromagnetic and cyberspace effects	Expanded capabilities, electronic support, and electronic/cyber attack for each fire team
Precision kinetic fires	Each fire team

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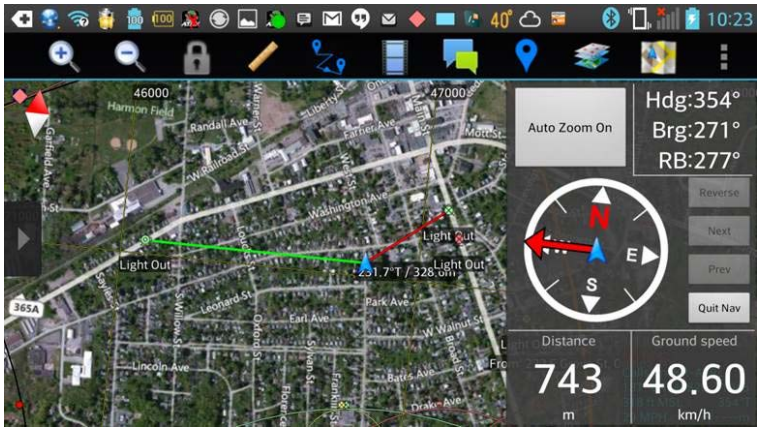
Android Architecture Baseline

- DARPA will provide Government-owned, Android-based software architectures as a baseline, such as:
  - Android Tactical Assault Kit (ATAK)
  - Nett Warrior operating system
- DARPA does not expect, but will not prevent, significant modifications of the platform architecture
- Performer teams should implement improvements, applications, or changes as necessary to implement Squad X capabilities
- Performers should request ATAK, Nett Warrior, or both as Government Furnished Property in their Squad X Experimentation Phase I proposal



Android Tactical Assault Kit

Nett Warrior

Minimal Investment

The Squad X Experimentation program intends to make minimal investment in the following areas:

- Significant hardware development, such as user interfaces, unmanned platforms, or novel sensors
- Significant modification or development of digital communications, to include radios, waveforms, and networking technologies
- Technologies that duplicate those currently funded under the Squad X Core Technologies program
- Evolutionary upgrades to existing technical capabilities that do not contribute to meeting the program goals or metrics

Program Success Metrics

	Type	Metric	Phase I Goal	Phase II Goal
Technical Metrics	Scalability	Number of human or unmanned system nodes	4 to 16 nodes	4 to 25 nodes
	Accuracy	Kinetic fires	Range ≥ 300 m	Range ≥ 1000 m
		Non-kinetic effects	Range ≥ 150 m	Range ≥ 300 m
		Threat detection	$P_d \geq 0.75$ $P_{fa} \leq 0.25$	$P_d \geq 0.9$ $P_{fa} \leq 0.1$
		Localization	Relative ≤ 2 m Absolute ≤ 10 m	Relative ≤ 1 m Absolute ≤ 6 m
Tactical Metrics	Distribution	Between nodes	≥ 50 m	≥ 100 m
		Between fire teams	≥ 150 m	≥ 300 m
	Mobility	Average speed Burst speed	≥ 1 m/s ≥ 2 m/s	≥ 1 m/s ≥ 5 m/s
	Autonomy	Number of interventions	≤ 3 per km	≤ 1 per km

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Experimentation

Squad X: Current Experimentation Efforts

Baseline Experimentation

- Goal: Develop metrics that can be used to quantitatively differentiate performance between squads
- The metrics will lay the foundation for comparative assessment (positive, negative, indifferent) of individual capabilities in Phase 2 of the Squad X Core Technologies program and system-level capabilities in the Squad X Experimentation program
- Currently working with the Joint Deployable Analysis Team and the U.S. Army Maneuver Battle Lab for design and execution
- Trial experimentation scheduled for August 2016 at Fort Benning, GA

Squad X Core Technologies Experimentation

- Concept Demonstrations: August 2016 to October 2016
  - Surrogate fire team in open and rolling terrain
  - At various performer sites
- Evaluation Experiments: March–May 2017; September–November 2017; March–May 2018
  - Rifle squad in urban and complex terrain
  - Successive experiments to demonstrate increased capability (by performer)
  - Exact dates dependent on Phase 2 performers
  - Leverage lessons learned from Baseline Experimentation

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Experimentation Is Critical to Success

DARPA will assess success throughout the program using a series of field experiments that demonstrate system performance

- All experiment scenarios will start with a movement to contact
  - A movement to contact is an offensive task designed to develop the situation and to establish or regain contact
  - Once contact is made with an enemy force, the squad leader has five options: attack, defend, bypass, delay, or withdraw
- Experiment design will vary the forms of contact and include "approved solutions" once contact is made
- Use baseline comparisons for each squad per experiment:
  Baseline → Squad X → Squad X → Baseline

Type	Metric	Goal
Operational Effectiveness	Mission Success Rate	≥ Baseline Squad
Mission Preparation	Reconfiguration time, planning time, setup time	≤ Baseline Squad
Physical	Cost of transport	≤ Baseline Squad
Cognitive	Decision time, dissemination time, and execution time	≤ Baseline Squad

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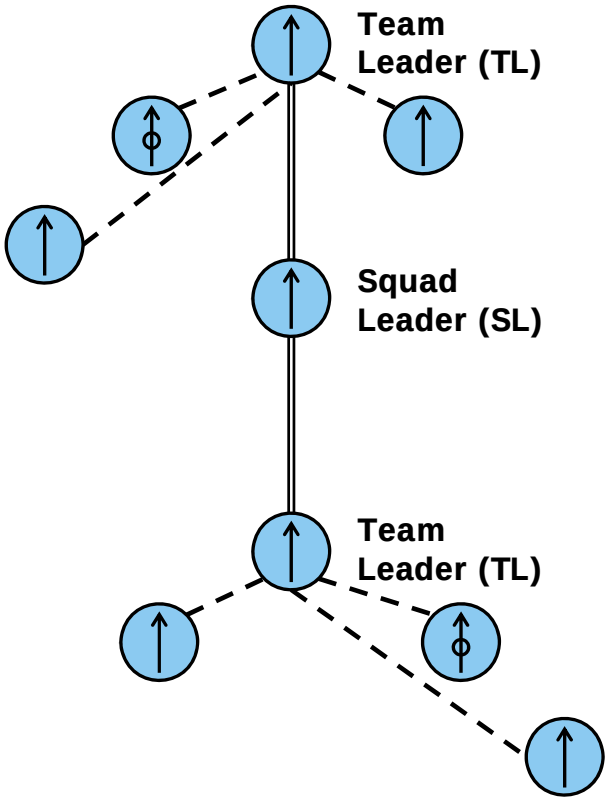
Today, Multi-Domain Operations Are Not Practical

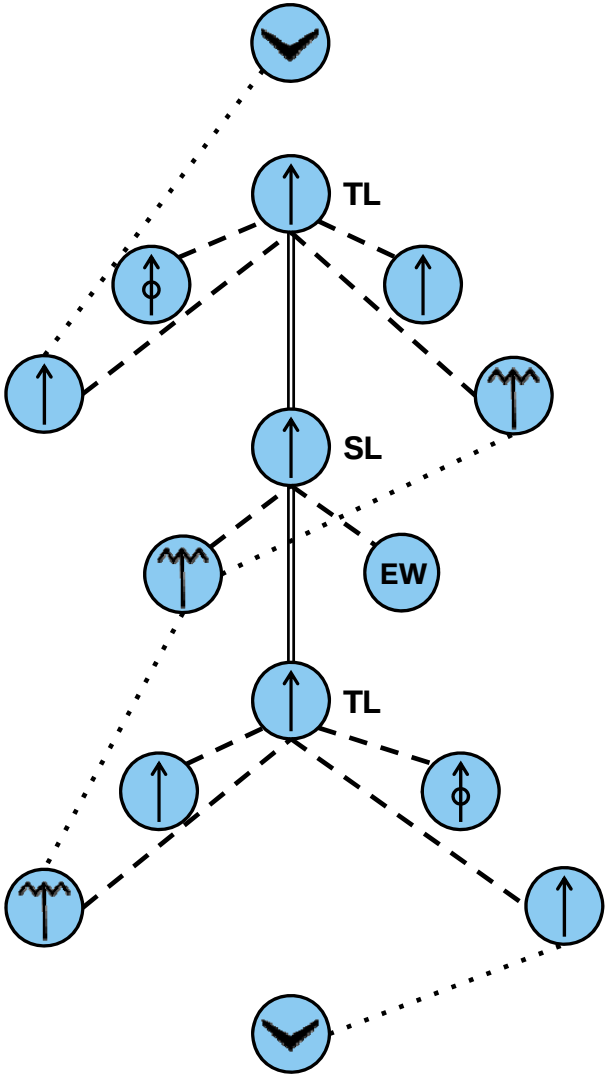
Army Squad
Movement to Contact



Limitations

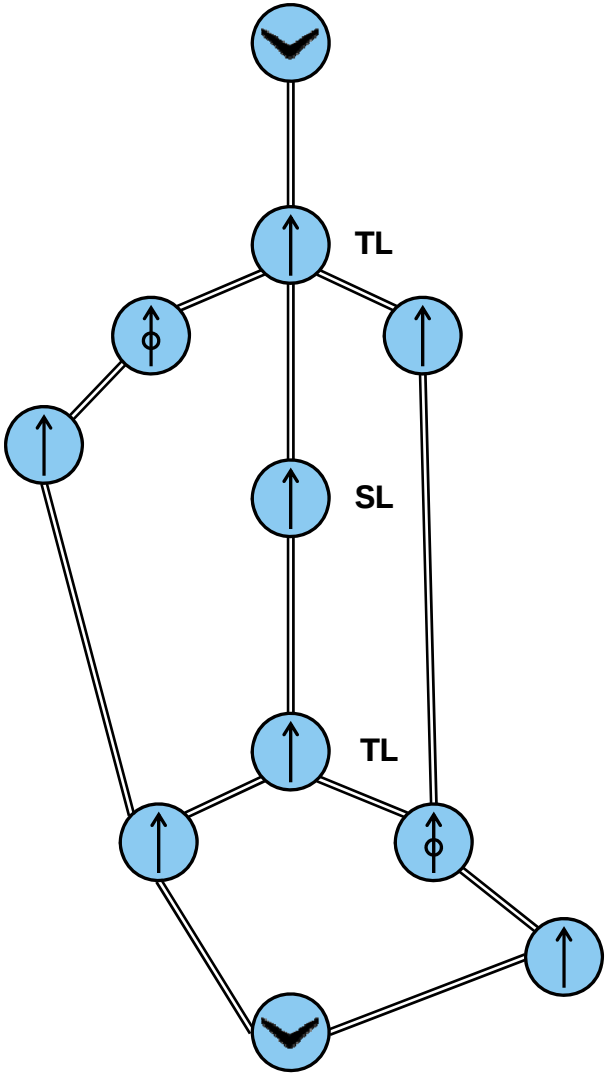
- Unmanned systems are not integrated, cannot distribute information, and exacerbate command and control challenges
- Electromagnetic spectrum operations are limited to push-to-talk radios and counter-IED only
- Electromagnetic spectrum operations require at least four additional personnel and cannot distribute information
- Cyberspace operations are limited to fixed locations

Notional, Multi-Domain Squad*
Movement to Contact



*This does not exist today

System Prototyping
Point of Departure – Army Squad



Squad X Capabilities

- Every Squad member has local processing and communications
- Data and information can be passed between all Squad members to include unmanned systems
- Unmanned systems capable of follow behaviors and waypoint navigation, with planned improvements

Leverage and Enhance

- Off-the-shelf technologies: communications, processing, displays/interfaces, and software
- Squad X Core Technologies investments

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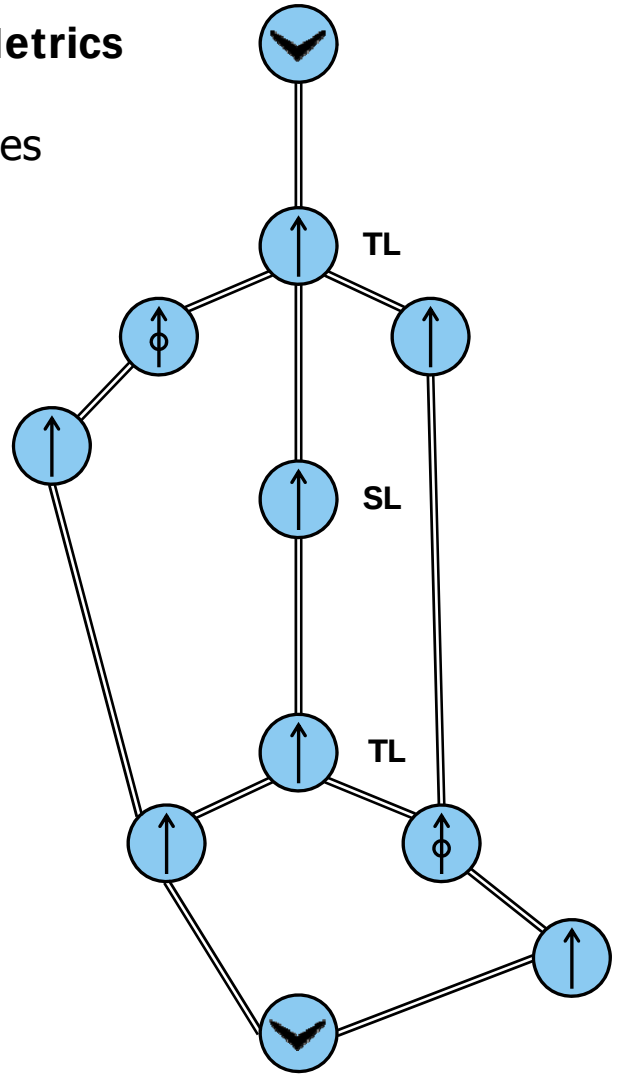
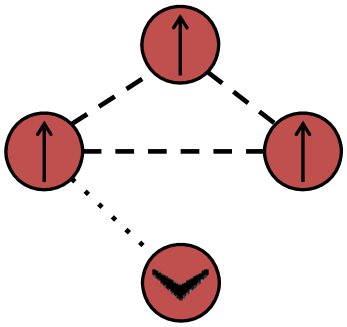
System Prototyping
Experiment 1 – Army Squad

Technical Metrics
Scalability:
4 to 11+ nodes
Endurance:
4 hours



Threat Size and Capabilities
Small arms and voice communications
Unmanned systems



Squad X Capability Investment
Shared, situational understanding of their multi-domain, operational environment: physical, electromagnetic spectrum, and cyberspace

Risk
Detrimental system latency due to disaggregated processing and communications

· · · · · · · Data — — — Voice ═══ Data & Voice ↑ Rifleman ↑ Grenadier ⌄ Unmanned System

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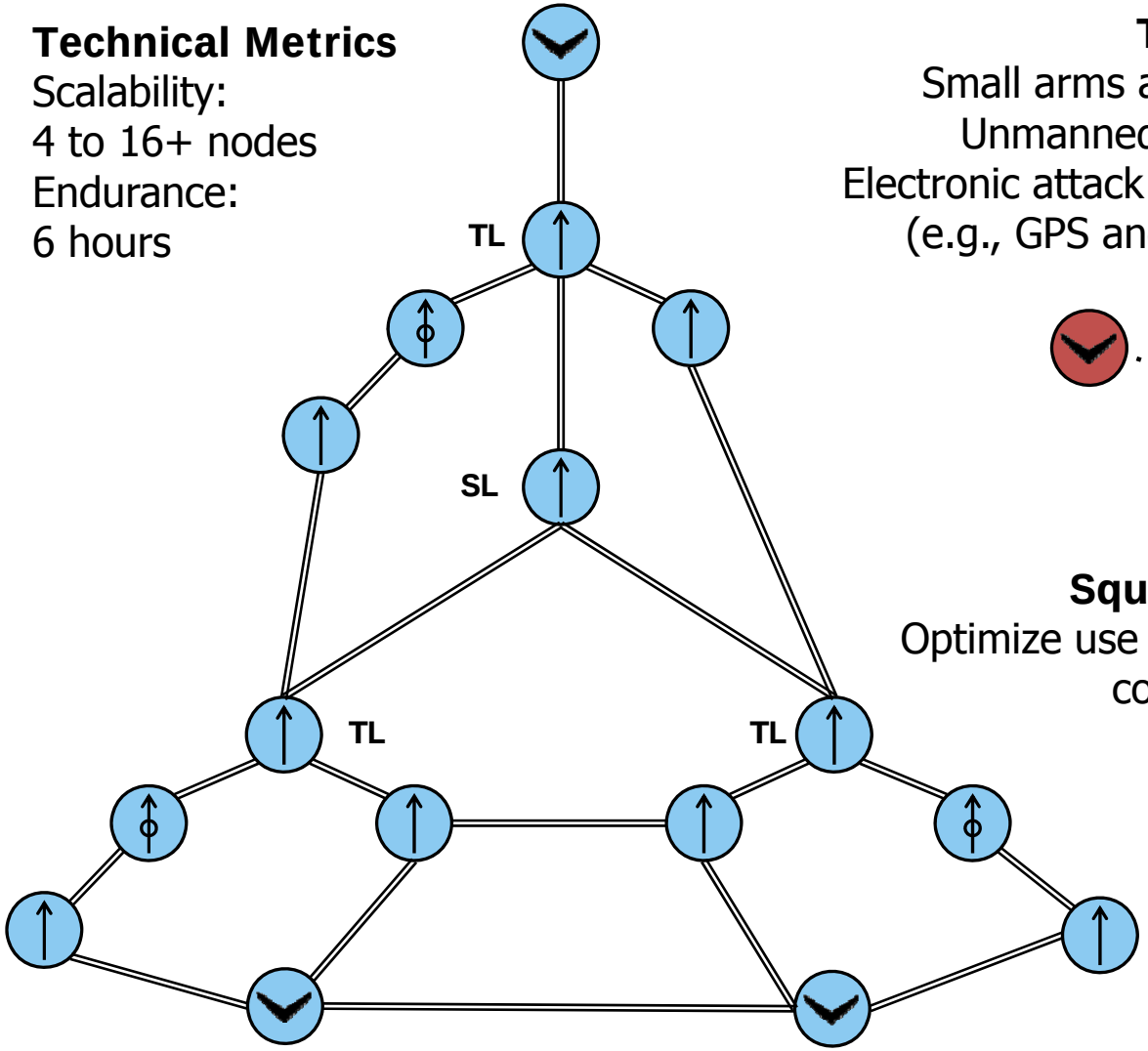
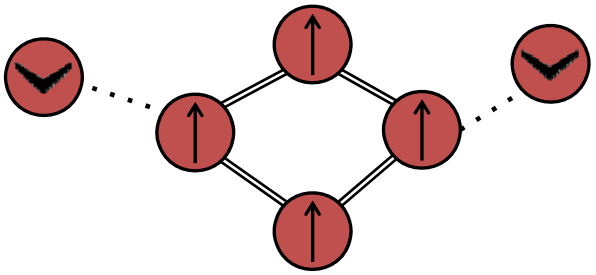
System Prototyping
Experiment 2 – Marine Corps Squad

Technical Metrics
Scalability:
4 to 16+ nodes
Endurance:
6 hours



Threat Size and Capabilities
Small arms and voice/data communications
Unmanned systems with physical sensing
Electronic attack within limited frequency bands
(e.g., GPS and communications frequencies)



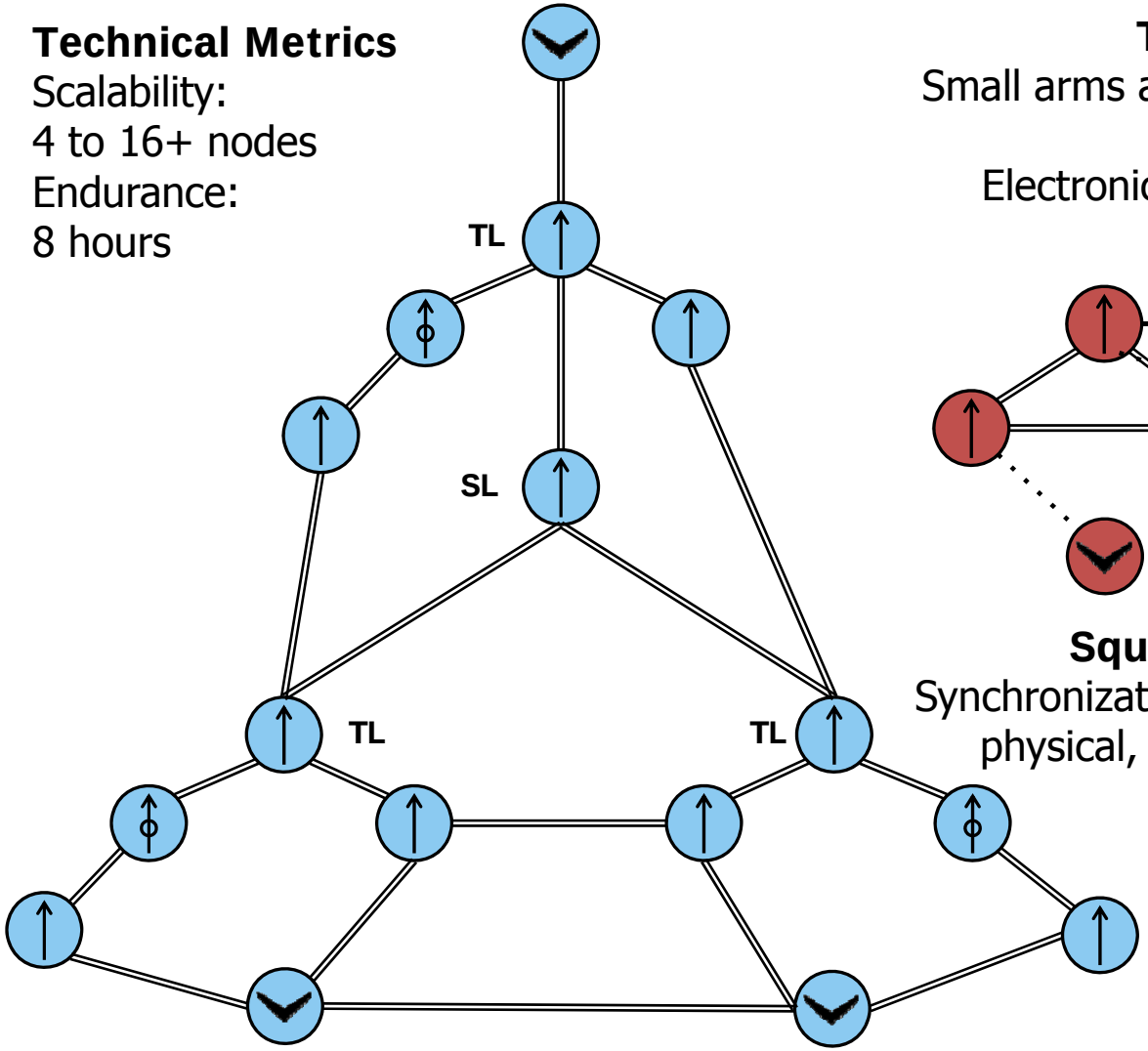
Squad X Capability Investment
Optimize use of the Squad's limited physical, cognitive, and material resources

Risk
System increases the physical and cognitive burden of Squad

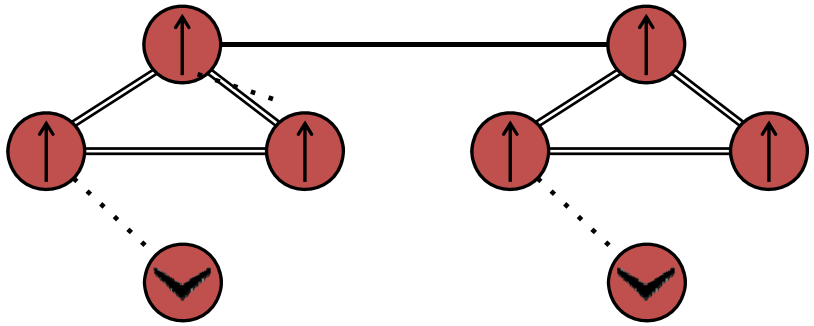
Data | Voice | Data & Voice | Rifleman | Grenadier | Unmanned System

System Prototyping
Experiment 3 – Marine Corps Squad

Technical Metrics
Scalability:
4 to 16+ nodes
Endurance:
8 hours



Threat Size and Capabilities
Small arms and voice/data communications
Unmanned systems
Electronic warfare and cyber capabilities



Squad X Capability Investment
Synchronization of fire and maneuver in the physical, electromagnetic spectrum, and cyberspace domains

Risk
Squad cannot take effective action in any domain

· · · · · · · Data — — — Voice ═══ Data & Voice Rifleman Grenadier Unmanned System

System Prototyping (Phase I) Experiments

Experiment	Squad X Scalability	Endur-ance	Threat Size	Environment
Experiment 1	Army Squad 4–11+ Nodes	4 hrs	3–4 nodes	• Small arms and voice comm. • Unmanned systems
Experiment 2	Marine Corps Squad 4–16+ Nodes	6 hrs	4–6 nodes	• Small arms and voice/data comm. • Unmanned systems with physical sensing • Electronic attack within limited frequency bands (e.g., GPS and comm. frequencies)
Experiment 3	Marine Corps Squad 4–16+ nodes	8 hrs	6–8 nodes	• Small arms and voice/data comm. • Unmanned systems • Electronic warfare and cyber capabilities (e.g., GPS jamming)

The Phase I aims for successful execution of missions with synchronized fire and maneuver against line-of-sight threats greater than 300 meters from the squad

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System Development (Phase II) Experiments

- All System Development experiments will face combinations of physical, electromagnetic spectrum, and cyberspace threats
- Experiments will focus on agile response to threat complexity in different environments with increasing system endurance; performer(s) will receive threat configuration six months prior to next experiment

Experiment	Squad X(s)	Endurance	Threat Size	Environment
Experiment 1	1 Squad X	12 hrs	5–7 nodes	Complex, Non-Urban
Experiment 2	1 Squad X	16 hrs	7–9 nodes	Complex, Mixed
Experiment 3	2 Squads X	20 hrs	9–11 nodes	Urban: Outdoors and Indoors
Experiment 4 (Capstone)	3 Squads X (Platoon X)	24 hrs	15–18 nodes	Urban: Outdoors, Indoors, & Underground

The Phase II end-state aims for successful execution of missions with synchronized fire and maneuver against non-line-of-sight threats greater than 1000 meters from the squad

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Program

Two-Phase Program

Phase I

- 24 months
- Effort:
  - Mature and integrate technologies into a prototype system that implements squad combined arms
- End state:
  - Successful execution of missions with synchronized fire and maneuver against threats
- Threats:
  - Technology-enabled insurgents
  - Line-of-sight
  - ≥ 300 m from squad
- Up to 3 teams
- Up to $25.5M available for award

Phase II

- 24 months
- Effort
  - Insert new technologies
  - Continue to refine and mature the system prototypes
  - Conduct extensive experimentation
  - Deliver an integrated system
- End state:
  - Successful execution of missions with synchronized fire and maneuver against threats
- Threats:
  - Non-state/hybrid actors
  - Peer/near-peer states
  - Non-line-of-sight
  - ≥ 1000 m from squad
- Approximately 1 team
- Up to $19M available for award

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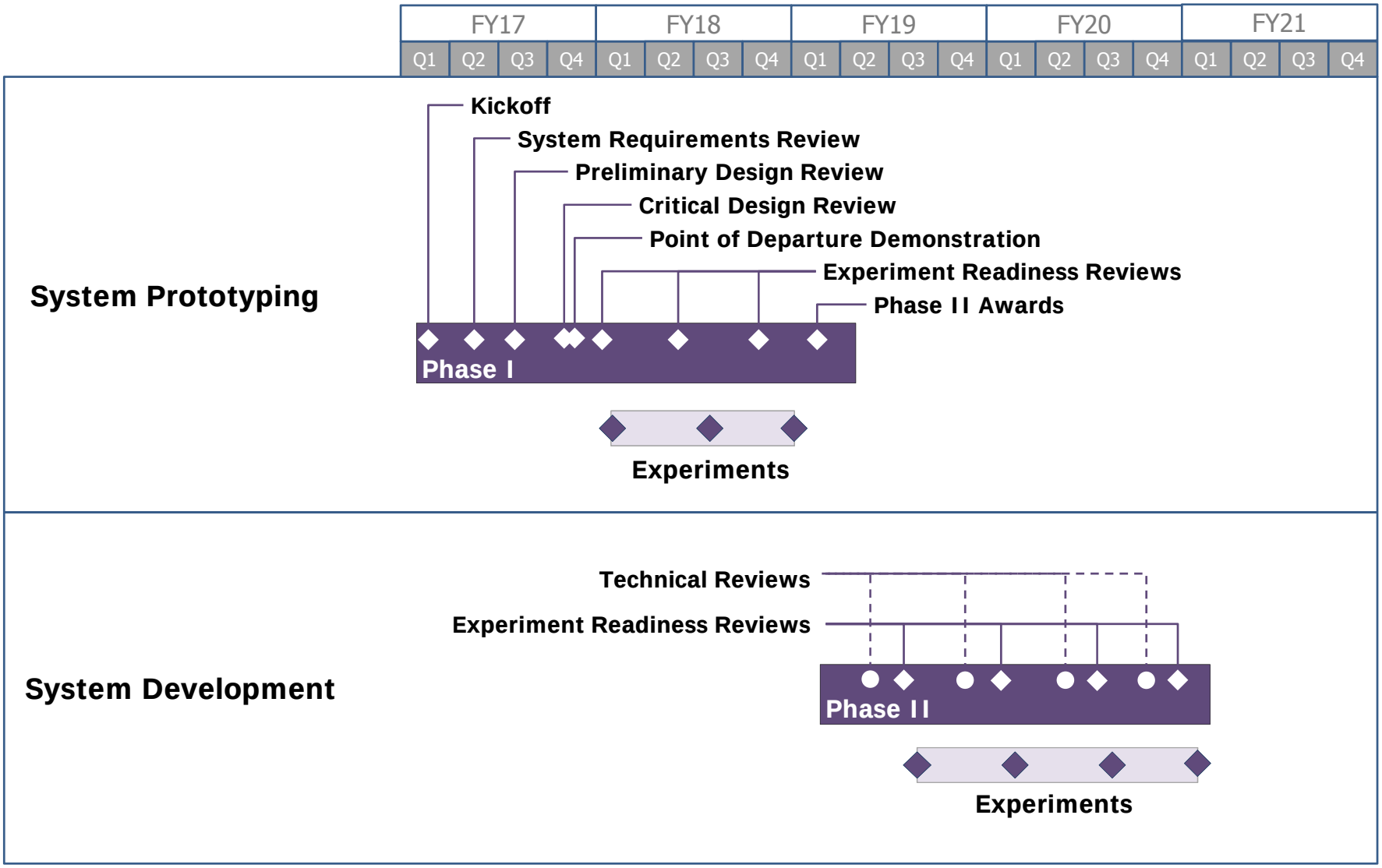
Notional Program Schedule



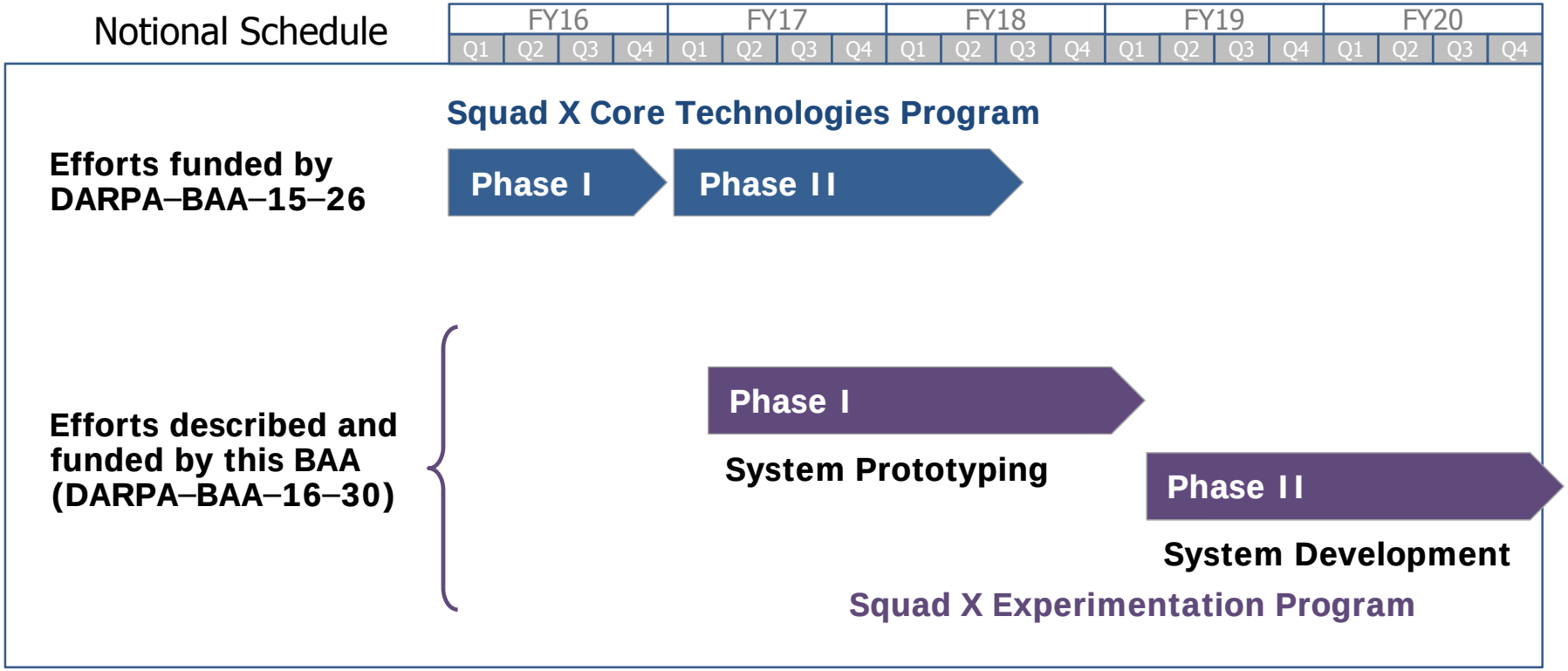
Multidisciplinary Performer Teams Wanted

- DARPA expects that successfully achieving the program goals will require multidisciplinary performer teams who can:
  - Identify and mature key technologies
  - Develop system prototypes
  - Perform field experiments
  - Refine the system to maximize its performance against the program metrics.

- Squad X Experimentation ***is not*** a program for technology development only

Program Relationships

- DARPA is currently funding the Squad X Core Technologies (SXCT) program to develop technologies that have the potential to augment dismounted squad capabilities
- The Squad X Core Technologies program will continue to exist as a separate DARPA program in parallel with Squad X Experimentation:

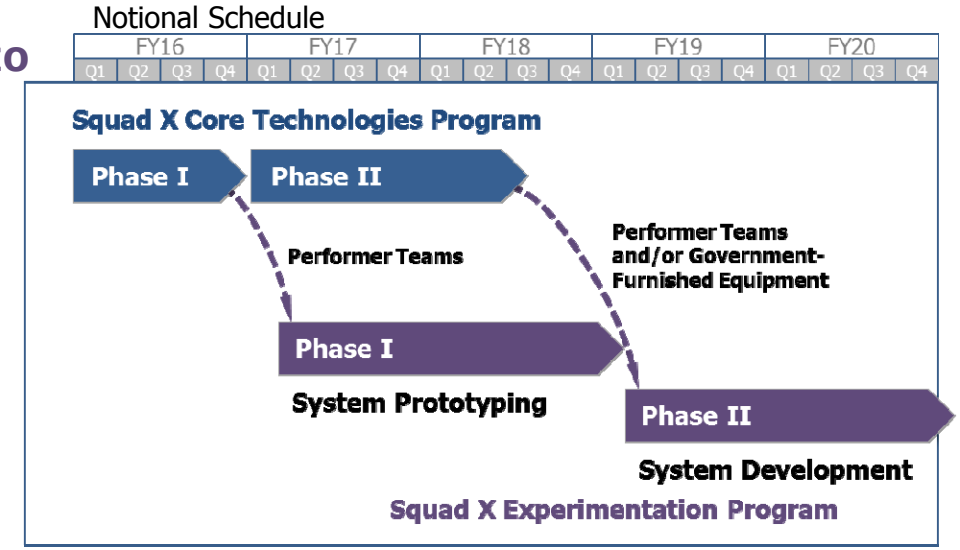


Program Relationships

- DARPA strongly encourages forming teams that incorporate all of the expertise necessary to succeed
  - SXCT Phase II funding decisions will not be made before proposals are due
  - Proposed teams may include current SXCT performers
  - Proposals may only assume SXCT technology maturity up to the Phase I end state, and must clearly define further development to meet program goals
- DARPA may provide Government Furnished Equipment (GFE) from SXCT, or other sources, for integration into Squad X Experimentation Phase II

SXCT will potentially be incorporated into Squad X Experimentation in three ways:

1. As part of a performer team for Squad X Experimentation Phase I
2. As part of a performer team for Squad X Experimentation Phase II
3. As DARPA-provided GFE for Squad X Experimentation Phase II



Submission Guidance

- **Proposers are strongly encouraged to submit an abstract in advance of a full proposal**
  - DARPA will respond to abstracts with a statement as to whether DARPA is interested in the idea
  - Regardless of DARPA's response to an abstract, proposers may submit a full proposal

- **Classified abstracts and proposals are not required, but will be accepted for the Squad X Experimentation program**
  - When the classification of a submission is in question, refer to the Squad X Security Classification Guide (SCG), to determine the classification
  - If there are concerns about classification and the Squad X Experimentation SCG does not sufficiently address the issue, proposers may defer to another SCG
    - Please reference the appropriate SCG in the proposal
  - The Security Classification Guide must be requested per instructions provided in the BAA

Experimentation Support

- **DARPA will support experimentation in several ways:**
  - DARPA will run experiments using Government-provided operational elements
  - DARPA will pay the site costs for all DARPA-run experiments
  - DARPA will provide the appropriate simulation equipment, to include simulated ammunition
  - Performers may assume that operational units will have their own personal protective equipment, night vision devices, and personal weapons/attachments
    - Performers may not modify these devices

- **Proposals should describe:**
  - The system to be provided for experimentation, including any replacements for operational element equipment
  - Personnel travel and transportation of the proposed system to/from the experiment locations described in the BAA
  - All costs associated with performing experiments at performer sites

Human Subjects Testing

- DARPA anticipates that all efforts will require the performer to conduct periodic human subjects testing as part of evaluating Squad X systems and user interfaces
- Proposers should plan for separate protocols for internal testing and external, DARPA-led experimentation
- For such efforts, the proposal must include:
  - Evidence of a fully drafted protocol
  - A plan for submission and review by an Institutional Review Board (IRB)
- Do not underestimate the required timelines – this has the potential to significantly delay development
- Further details on the process will be provided

Questions

- Please submit your written questions via the cards provided
  - This will allow us to capture the Q&A portion for those not able to attend
- Answers to the questions will posted to FBO.gov
- FAQ
  - Will a copy of the presentation materials be made available?
    - Yes, once it has cleared public release
  - How will proposals be ranked against each other?
    - Proposals will not be compared to one another; each proposal will only be evaluated against the evaluation criteria provided in the BAA

Squad X

Squad X will enable the humans in the Squad to be increasingly effective in future complex, multi-domain operational environments

We need your help to make this real

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